

PROJECT TITLE COBOCONK DAM REHABILITATION

ISSUED FOR TENDER

MAY 2018

PROJECT NUMBER exp – BRM-00605412-A0

DATE May 2018

END OF SECTION



END OF SECTION

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END OF SECTION

Part 1 - General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- .1 In general, work of this Contract comprises the rehabilitation of the Coboconk Dam, located in Coboconk, Ontario.
- .2 The Construction Work consists of, but is not limited to the following:
 - .1 Preparation of plans, shop drawings and other required submissions.
 - .2 Temporary Site Access
 - .3 Construction Camp/Staging Area
 - .4 Vehicular traffic control/detour
 - .5 Public and Navigation traffic safety
 - .6 Drainage, sediment, and erosion control; and other environmental protection
 - .7 Procurement of regulatory permits certificate of authorization and approvals
 - .8 Cofferdams and dewatering of the work area, including maintenance of the dewatering system
 - .9 Water diversion (through existing dam)
 - .10 Preparation and implementation of an Emergency Response Plan (ERP), Operation/Monitoring/Surveillance Plan (OMS) for the Contractor's temporary works
 - .11 Demolition of portions of the existing concrete dam structure
 - .12 Salvage of the existing winches and other identified equipment
 - .13 Construction of the upgrades to the existing concrete dam structure and related work
 - .14 River erosion protection
 - .15 Removal of cofferdams and other temporary works
 - .16 Site reinstatement and restoration
- .3 Location of Work
 - .1 The Coboconk Dam is located on the Gull River within the community of Coboconk in the City of Kawartha Lakes, approximately 100 metres upstream of the Highway 35 bridge. The dam is one of 125 dams that are used to regulate the water levels for navigation on the Trent-Severn Waterway. The dam is owned and operated by Parks Canada Agency (PCA).
- .4 Examination of Site
 - .1 Visit site before submitting tender. Examine site, adjacent premises, means of access and egress, and investigate and be fully informed of the nature and extent of the work required, difficulties in performing the work, facilities available for delivery, placing, operating plant and for delivery of materials
 - .2 A site visit will be organized to allow Bidders to examine site, adjacent premises, and condition of existing structure(s) before submitting a bid.

- .3 Be completely familiar with every detail and intent of these specifications and scope of work to be performed, and regulatory requirements governing Work.

1.2 WORK BY OTHERS

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Departmental Representative.
- .2 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Departmental Representative, in writing, any defects which may interfere with proper execution of Work.

1.3 WORK SEQUENCE

- .1 Construct Work in stages to accommodate Owner's continued use of premises during construction. Stage 1 - West Side 2018, Stage 2 - East Side 2019, Contractor may submit alternate staging and sequence plan for review by Departmental Representative. Refer to VALUE ENGINEERING PROPOSAL.
- .2 Co-ordinate Progress Schedule and co-ordinate with Owner occupancy during construction.
- .3 Replacement of new concrete deck must be performed in sections. PCA will require a minimum of four (4) operational bays at all times. A combination of at least two of the four operational bays shall be from Sluices #3,4,5,6 or 7. At minimum, temporary guardrails meeting CLC and OSHA requirements must be in place at all times on the sluices intended to be operational to protect Parks Canada staff. Public access is not permitted. Fence off to public and sign accordingly.
- .4 Maintain fire access/control.

1.4 CONTRACTOR USE OF PREMISES

- .1 The Contractor may use grounds at the dam for access to site, parking and as staging area to complete work. Contractor is to use areas as specified on drawings only and as otherwise approved by Departmental Representative.
- .2 Limit use of premises for Work, storage, and access, to allow:
 - .1 Owner occupancy.
- .3 Co-ordinate use of premises under direction of Consultant.
- .4 Obtain and pay for use of additional storage or work areas needed for operations under this Contract. Additional environmental constraints may be required for the use of identified additional laydown area (contaminated land).
- .5 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .6 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.

1.5 OWNER OCCUPANCY

- .1 Owner will occupy premises during entire construction period for execution of normal operations.
- .2 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.
- .3 Dam must remain continuously accessible and operational to Parks Canada and any service providers it employs during work for regular operation of dam and urgent maintenance needs, with a minimum of four sluices available for access and operation.
- .4 Prior to closing access to any given sluice to complete work, Parks Canada must adjust stop logs to desired setting while work on sluice is to be completed. Only PCA may adjust stop logs in main gains, Contractor is responsible for operating service gains during construction for localized dewatering purposes.

1.6 PRE-PURCHASED EQUIPMENT

- .1 Parks Canada is supplying existing salvaged items from the dam (crab winches, water level gauge) for the contract. The Contractor will be responsible for removal, delivery, and re-installation. Refer to drawings for further details of owner purchased items. Notify PCA at least one week prior to removal of water gauge to allow PCA to remove oil and equipment from gauge housing.
- .2 Request Departmental Representative in writing at least 7 calendar days in advance of date on which materials and equipment are required.
 - .1 Pick up materials on date requested.
 - .2 In the event of inclement weather notify Departmental Representative 24 hours in advance of any cancellations and request reschedule.

1.7 OWNER FURNISHED ITEMS

- .1 Owner Responsibilities:
 - .1 Deliver supplier's bill of materials to Contractor.
 - .2 Inspect deliveries jointly with Contractor.
- .2 Contractor Responsibilities:
 - .1 Designate submittals and delivery date for each product in progress schedule.
 - .2 Inspect deliveries jointly with Owner; record shortages, and damaged or defective items.
 - .3 Handle products at site, including uncrating and storage.
 - .4 Assemble, install, connect, adjust, and finish products.
 - .5 Provide installation inspections required by public authorities.
 - .6 Repair or replace items damaged by Contractor or subcontractor on site (under their control).
- .3 Schedule of Owner furnished items:
 - .1 Stop logs cut and finished to suit dam.

- .2 Salvaged items from existing log lifting system (2 crab winches).
- .3 Water Level Gauge (existing automatic water level gauge, remove at start of project, reinstall at finish of project)

1.8 DOCUMENTS REQUIRED

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

1.9 FEES, PERMITS AND CERTIFICATES

- .1 Canal Regulations and Permits
 - .1 "Historic Canals Regulations" apply to and govern work under this Contract.
 - .2 Regulations may be obtained from Justice Canada's website at:
<http://laws-lois.justice.gc.ca/eng/regulations/sor-93-220/>.
 - .3 Contractor may not mobilize or begin any work until Parks Canada issues permit under Historic Canals Regulation (SOR93-220 Sections, 11, 14 and 15).
 - .4 Permit will not be issued before following submittals are submitted and accepted:
 - .1 Environmental Management Plan (EMP) including all relevant component plans as identified in the ESG document.
 - .2 Health and Safety Plan
 - .3 Site Layout Plan
- .2 Changes to project scope of work not assessed under site-specific Basic Impact Assessment (BIA) will require review and acceptance by Client Department and may require issuing a revised BIA.

1.10 ARCHEOLOGICAL, CULTURAL AND ENVIRONMENTAL HERITAGE PROTECTION

- .1 The TSW below the dam is a National Heritage Site.
- .2 Client Department, Parks Canada Agency, is the main Environmental Authority for Trent-Severn Waterway projects.
- .3 Departmental Representative will seek and obtain acceptance of Client Department and PCA Environmental Authority for submittals or changes in scope of work or methodologies that may affect archeological resources, cultural resources or environment prior to providing direction to the Contractor.

- .4 Comply with mitigation measures outlined in site-specific Basic Impact Assessment (BIA) and other federal, provincial, territorial or municipal acts or regulations applying to the National Parks and Historic Sites of Changes, Project scope of work not assessed under site-specific BIA will require review and acceptance by Client Department and may require issuance of a revised permit.
- .5 Environmental requirements: All works shall be carried out at site in compliance with the approved Site Specific Environmental Management Plan. The Contractor will produce this document based on Owner's Basic Impact Assessment for the site and the Environmental Standard Guidelines (ESG). The Contractor's site specific EMP shall be written by a qualified consultant. Should the Contractor encounter historical artifacts, it will immediately notify the Departmental Representative and no work shall progress further in that area until the Departmental Representative confirms to proceed.
- .5 Site may contain possible cultural and archaeological resources.
- .6 Employ minimal intervention approach for all Work.
- .7 Damage to heritage elements will not be tolerated.
- .8 All work to be in accordance with requirements of Section 01 35 46.

Part 2 - Products**2.1 NOT USED**

- .1 Not used.

Part 3 - Execution**3.1 NOT USED**

- .1 Not used.

END OF SECTION

Part 1 - General**1.1 ACCESS AND EGRESS**

- .1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations. A pre-condition assessment will be required, in particular for features and structures on adjacent properties.

1.2 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Maintain existing access to site for PCA operations.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Contract to provide temporary sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .5 The Work will be completed in two stages:
 - i. Stage 1 - East Side in 2018
 - ii. Stage 2 - West Side in 2019
 - iii. Contractor to complete site restoration in Spring 2020
 - iv. Each stage will be completed in multiple phases; it is the Contractor's sole discretion on the number of bays to be completed in each phase, as long as it complies with PCA requirements and all applicable restrictions.
- .6 Contractor to limit use and occupation of staging and laydown on east side to Stage 2.
- .7 Completion of Stage 1 is defined as the following:
 - i. Newly rehabilitated bays are fully operational and safe for operation, which includes:
 - a. installation of new handrails;
 - b. installation of winches and rails;
 - c. installation of log slides; and
 - d. installation of gain covers.
 - ii. Security fencing installed around perimeter of construction site to ensure safety for public.
 - iii. Construction site clean and tidy.
 - iv. Access for PCA to conduct their normal operations.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING SITE

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

1.4 SEASONAL OPERATING WATER LEVELS

- .1 Normal Summer Water Levels: Upstream 257.70m, Downstream 256.33m
- .2 Normal Winter Water Levels: Upstream 257.19m, Downstream 256.33m
- .3 Maximum Observed Levels: Upstream 258.05m, Downstream 256.45m
- .4 Water levels can vary, due to precipitation and runoff or drought, and the Owner takes no responsibility to maintain water levels at the seasonal water levels referenced.
- .5 Owner will respond within a reasonable timeframe to adjust flows in the river system to bring the water level to the seasonal levels indicated when possible. The timing to bring the water level to the seasonal level cannot be established by the Owner, and the Owner cannot be held responsible for any related delay.

1.5 SPECIAL REQUIREMENTS

- .1 The restriction period for in-water work is March 15 to July 15. During the restriction period, the Contractor is not permitted to engage in any activity that may cause disturbance of the watercourse bottom and dispersion of sediment. Examples of prohibited activities include in-water excavation, in-filling, rock placement, transfer/movement of granular material or aggregate.
- .2 Between May 16 and July 15, PCA may permit the installation of cofferdams, placement of pier extensions in the water, and tremie concrete provided that all the mitigating conditions are met. Refer to Section 01 35 43 Environmental Procedures and Appendix A - Basic Impact Analysis.
- .3 Granular or loose-fill aggregate cofferdams will NOT be permitted on the project.
 - i. There shall be no risk for release of fines into the watercourse at any time, therefore the use of granular materials as part of a cofferdam system (e.g. metre bags or within double sheet pile walls) shall be washed of all fines prior to placement. The Contractor shall permit inspection and/or sampling, from the source pit, of the granular materials to be used a minimum four (4) weeks prior to being used.
 - ii. Temporary placement of large rip rap or armour stone along the banks may be permissible to protect the shoreline to support the Contractor's work plan. Refer to Section 01 14 00 clause 1.6.1 for timing of placement and removal.
- .4 Where possible, site clearing should be planned to occur outside of sensitive bird nesting times - April 8th to August 28th. If this is not feasible, then the site must be inspected by the contractor's biologist (environmental consultant) prior to clearing, to identify any potential for nests.
- .5 Carry out noise generating Work Monday to Friday from 07:00 to 20:00 hours.
- .6 Only localized cofferdams are permitted on the project.
 - i. Localized cofferdams are defined as not more than 3m beyond the pier nose extensions.
 - ii. Placement and removal of localized cofferdams shall be in conformance with in-water work restrictions stated in Section 01 14 00 and the Basic Impact Assessment.

- .7 A minimum of four (4) bays shall be operational at all times throughout the project; two of the four bays shall be from either Sluices #3, 4, 5, 6, or 7.

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 LUMP SUM PRICE ITEMS**

- .1 Lump Sum Price - All Work other than that which is specifically designated in the Unit Price Table, shall be included Contract Lump Sum Price. This item includes all costs to undertake the Work.
- .2 The items of work listed below are not intended to be complete, but are provided to give an indication to the Contractor how the Contract Lump Sum Price will be broken down for payment purposes. As such, it is the Contractor's responsibility to ensure that all items of work not covered under the Unit Price Table are covered in the Contract Lump Sum Price.
- .3 Items of work to be considered in the Contract Lump Sum Price are, but not limited to:
 - .1 Mobilization/Demobilization, including (Payment Group 1):
 - .1 General site preparation, clearing and grubbing, soils stripping etc;
 - .2 General maintenance and cleaning of work site, site access, and haul routes;
 - .3 Site security;
 - .4 Snow removal;
 - .5 Temporary utilities;
 - .6 Contractor's and Engineer's Site Office;
 - .7 Shop drawings;
 - .8 Submittals, approvals, permits and fees (other than specified below);
 - .9 Agreements/permits/authorization and releases with private landowners, municipalities and other authorities having jurisdiction;
 - .10 Dust and noise management.
 - .11 Protection, maintenance, relocation and reconnection of existing services and utilities.
 - .2 Contractor Staging Areas (on-site and/or off-site)- Construction/deconstruction including (Payment Group 2):
 - .1 Preparation, clearing and grubbing, soil stripping, rough grading and granular backfill, drainage of area etc. as required;
 - .2 Sediment/erosion control measures, wildlife exclusion measures;
 - .3 Temporary utilities;
 - .1 Site security;
 - .2 General maintenance and cleaning;
 - .3 Dust and noise management;
 - .4 Land restoration;
 - .5 Lease agreement payment (as required).
 - .4 Site Access - Construction and deconstruction of temporary works for access to east and west side work areas (Payment Group 3).
 - .5 Water Diversion System (Payment Group 4) Design and approvals, construction, maintenance, operation (including record keeping), deconstruction and restoration (including grading, topsoiling, fine grading and sodding), reconstruction of residential driveways, west side access and parking lot, private docks, fencing and gates, and reconnection of electrical service and any water supply lines.
 - .6 Cofferdam (Payment Group 5) - Design and approvals, construction, maintenance and deconstruction of the upstream and downstream cofferdams.

- .7 Construction Control and Monitoring (Payment Group 6) - Condition surveys and monitoring of temporary works.
- .8 Traffic Control (Payment Group 6) Temporary measures for vehicle and navigation traffic control provisions and maintenance.
- .9 Dewatering/Recharging (Payment Group 6) Dewatering and dewatering maintenance, including removal of fish trapped in dewatered area, and recharging of dewatered area.
- .10 Drainage/Sediment/Erosion Control (Payment Group 6) - Temporary drainage, sediment and erosion control and treatment at work area, construction, maintenance and removal.
- .11 Excavation (Payment Group 7) – excavation of work area including hauling, stockpiling and disposal.
- .12 Demolition (Payment Group 7) - Removal, reuse and/or disposal of existing dam and associated works.
- .13 Salvage (Payment Group 8) - Removal, storage, re-installation of designated items, including transportation to and from Parks Canada compound in Peterborough.
- .14 Concrete Works (and associated works, excluding miscellaneous steel embedded components) (Payment Group 7):
 - .1 Deck Replacement;
 - .2 Pier extensions (upstream and downstream);
 - .3 Pier extensions (vertical);
 - .4 Wingwall extensions (vertical);
 - .5 Endwall thickening (east and west side);
 - .6 Stop log sills (upstream);
 - .7 Concrete Pier Repairs (not included, see Unit Price Items)
- .15 Backfilling and Grading (Payment Group 7) - supplying, hauling, placement and compaction of site and imported materials within work area.
 - .1 Rip rap material;
 - .2 Granular material backfill;
- .16 Miscellaneous Steel Work (Payment Group 9):
 - .1 Gain Liner;
 - .2 Sill Beams;
 - .3 Pier Nosings;
 - .4 Railing;
 - .5 Gain Covers;
 - .6 Staff Gauge;
 - .7 Winch Trolleys Rail and Assembly;
 - .8 Other miscellaneous steel fabrications items.
- .17 Dam Safety Signage(permanent) (Payment Group 9).
- .18 Safety Booms (Payment Group 9) - supply and installation of safety boom assemblies (upstream and downstream), including in-water and shoreline anchors (permanent).
- .19 Trees, Shrubs and Ground Cover Planting (Payment Group 9) - supply, placement and maintenance including watering of trees, shrubs and ground cover planting in landscape areas.
- .20 Fencing (safety) at dam site (Payment Group 9).

- .21 Road Right-of-Way (Payment Group 10)- Deconstruction and re-constructions/reinstatement of road structure and affected driveways, including temporary sediment controls, asphalt disposal, removal of guiderails, and associated site restoration works.
- .22 Parks Canada Agency Access and Parking Lot Restoration (Payment Group 9).
- .23 Commission and Training (Payment Group 9).
- .24 Close-Out Submission (Payment Group 3).

1.2 CONTRACT LUMP SUM PRICE WORK ITEMS PAYMENT PROCEDURES

- .1 Items of Work will be paid within Contract Lump Sum Price at completion of the particular item of work, as set out below.
 - .1 Payment Group 1: "Mobilization/Demobilization" - 40% initial mobilization, 20% on completion of demobilization, and 40% pro-rated over duration of contract.
 - .2 Payment Group 2: "Contractor Staging Areas", "Turning Areas" - 50% construction activity, 30% deconstruction activities, and 20% maintenance activities pro-rated over duration of contract.
 - .3 Payment Group 3: "Temporary Site Access" and "Close-Out" - 60% construction activity/submittal and 40% on completion of deconstruction work/acceptance of submittals.
 - .4 Payment Group 4: "Water Diversion System" - 5% design and approvals, 50% construction activities, 30% deconstruction activities, and 15% operation and maintenance activities pro-rated over duration of diversion system usage.
 - .5 Payment Group 5: "Cofferdams" - 5% design and approvals, 55% construction activities, 30% deconstruction activities and 10% maintenance pro-rated over duration of the work item.
 - .6 Payment Group 6: "Construction Control and Monitoring", "Traffic Control", "Dewatering/Recharging" and "Drainage/Sediment/Erosion Control" - 20% initial activities (program development and approvals/installation of measures/initial work), 10% removal of measures/reporting and 70% maintenance/monitoring pro-rated over duration of the work item.
 - .7 Payment Group 7: "Excavation", "Demolition", "Concrete Works", "Backfilling and Grading" and "Erosion Protection" - 100% pro-rated over duration of the work item. Work items with multi-items may be broken into individual items.
 - .8 Payment Group 8: "Salvage" - 50% for removal and storage, 50% for re-installation.
 - .9 Payment Group 9: "Slope Erosion Protection", "Erosion Restoration", "Other Environmental Controls e.g. Wildlife Exclusion", "Miscellaneous Steel Work", "Timber Stop Logs", "Dam Safety Signage", "Safety Boom", "Trees, Shrubs and Ground cover Planting", "Fencing"; "Parks Canada Agency Access and Parking Lot Restoration", and "Commissioning and Training" 100% on completion of work item. Work items with multi-items may be broken into individual items.
 - .10 Payment Group 10: "Road Right-of-Way" 25% on deconstruction and 75% on re-construction/ reinstatement.

1.3 UNIT PRICE ITEM MEASUREMENT AND PAYMENT PROCEDURES

- .1 Item No. 1 - "Concrete Pier Repairs" – shall be paid at the Contract unit price by the cubic metre. Volume of installed patch shall be field measured jointly by the Contractor and Departmental Representative and authorized in writing by Departmental Representative.
 - .1 Include in the price of concrete the heating, cooling, hot and cold weather protection, curing, and finishing, including pre-heating of substrate.

1.4 PROGRESS PAYMENT

- .1 Make applications for payment on account monthly as Work progresses.
- .2 Contractor is to provide a cost breakdown per the major components of the work within 7 days of the award acceptable to the Departmental Representative.
- .3 Date applications for payment last day of agreed monthly payment period and ensure amount claimed is for value, proportionate to amount of Contract, of Work performed and Products delivered to Place of Work at that date.
- .4 For Concrete Deck Removal, Fabrication, and Installation, the Contractor can claim up to a maximum of 25% of the total value of this work for the demolition of the deck, a maximum of 50% of the total value of this work for the fabrication and delivery to site of the new pre-cast concrete deck, and a maximum of 25% of the total value of this work for the completed installation of the new deck.
- .5 For new Signs and Guardrails (handrails), the Contractor can claim up to a maximum of 50% of the total value of this work for the fabrication and delivery to site of the signs and guardrails, and a maximum of 50% of the total value for this work for the completed installation of the signs and guardrails.
- .6 Final Payment shall be made upon certification and final acceptance of all work.

1.5 FINAL PAYMENT

- .1 Submit application for final payment when Work is completed.
- .2 Department Representative will, no later than 10 days after receipt of application for final payment, review Work to verify validity of application. Department Representative will give notification that application is valid or give reasons why it is not valid, no later than 7 days after reviewing Work.
- .3 Final Payment shall be made upon certification and final acceptance of all work. Department Representative will issue final certificate for payment when application for final payment is found valid.

Part 2 - Products

2.1 NOT USED

- .1 Not Used.

Part 3 - Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 - General**1.1 ADMINISTRATIVE**

- .1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.
- .2 Provide physical space and make arrangements for meetings.
- .3 Preside at meetings.
- .4 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.
- .5 Minutes of meeting to be recorded and distributed by the Departmental Representative.

1.2 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 Senior representatives of Departmental Representative, Consultant, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

1.3 PROGRESS MEETINGS

- .1 During course of work schedule and attend any progress meetings scheduled by Parks Canada. In general, progress meetings are to be held every two weeks.
- .2 Contractor, major Subcontractors involved in Work, Departmental Representative are to be in attendance.
- .3 Notify parties minimum 7 days prior to meetings.
- .4 A meeting shall be held at substantial completion of all work to jointly assess final completion status.

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 DEFINITIONS

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally, Bar Chart should be derived from commercially available computerized project management system.
- .3 Baseline: original approved plan for project, plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
- .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7 Milestone: significant event in project, usually completion of major deliverable.
- .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

1.2 REQUIREMENTS

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and time frame.
- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Interim Certificate and Final Certificate as defined times of completion are of essence of this contract.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Submit to Departmental Representative within working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

1.4 PROJECT MILESTONES

- .1 Project milestones form interim targets for Project Schedule.
 - .1 Stage 1 (West Side) to be completed in 2018.
 - .2 Stage 2 (East Side) to be completed in 2019.
 - .3 Site Restoration to be completed in Spring 2020.

1.5 MASTER PLAN

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 Departmental Representative will review and return revised schedules within 5 working days.
- .3 Revise impractical schedule and resubmit within 5 working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.6 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings, Samples.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Concrete Deck removal
 - .6 Concrete Deck replacement.
 - .7 Concrete Pier Extensions.
 - .8 Concrete Pier Repairs.
 - .9 Site Grading.
 - .10 Safety Upgrades (handrailing, signage, safety booms).
 - .11 Operational upgrades (log lifting system).

1.7 PROJECT SCHEDULE REPORTING

- .1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.

- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.8 PROJECT MEETINGS

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

Part 2 - Products

2.1 NOT USED

- .1 Not used.

Part 3 - Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 - General**1.1 ADMINISTRATIVE**

- .1 Submit to Departmental Representative (Consultant) 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 and product data, in SI Metric units.
- .4 Where items and information are not produced in SI Metric units, converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative (Consultant). 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 (Consultant) 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 Consultant's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative (Consultant) review.
- .10 Keep one reviewed copy of each submission on site.
- .11 Contractor is to provide access to any material supplier for the purpose of inspecting, sampling and testing materials to be incorporated into the completed Work.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit shop drawings and product data sheets for all new installations.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 10 days for Departmental Representative (Consultant) review of each submission.

-
- .5 Adjustments made on shop drawings by Departmental Representative (Consultant) are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative (Consultant) prior to proceeding with Work.
 - .6 Make changes in shop drawings as Departmental Representative (Consultant) may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative (Consultant) 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 (but are not limited to):
 - .1 Concrete slabs and hoisting details
 - .2 Handrailing
 - .3 Signs
 - .4 Repair concrete
 - .5 Concrete mix designs
 - .6 Rebar drawings
 - .7 Gain covers
 - .8 Pier Nose Extensions
 - .9 Rip-Rap
 - .10 Safety boom components (boom units, chains, buoys, etc.)
 - .11 Steel Gain Liners
 - .12 Steel Anchor Plates
 - .9 Submissions to 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 details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Relationship to adjacent work.
- .10 After Departmental Representative (Consultant)'s review, distribute copies.
 - .11 Submit an electronic copy and 3 prints of shop drawings for each requirement requested in specification Sections and as Departmental Representative (Consultant) may reasonably request.
 - .12 Submit 3 copies and an electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative (Consultant) where shop drawings will not be prepared due to standardized manufacture of product.
 - .13 Submit 3 copies and an electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative (Consultant).
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.
 - .14 Submit 3 copies and an electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative (Consultant).
 - .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.
 - .15 Submit 3 copies and an electronic copy of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative (Consultant).
 - .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.
 - .16 Submit 3 copies and an electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative (Consultant).
 - .17 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
 - .18 Submit 3 copies and an electronic copy of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative (Consultant).

- .19 Delete information not applicable to project.
- .20 Supplement standard information to provide details applicable to project.
- .21 If upon review by Departmental Representative (Consultant), no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .22 The review of shop drawings by Parks Canada Agency (PCA) is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that PCA approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.3 CERTIFICATES AND TRANSCRIPTS

- .1 Immediately after award of Contract, submit Workers' Compensation Board status.
- .2 Submit transcription of insurance immediately after award of Contract.

1.4 MEASUREMENT FOR PAYMENT

- .1 The work covered by this section will not be considered separately for payment but will be considered as incidental to Work of the specification.

Part 2 - Products

2.1 NOT USED

- .1 Not Used.

Part 3 - Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 - General**1.1 REFERENCES**

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of Ontario
 - .1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. 1990, c.0.1, as amended and O. Reg. 213/91 as amended - Updated 2011.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit Site Specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Use Parks Canada Safety Template. Form attached to the end of this section.
- .3 Submit 3 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets.
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 days after receipt of plan. Revise plan as appropriate and resubmit plan to Consultant within 5 days after receipt of comments from Departmental Representative.
- .8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Consultant.
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.
- .11 Complete and Submit Parks Canada Attestation and Proof of Compliance with Occupational Health and Safety. Form attached as appendix item.
- .12 If diving work is required, submit a separate site-specific Health and Safety Plan for Diving Operations, at least 7 days prior to commencement of diving work. Health and Safety Plan must include:
 - .1 Site-specific safety hazard assessment and measures to be taken to address the anticipated hazards associated with diving work.
 - .2 Diving Contractor's and Contractors' Safety Communication Plan. Must include contact information for all key contacts.

.3 Contingency and Emergency Response Plan addressing standard operating procedures specific to the Diving Operations to be implemented during emergency situations.

.4 Diving Contractor's Health and Safety Policy.

.5 Name of Health and Safety Coordinator

1.3 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.
- .2 Contractor shall be responsible and assume the Principal Contractor role for each work zone location. Contractor shall provide a written acknowledgement of this responsibility with 3 weeks of contract award, or prior to beginning work, whichever is sooner.
- .3 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

1.4 SAFETY ASSESSMENT

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

1.5 MEETINGS

- .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

1.6 REGULATORY REQUIREMENTS

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

1.7 PROJECT/SITE CONDITIONS

- .1 Work at site will involve contact with:
 - .1 Parks Canada staff.
 - .2 Local property owners and watercourse users.
 - .3 Contract work involves working within high flow watercourse and in proximity to upstream intakes of water control dam. Workers shall wear appropriate personal protective equipment at all times including Transport Canada Approved Personal Floatation Devices (PFDs). An adequate supply of Transport Canada approved life preserver rings with sufficient life rope must also be on hand, accessible and at ready at all times. Do not rely on any Parks Canada life rings that may be posted on the dam.
 - .4 Minimize work in-water where possible.

1.8 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications. Sub-contractors shall be bound by the contractor's approved Health and Safety plan or their own plan, whichever is more stringent
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.9 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Contractor will be responsible and assume the role Constructor as described in the Ontario Occupational Health and Safety Act and Regulations for Construction Projects.
- .3 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.10 COMPLIANCE REQUIREMENTS

- .1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990, c. 0.1 and Ontario Regulations for Construction Projects, O. Reg. 213/91.

1.11 UNFORESEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factors, hazards, or conditions occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Ontario and advise Departmental Representative verbally and in writing.
- .2 When unforeseen or peculiar safety-related factors, hazards, or conditions occur during performance of Work, advise Safety Officer and follow procedures in accordance with Acts and Regulations of Ontario and advise Departmental Representative verbally and in writing.

1.12 HEALTH AND SAFETY CO-ORDINATOR

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

1.13 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in a conspicuous location on site in accordance with Acts and Regulations of Ontario, and in consultation with Departmental Representative.

1.14 CORRECTION OF NON-COMPLIANCE

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

- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected. The contractor shall have no claim for delay as a result of this work stoppage.

1.15 BLASTING

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

1.16 WORK STOPPAGE

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

Part 2 - Products

2.1 NOT USED

- .1 Not used.

Part 3 - Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Attestation and Proof of Compliance with Occupational Health and Safety (OHS)

Submission of this completed form, satisfactory to Parks Canada, is a condition of gaining access to the work place.

Instructions:

Prime contractor must sign this form for all projects undertaken at Parks Canada work places.

This form is to be administered by the Project Manager and completed by the Prime Contractor (Consultant) AFTER contract award.

Parks Canada recognizes that federal OHS legislation places certain specific responsibilities upon Parks Canada as owner of the work place. In order to meet those responsibilities, Parks Canada is implementing a contractor safety regime that will ensure that roles and responsibilities assigned under Part II of the *Canada Labour Code* and the *Canada Occupational Health and Safety Regulations* are implemented and observed when involving contractor(s) to undertake works in Parks Canada work places.

Parks Canada Responsible Authority/Project Lead	Address	Contact Information
Contractor (Consultant)		
Subcontractor(s) (add additional fields as required)		

Location of Work

General Description of Work to be Completed

Mark "Yes" where applicable.

	A meeting has been held to discuss hazards and access to the work place and all known and foreseeable hazards have been identified to the contractor and/or subcontractor(s)
	The contractor and/or its subcontractor(s) will comply with all federal and provincial/territorial legislation and Parks Canada's policies and procedures, regarding occupational health and safety.
	The contractor and/or its subcontractor(s) will provide all prescribed safety materials, equipment, devices and clothing.
	The contractor and/or its subcontractor(s) will ensure that its employees are familiar with and use all prescribed safety materials, equipment, devices and clothing at all times.

	The contractor and/or its subcontractor(s) will ensure that its activities do not endanger the health and safety of Parks Canada employees.
	The contractor and/or its subcontractor(s) has inspected the site and has carried out a hazard assessment and has put in place a health and safety plan and informed its employees accordingly, prior to the commencement of the work.
	Where a contractor and/or its subcontractor(s) will be storing, handling or using hazardous substances in the work place, it will place warning signs at access points warning persons of the presence of the substances and any precautions to be taken to prevent or reduce any hazard of injury or death.
	The contractor and/or its subcontractor(s) will ensure that its employees are instructed in respect of any emergency procedures applicable to the site.

I, _____ (contractor/consultant), certify that I have read, understood and attest that my firm, employees and all sub-contractors will comply with the requirements set out in this document and the terms and conditions of the contract.

Name _____ Signature _____

Date _____

Part 1 - General**1.1 REFERENCES**

- .1 Definitions:
 - .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
 - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.
- .2 Refer to Appendix A - Basic Impact Analysis
- .3 Canal Regulations and Permits
 - .1 "Historic Canals Regulations" apply to and govern work under this Contract.
 - .2 Regulations may be obtained from Justice Canada's website at:
<http://laws-lois.justice.gc.ca/eng/regulations/sor-93-220/>.
 - .3 Contractor may not mobilize or begin any work until Parks Canada issues permit under Historic Canals Regulation (SOR93-220 Sections, 11, 14 and 15). Permit will not be issued before following submittals and submitted and accepted:
 - .1 Environmental Management Plan (EMP)
 - .2 Dewatering Plan
 - .3 Health and Safety Plan
 - .4 Site Layout Plan
 - .5 Changes to project scope of work not assessed under site-specific BIA will require review and acceptance by Client Department and may require issuing a revised BIA.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedure.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements, and 01 35 43 - Environmental Procedures.
- .3 Environmental Management Plan (EMP) to be developed in accordance with the PCA ESG document.
 - .1 Submit Environment Management Plan (EMP) to Departmental Representative (who will co-ordinate review and acceptance by PCA Environmental Authority) a minimum of 10 working days prior to commencing site setup, construction activities, or delivery of materials to site.
 - .2 Environment Management Plan and its component plans must be prepared by qualified environmental professionals in accordance with Parks Canada Agency's Environmental Standards and Guidelines Document – Ontario Waterways (July 2017) and site-specific Basic Impact Assessment (BIA).
 - .3 PCA Environmental Authority will outline prescribed mitigation measures during construction start-up meeting.
 - .4 Environment Management Plan to detail frequency of monitoring and high-risk construction activities requiring environmental professional onsite.

- .5 Environmental Management Plan to present comprehensive overview of known or potential environmental issues to be addressed during construction.
- .6 Environmental Management Plan to be prepared in accordance with requirements of Federal, Provincial, and Municipal laws and regulations.
- .7 Include measures to avoid causing harm to fish and fish habitat including aquatic species at risk in compliance with the Fisheries Act and Species at Risk Act.
- .8 Environmental Management Plan to follow baseline water and streambed quality indicated in Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life.
- .9 Notify Departmental Representative and PCA Environmental Authority of proposed changes to project plans or schedules effecting Environmental Management Plan.
- .10 Contractor to ensure on-site personnel are aware of, and comply with prescribed mitigation measures in Environmental Management Plan.
- .11 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .12 Environmental Management Plan to include:
 - .1 Names of Responsible Persons: Persons responsible for ensuring adherence to Environmental Management Plan.
 - .2 Names of Waste Handlers: Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
 - .3 Names of Instructors: Names and qualifications of persons responsible for training site personnel.
 - .4 Training Program: Description of environmental protection personnel training program.
 - .5 Erosion, Sediment, and Dust Control Plan: Plan which identifies type and location of erosion, sediment, and dust controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion, sediment, and dust control plan, Federal, Provincial, and Municipal laws and regulations. The plan will describe water quality standards to be adhered to and frequency of monitoring on-site
 - .6 Temporary Works: Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
 - .7 Work Area Plan: showing proposed activities in each portion of work area and identifying areas of limited use or non-use.
 - .1 Work area plan to include measures for marking limits of use areas including methods for protection of features to be preserved within authorized work areas.
 - .2 Identify areas for storage of hazardous materials, cleaning hazardous materials, refueling, fuel storage, and other critical areas.
 - .3 Invasive Species Plan.

- .4 Commissioning Plan.
- .8 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .9 Spill Prevention Plan: including location/procedures for storage and refuelling of all fuel and fuel operated equipment located near waterway. Fuel containers are to have secondary containment, overfill and spill protection. Fueling area is to be contained to address potential spillage. All heavy equipment used near waterway is to be in good condition. Any equipment that is leaking any fluid is to be removed from the site
- .10 Non-Hazardous Solid Waste Disposal Plan: identifying methods and locations for solid waste disposal including clearing debris.
- .11 Air Pollution Control Plan: detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and are contained on project site.
- .12 Contaminant Prevention Plan: that identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
- .13 Waste Water Management Plan that identifies methods and procedures for management and discharge of waste waters which are directly derived from construction activities, such as dewatering, concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.
- .14 Historical, Archaeological, Cultural Resources, Biological Resources, and Wetlands Plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources, and wetlands.
- .15 Pesticide Treatment Plan: to be included and updated, as required.
- .16 Dewatering Plan: Plan for design, installation, operation and removal of dewatering structures and dewatering systems, to be updated as required.
- .17 Water Quality Testing Reports: to be submitted prior to start of work, daily during construction activities, and immediately after spills or when changes in water quality observed.
- .18 Noise Control Plan: including notifying local residents in advance of potential disruption from noise activities. Establish a communications protocol / plan acceptable to the Departmental Representative
- .19 Plan to include provisions for protecting species at risk (SAR), including procedures for reporting if SAR found in the project area and measures for keeping at risk turtles out of the project site (including, but not necessarily limited to, installation of reptile exclusion fencing around disturbed soils and stockpiles). Should any suspected SAR be encountered, or if there is potential to negatively impact SAR (or wildlife generally), contact PCA EA staff (705) 750-4931 for guidelines on how to proceed.
- .20 Traffic Control Plans: including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather.

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

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

.5 A Basic Level Impact Assessment under the 2012 Canadian Environmental Assessment Act (CEAA) has been undertaken by Parks Canada environmental officers. Refer to Appendix A Basin Impact Analysis and List of Mitigations related to construction activities and ensure all mitigations are adhered to.

1.3 FIRES

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

1.4 DRAINAGE

.1 Develop and submit Erosion and Sediment Control Plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to 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 (refer to Appendix F Erosion and Sediment Control Guidelines).

.2 Submit Erosion and Sediment Control Plan, prepared by a qualified individual. Can be submitted as a stand-alone submission or as part of Environmental Management Plan. EMP to demonstrate:

.1 Focus primarily on erosion control and sediment control secondary.

.2 Areas to be controlled; including adjacent areas that could be negatively impacted by construction activities

.3 Drainage areas and patterns based on construction design and site topography.

.4 Plan for directing sediment-laden run-off to on-site detention or retention facilities.

.5 Plan for diverting clean storm run-on from site and exposed areas.

.6 Channels for necessary design discharge.

.7 Plans for temporary and permanent erosion control needs for all channels.

.8 Consideration of project schedule in selecting environmental controls.

.9 Consideration of seasonal requirements and plans for design controls and practices for controlling associated erosion and settlement.

.3 Prior to starting work that will create dust or debris, install effective mitigation techniques for erosion, sediment, dust, and debris control in accordance with Federal, Provincial, and Municipal laws and regulations.

.1 Maintain these protective measures at all times, including during shut down periods.

.2 Choose appropriate controls based on particle size present in sediment.

.3 Provide one metre high sediment barrier in areas where, due to construction activities, sediment, or debris may enter Canal or waterway. This includes, but is not limited to, sediment barrier installed around staging and work areas, and on canal bed (or ice surface) parallel to canal wing walls. Install turbidity curtain approximately 2 m to 3 m from wall.

.4 Maintain standby supply of pre-fabricated sediment barrier, or a ready-to-install sediment control device.

.5 Maintain effective surface drainage and direct runoff away from work areas and into adequately vegetated areas.

- .6 Excavation to cease during periods of heavy rainfall, unless runoff is contained from entering waterway.
- .7 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.
- .8 Implement sediment and erosion control measures prior to Work and maintain during Work phase. The following principles should be considered:
 - .1 Diversions to limit run-off water.
 - .2 Reduction of erosional forces by surface water velocity reduction.
 - .3 Reduction of sediment development through sediment collection or anchoring.
 - .4 Sedimentation of mobilized sediments.
 - .5 Filtration of sediment carrying flows.
 - .6 Collection of captured or contained sediments.
 - .7 Treatment of pH.
- .9 Consider particle size present in the sediment to select appropriate control options.
- .10 Erosion and sediment controls must be selected to treat particle size present in the native soils and sediments on the Work.
- .11 Environmental protection measures shall be checked after each extreme weather event. Avoid activities that could lead to erosion during excessively wet weather conditions; monitor forecasts for heavy rainfall watches & warnings.
- .12 All disturbed areas of the work site shall be stabilized immediately and re-vegetated as soon as conditions allow. All exposed areas should be covered with erosion control blankets or other measures to keep the soil in place and prevent erosion until vegetated in the spring.
- .3 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .4 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
- .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.
- .6 The following factors must be considered in determining the suitability of specific erosion control practices:
 - .1 Run-off Quantity and Velocity: Dictates the suitability of products;
 - .2 Soil Characteristics: Soil texture and chemistry can affect the performance of many erosion control practices. Grain size characteristics of concrete sediment must be considered when selecting filter fabric material. Filter fabric material shall be designed around the principles of maintaining sufficient hydraulic flow and preventing particle movement through the material;
 - .3 Topography: The selection and success of erosion control practices is dependent on slope length and gradient. The ease or difficulty of diverting clean run-off around the site is dependent on the terrain and drainage patterns;
 - .4 Climate and Season Contingency measures for extreme water events including rainfall and flooding need to be considered in the Plan.
 - .5 Temporary vs. Permanent Controls: Some erosion control practices are intended as permanent measures;
 - .6 Accessibility: Some practices require access for specialized equipment (i.e. hydroseeding);
 - .7 Erosion and sediment control requirements by construction phase

1.5 SITE CLEARING AND PLANT PROTECTION

- .1 Protect trees and plants on site and adjacent properties as indicated.
- .2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
 - .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation. All vegetation to be removed must be identified in the EMP.
- .5 All disturbed areas of ground are to be restored to existing or better condition than documented prior to construction. All disturbed areas of lawn must be restored by re-grading and restoring lawn with minimum 100mm of topsoil and sod. This includes all excavations and tire ruts for which a minimum 300mm wide row of topsoil and sod is to be placed along tire ruts in surface. All watering of new grass is responsibility of Contractor until such time new grass has rooted. Sod rooting will be based on 'tug test'. Seeded areas rooting will be based on 25mm blade growth and 98% coverage of restored area. Burned sod must be replaced within 2 weeks. Water may be drawn from adjacent watercourse for lawn watering. Remove lawn watering equipment at end of each visit. Do not draw water for any other purposes such as concrete mixing or cleaning of equipment, etc. Do not use fertilizer. Use compost if necessary. Pesticides and herbicides are strictly prohibited.

1.6 WORK ADJACENT TO WATERWAYS

- .1 Construction equipment shall not be operated in open water, see ESG document ESG – 15-C (Use and Maintenance of Heavy Equipment).
- .2 Waterways to be kept free of excavated fill, waste material and debris.
- .3 Design and construct temporary crossings to minimize erosion to waterways.
- .4 Do not skid logs or construction materials across waterways.
- .5 Avoid spawning beds when constructing temporary crossings of waterways.
- .6 Erect sediment control measures along the shoreline and perimeter of all excavations proximate to waterway. Securely anchor to guard against failure due to erosion.
- .7 No stockpiling of material is permitted on site. All material to be excavated must be removed and placed directly into trucks or containers for immediate transport from site. New material such as backfill material must be transported to site and taken directly from truck or container and immediately placed in intended location.

1.7 INVASIVE SPECIES

- .1 Clean mud, dirt, and vegetation off clothing and footwear before entering work site and before leaving work site.
- .2 Clean mud, dirt, and vegetation off machinery and equipment before entering work site and before leaving work site. Inspect and clean in accordance with Clean Equipment Protocol for Industry:
http://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/Clean-Equipment-Protocol_June2016_D3_WEB-1.pdf.
- .3 Equipment and vehicles to be used in water, to be cleaned before and after use. This includes any visible mud, vegetation, mussels.
 - .1 Drain of standing water
 - .2 Clean with hot water (> 50 °C) at high pressure (> 250 psi).
 - .3 Allow to dry for 2-7 days in sunlight before transporting between waterbodies.
 - .4 Conduct cleaning minimum 30 m from edge of waterbody.
- .4 Submit photo and report to Invading Species Hotline (1-800-563-7711) or online at EDDMapS Ontario, <https://www.eddmaps.org/ontario/> and to Departmental Representative and PCA Environmental Authority if an invasive species is suspected.
- .5 Conduct site assessment for invasive plant infestations prior to carrying out field activities.
- .6 Use weed-free material for erosion control and stabilization ensuring that seed does not potentially contain invasive plants.
- .7 Commercially purchased seeds should have a label that states Purity: no less than 75% and preferably over 85%.
 - .1 Weed seed content: tag should state no invasive plants are present, only use certified weed-free seed.
 - .2 Germination of desired seed: germination should not be less 50% for most species with exceptions for some shrubs and forbs.
- .8 Move only contaminate-free materials to non-infested areas to prevent spread of invasive plants.
- .9 Familiarize workers with invasive species potentially present within work site areas including but not limited to; European Buckthorn, Japanese knotweed, and Zebra mussel.
- .10 Properly dispose of any found invasive species to ensure no further growth.

1.8 WILDLIFE PROTECTION

- .1 Water drawdown to occur either before or soon after boating navigation season and will not be lowered below winter operating levels (to protect turtle species).
- .2 Detail procedures for preventing turtle entry and nesting within disturbed projects area in Environmental Management Plan.
- .3 Place temporary reptile exclusion fencing around stockpiled material and construction areas that may attract turtle nesting activities.
 - .1 Reptile exclusion fencing must follow the guidance in the document titled Species at Risk Branch, Best Practices Technical Note, Reptile and Amphibian Fencing, Ver. 1.1, developed by the Ontario Ministry of Natural Resources and Forestry:http://files.ontario.ca/environment-and-energy/species-at-risk/mnr_sar_tx_rptl_amp_fnc_en.pdf
- .4 Environment Management Plan to detail procedures for avoiding disturbance to wildlife and nesting birds.
- .5 Do not use synthetic plastic erosion control mats or blankets to prevent entrapment hazard for turtles and migratory birds.

1.9 AQUATIC LIFE PROTECTION

- .1 In water work to be completed before March 15 to protect fish populations. Restricted in-water activities between March 15th and June 30th are in-water excavation, in-filling, rock/armour stone placement, transfer/movement of granular material or aggregates.
- .2 Amphibians, reptiles, fish, or crustaceans that could become or have become trapped within dewatered cofferdam area, or in other construction zones, to be captured and transferred "live" immediately to nearest waterbody as directed by a qualified professional.
 - .1 Work program to be overseen by Departmental Representative and PCA Environmental Authority to ensure proper capture and handling of aquatic life.
 - .2 Advise Departmental Representative and PCA Environmental Authority 24 hours prior to fish rescue.
 - .3 Minimize length of time fish are out of the water.
 - .4 Use appropriate equipment when removing stranded fish.
 - .5 Monitor Work areas with deeper pool areas where fish are congregating, if safe to do so seine or dip nets can be operated to remove the fish.
 - .6 Document by species, counted and removed any fish found within dewatered areas, fish to be placed in nearest waterbody.
- .3 Should suspected Species At Risk, specifically snakes or turtles, be encountered during project staging, construction, or demobilization, contact Departmental Representative and PCA Environmental Authority immediately.
- .4 Report to Departmental Representative and PCA Environmental Authority, invasive species found within dewatered cofferdam area.
- .5 Invasive species to be euthanized rather than returned to water system.

1.10 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.

- .1 Provide temporary enclosures to the approval of the Departmental Representative.
- .4 Cover dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.
- .5 Spills:
 - .1 Definition: Includes any release of a deleterious substance to areas frequented by fish (e.g. sediment).
 - .2 Have environmental emergency response plan in place, spill kit, and other materials readily available on-site to respond quickly if spills occur.
 - .1 Spill kit to be maintained on site.
 - .2 Contractor to ensure adequate additional resources available
 - .3 Report all spills immediately to Departmental Representative and PCA Environmental Authority. All reportable spills must be relayed to Ontario Ministry of Environment Spills Action Centre (Telephone No. 1-800-268-6060).
 - .4 Secure source of spill to stop flow of spill and isolate area of spill.
 - .5 Using appropriate safety precautions, collect liquid or solidify liquid with an inert, noncombustible material, or absorbent pads.
 - .6 Clean-up, remove, and dispose of contaminated materials in accordance with Federal requirements, MSDS, or as directed by Ontario Ministry of Environment.
 - .7 Sediment release above guidelines is considered a spill and must be reported. At the discharge points of pumping into any waterbody, a maximum increase of suspended sediment concentration shall not be more than 25 mg/L over background levels during any short term exposure period (i.e., less than 24 hours). For longer term operations (i.e., more than 30 days), average suspended sediment concentrations shall not be increased by more than 5 mg/L over background levels. Note: the field measurement for turbidity will be in NTU. TSS (mg/L) is only acceptable from lab results and will only be used if there is exceedances and potential enforcement action.
 - .1 At the discharge points of pumping into any waterbody, a maximum increase of 8 NTU from background levels for a short-term exposure (i.e., 24 hours). Maximum average increase of 2 NTU from background levels for a longer term exposure (e.g., more than 30 days). Should there be exceedances (Treatment of Discharge Waters (ESG-14-C) 2) then PCA/Contractor may analyze Suspended Solids (SS) concentration with lab samples. Measurements should be taken $\mu/s(\text{background})$ within the work area and downstream directly in the receiving water.
 - .2 Receiving waters at the point of discharge shall be routinely tested and compared to background to confirm compliance with performance standards (e.g., pH readings should be taken if there is any concrete work being completed).
 - .8 Be responsible for costs of cleaning up spills by method accepted by Departmental Representative and PCA Environmental Authority.
 - .9 Submit documentation of remediation techniques and testing.

1.11 NOTIFICATION

- .1 Departmental Representative will notify Contractor in writing of observed non-compliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.

- .1 Take action only after receipt of written approval by Departmental Representative.
- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

1.12 REGULATORY REQUIREMENTS

- .1 Comply with environmental requirements of Contract Documents, applicable federal, provincial, and local statutes, acts, regulations, and ordinances of Agencies having jurisdiction.
- .2 Client Department, Parks Canada Agency, is main Environmental Authority for TSW Projects.
- .3 Client Department will not issue permit to authorize start of Work, under Historic Canal Regulations, before review and acceptance of Environmental Management Plan.
- .4 Comply with and enforce compliance by employees of prescribed environmental mitigation measures outlined in Environmental Management Plan and Basic Impact Assessment (BIA).
- .5 Allow PCA Environmental Authority full access to affected Work area and cooperate to provide reasonable facilities for such access.
- .6 Comply with written orders and directions from PCA Environmental Authority to correct deficiencies or implement additional environmental mitigation measures.
- .7 PCA Environmental Authority may issue written Stop Work order if elevated turbidity or suspended sediment concentrations are observed above CCME guidelines.
- .8 Submit copies of environmental orders and directions to Departmental Representative.

Part 2 - Products

2.1 NOT USED

- .1 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.
- .2 Bury rubbish and waste materials on site where directed after receipt of written approval from Departmental Representative.
- .3 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.
- .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .5 Waste Management: separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 - General

1.1 REFERENCES AND CODES

- .1 Perform Work in accordance with CSA and ASTM guidelines, including all amendments up to bid closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply. See Section 033000 for CSA and ASTM standards regarding concrete. See Section 055000 for CSA and ASTM standards regarding structural steel.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

- .1 Stop work immediately and notify Departmental Representative if materials which may contain designated substances are discovered in course of work.

1.3 NAVIGATION BUOYS AND MARKERS

- .1 Navigation hazard buoys and markers used on this project are to conform to the Canadian Coast Guard -Canadian Aids to Navigation System (TP 968) and to the Transport Canada – An Owner's Guide to Private Buoys (TP 14799E).

1.4 WATER QUALITY

- .1 The contractor shall not impact the quality of surface water or groundwater. CCME guidelines to be met.
- .2 The contractor shall obtain all respective permits and approvals to be able to undertake the work. Historic canal permit required.

1.5 TAXES

- .1 Pay applicable Federal, Provincial and Municipal taxes.

1.6 EXAMINATION

- .1 Examine existing conditions and determine conditions affecting work.

Part 2 - Products

2.1 NOT USED

- .1 Not Used.

Part 3 - Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 - General

1.1 INSPECTION

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.
- .2 Provide equipment required for executing inspection and testing by appointed agencies.
- .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and re-inspection.

1.3 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.

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

1.5 REJECTED WORK

- .1 Remove defective Work, whether the result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.

1.6 REPORTS

- .1 Submit 4 copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to Subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

1.7 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as requested.
- .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.

1.8 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Remove mock-up at conclusion of Work or when acceptable to Departmental Representative.
- .3 Mock-ups may remain as part of Work.

1.9 MILL TESTS

- .1 Submit mill test certificates as requested.

Part 2 - Products

2.1 NOT USED

- .1 Not Used.

Part 3 - Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 - General**1.1 DESCRIPTION**

- .1 Work under this section relates to condition surveys and monitoring of structures and buildings which are adjacent to the construction site and which may be affected by excavation, dewatering and vibration producing activities (such as sheet pile driving/vibrating, concrete demolition work, excavation of frozen ground, and operation of heavy construction equipment.)
- .2 The Contractor is advised that structures, buildings and water supply wells are located close to the proposed work and that construction activities are to be conducted in such a manner to preclude damage to these structures, buildings and wells. The Contractor shall be responsible for any damage caused by their activities.
- .3 The Contractor shall undertake environmental monitoring of the sediment and erosion control system of their EMP including water quality of discharge from dewatering operations by a third party qualified professional.
- .4 The scope of work described in this section is a minimum requirement for conducting a condition survey and monitoring of the work. The Contractor Design Engineer together with the Monitoring Engineer are to review and advise the Departmental Representative on movement and vibration criteria and any additional monitoring requirement.
- .5 The monitoring work under the present scope only covers the construction area and immediate surroundings. The Contractor shall take full responsibility for other areas as part of their haul routes.

1.2 MEASUREMENT AND PAY PROCEDURES

- .1 There shall be no separate measurement for payment for the work under this Section. Include cost in the Contract Lump Sum Price.
- .2 Payment shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work appointed agencies.

1.3 INDEPENDENT INSPECTION AGENCIES

- .1 An Independent Inspection/Monitoring Firm(s) shall be retained by the Contractor for the purpose of inspecting and/or monitoring portions of Work as described in this section. Cost of such services will be borne by the Contractor.
- .2 The Independent Inspection/Monitoring Firm(s) shall be qualified and competent in:
 - .1 Performing condition surveys
 - .2 The determination of allowable movement including displacement and vibration at structures and embankments
 - .3 The protection of adjacent buildings, shoreline structures and embankments
 - .4 The protection of groundwater wells
 - .5 The establishment of measurement procedures and their implementation
 - .6 Monitoring and reporting.

- .3 The Condition Survey shall be undertaken by a qualified and competent inspector.
- .4 If requested by the Departmental Representative, submit the inspector and monitoring specialist qualifications and experience.

1.4 DEFINITIONS

- .1 Monitoring Engineer: refers to the independent inspection / monitoring firm which is responsible for the work under this section.
- .2 Design Engineer: refers to the engineer/engineering firm retained by the Contractor to design and oversee the construction of the temporary and permanent works (construction of cofferdam, temporary construction access roads and diversion system and any other temporary works) required to complete the work under the Contract.

1.5 CONSTRUCTION CONTROL AND MONITORING

- .1 At least fifteen (15) days prior to start of work, the Contractor shall submit their Construction Control and Monitoring (CCM) plan. The plan shall be prepared in conjunction with the work area dewatering and water diversion construction plans, demolition plan and environmental management plan for sediment and erosion control.
- .2 At a minimum the CCM plan is to cover:
 - .1 The format of the Condition Survey
 - .2 The extent of the Condition Survey
 - .3 The methodology to be used to monitor existing cracks in existing buildings and other structures including embankments
 - .4 The extent and methodology for soil movement monitoring program at existing structures and embankments, including establishment of critical movement criteria, type of monitoring equipment and frequency of measurement
 - .5 The vibration monitoring program, including influence vibration zone, safe and critical vibration levels and anticipated vibration levels at the closest structure, including type of monitoring equipment and frequency of measurement
 - .6 The turbidity control and drainage water as part of the sediment and erosion control plan
 - .7 The format for report reading of CCM plan
 - .8 Measures to protect existing groundwater wells and their services
- .3 Prior to commencement of the work meet with Departmental Representative to discuss the CCM plan, report format, report frequencies, emergency report and distribution list.

1.6 GROUNDWATER WELL MONITORING

- .1 The Departmental Representative will be undertaking a monitoring program of the drinking wells of the adjacent properties. The program will include sampling and testing of water and water levels prior to commencement of work and during the construction and post-construction phases.
- .2 Results of the initial sampling and sampling during the construction and post-construction phases will be shared with the Contractor.

- .3 If water quality changes during the construction phase of the project, the Contractor will be advised. The Contractor will be required to immediately stop all work and take appropriate measures to reduce or eliminate water quality problems.

1.7 TURBIDITY CONTROL AND DRAINAGE WATER

- .1 The Contractor shall undertake quality (turbidity and pH) monitoring of any discharge water to a receiving stream as part of their sediment and erosion control plan as set out in Section 01 35 43 and 35 42 19. This also applies to any in-water concrete/tremie work.

1.8 CONDITION SURVEY

- .1 Prior to commencement of the work, a Pre- Construction Condition Survey Report of adjacent properties and structures, within 50 meters of the defined construction limit at a minimum, that maybe affected by the work under this contract shall be submitted by the Contractor.
- .2 The Condition Survey shall be undertaken by the Contractors qualified inspector together with the Departmental Representative, private landowners and Township/municipality representatives (as applicable).
- .3 The survey shall include the location and condition of adjacent properties.
- .4 As a minimum the building and shoreline structures Condition Survey Reports are to cover the above and sub-grade accessible interior walls, exterior visible walls, ceiling, roof and floors, stone open fire pit, stone retaining walls and stairs. The reports shall detail, by sketches, video tape, photographs, and/or notes, the existing structural and cosmetic condition, but should not be limited to areas of building exhibiting distress (damage). Any significant cracks are to be identified and monitored.
 - .1 Condition Surveys are to be performed for all building and structures located within 40 metres from the edge of excavation and dewatering work, and/or 50 meters from vibration producing activities. Coordinate survey with the Departmental Representative.
- .5 Furthermore, Condition Survey is to be performed for:
 - .1 Township and municipalities roads to be used as Haul Routes.
 - .2 Staging areas.
 - .3 Shoreline at perimeter of construction areas mock-up at conclusion of Work or when acceptable to Departmental Representative.
- .6 The Contractor shall perform a monthly inspection of the Haul Routes and report their findings to the Township/Municipality and Departmental Representative. Repair and make good any damage to the satisfaction of the Local Authorities and the Departmental Representative.
- .7 Upon completion of the work under the contract a Post-Construction Condition Survey shall be performed on all properties, buildings or structures that were surveyed as part of the Pre- Construction Condition Survey. The survey needs to focus on the same issues that were identified under the original survey, plus any new issues that may have developed during the construction period.

1.9 CONDITION SURVEY REPORT

- .1 Prepare and submit a DRAFT Pre-Construction Condition Survey Report for review and approval by the Departmental Representative prior to construction commencement.
- .2 Revise as required by the Departmental Representative and submit Final version of survey report.
- .3 For each property surveyed, provide four (4) copies of the Condition Survey Report (PDF or approved alternative) with annotation of the location of interest and comments on the existing conditions.
- .4 One copy of the approved report is to be provided to the respective individual landowner and/or township/municipality. One copy is to be maintained on site.

1.10 MONITORING

- .1 The Contractor will be responsible to carry out monitoring. Monitoring work is to include:
 - .1 Monitoring of cracks in buildings and other structures which were identified as part of the Pre-Construction Condition Surveys;
 - .2 Vibration (seismographic) monitoring.
- .2 Cracks in buildings and structures monitoring:
 - .1 Displacement monitoring gauges shall be installed across any significant existing crack to monitor for any additional building/structure distress due to work under this contract.
 - .2 Location and number of gauges will be established by the Contractor and the Departmental Representative.
 - .3 Gauges shall be read prior to commencement of construction activities and shall continue on a weekly basis until the completion of vibration producing construction activities.
 - .4 The Departmental Representative is to be advised of any significant crack displacement detected by the monitoring gauges.
- .3 Vibration (Seismograph) monitoring:
 - .1 The monitoring engineer shall:
 - .1 Establish vibration influence zones and safe vibration levels and develop the Contractor's vibration monitoring program for the adjacent structures as required.
 - .2 Supervise the Contractor vibration monitoring program.
 - .2 During vibration producing activities, the Contractor shall monitor vibration levels, and shall not exceed the established safe level to preclude damage to the adjacent structures
 - .3 The vibration monitoring equipment shall be capable of:
 - .1 Continuously recording peak particle velocity.
 - .2 Providing permanent record of the entire vibration event.

- .3 Providing an alarm when vibration limit exceeds the established safe vibration level.
- .4 Remote monitoring by the Monitoring Engineer.
- .4 Copies of all vibration records and associated construction activities (sheet pile driving/vibrating, concrete demolition work, excavation of frozen ground, and operation of heavy construction equipment) data shall be provided to the Design Engineer and Departmental Representative on a daily basis.
- .5 Reporting:
 - .1 The Monitoring Firm shall provide a written record of findings including new data and its interpretation including other figures and graphs. The record shall be continuous and shall be provided within 24 hours of the measurements being taken.
 - .2 The Contractor Design and Monitoring Engineer shall provide recommendations based on the findings to the Departmental Representative.
 - .3 The report shall be clear and concise and be acceptable to the Departmental Representative.
 - .4 Action requirements by the Contractor shall be clearly defined with schedule of implementation.
 - .5 An addendum to the report shall be made by the Monitoring Engineer based on the results of the action taken by the Contractor to address the construction issue.
- .4 Take appropriate measures to reduce vibration to adjacent properties and structures. If vibration measurements exceed set criteria, immediately stop all construction activity and inform Design engineer and Departmental Representative of the situation. Provide and implement remedial action to rectify the situation. Obtain written permission from Departmental Representative prior to resuming construction activities.
- .5 Immediately repair any damage to any adjacent structure to the satisfaction of the Departmental Representative.
- .6 Turbidity control and drainage water:
 - .1 Turbidity measurements are to be in Nephelometric Turbidity Units (NTU). TSS requires lab samples and may be used for regulatory purposes.
 - .2 The monitoring firm shall provide a protocol and methodology for monitoring the total suspended solids (TSS) from any discharge point to a watercourse as set out in Section 01 35 43.
 - .3 The Ministry of Environment has established criteria wherein the allowable increase in TSS from background levels is 25 mg/l. We require no short term exceedance of 8 NTU above background for short term events < 24h and for long term no more than 2 NTU above background.
 - .4 Reporting shall be undertaken as set out in this Section.

Part 2 - Products

2.1 NOT USED

.1 Not Used.

Part 3 - Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 - General**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

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

1.2 INSTALLATION AND REMOVAL

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

1.3 DEWATERING

- .1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

1.4 WATER SUPPLY

- .1 Potable water is not available on site. The Contractor is responsible for providing a watertruck to complete work.
- .2 Do not draw water from river for purposes other than lawn watering. Ensure that the intake is equipped with an appropriate fish screen.

1.5 TEMPORARY HEATING AND VENTILATION

- .1 Arrange for connection with appropriate utility company. Pay all costs for installation maintenance and removal and ongoing utilization cost.
- .2 If electrical power is not available on site, Contractor must employ generators as necessary to complete work. Noise levels from generators must be minimized.
- .3 Note that temporary heating/hoarding may be required (weather dependant).

1.6 TEMPORARY COMMUNICATION FACILITIES

- .1 Not applicable.

1.7 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

Part 2 - Products**2.1 NOT USED**

- .1 Not Used.

Part 3 - Execution**3.1 NOT USED**

- Not used

END OF SECTION

Part 1 - General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1 - 09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA-Z321-96(R2006), Signs and Symbols for the Occupational Environment.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 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. Entrances must have a stabilized worksite entrance, see ESG.
- .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.

1.4 SCAFFOLDING

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

1.5 HOISTING

- .1 Provide, operate and maintain hoists/cranes required for moving of workers, materials and equipment and for the inspection and quality assurance by the Departmental Representative.
- .2 Hoists/cranes to be operated by qualified operator.

1.6 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.

1.7 CONSTRUCTION PARKING

- .1 Parking will be permitted on site, provided it does not disrupt performance of Work.
- .2 Provide and maintain adequate access to project site.

- .3 Provide 2 designated parking stalls for PCA staff.
- .4 Construction parking shall not interfere with the public use of roads and driveways.

1.8 SECURITY

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

1.9 OFFICES

- .1 Engineering trailer for the Departmental Representative to be provided. To be equipped with security lockable door and windows; lighting and power outlets; stable; amenities – desk, drafting table, shelving (4); file cabinet (2 drawer), 4 chairs including one office (coasters); coat rack; mud boot mat; task light.

1.10 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.

1.11 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.

1.12 CONSTRUCTION SIGNAGE

- .1 Do not erect any signs on site other than those related to Health and Safety, traffic control and site access unless approved otherwise by Departmental Representative. This includes Contractor construction site sign boards.
- .2 All signs are to be temporary erections and free standing. Do not excavate or install posts into ground unless approved otherwise.

1.13 PROTECTION AND MAINTENANCE OF TRAFFIC

- .1 Do not obstruct access to roadways and access lanes. Do not relocate or divert site access routes unless approved otherwise.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .3 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.
- .4 Protect travelling public from damage to person and property.

- .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .7 Construct access and haul roads necessary.
- .8 Access roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
- .9 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .10 Dust control: adequate to ensure safe operation at all times.
- .11 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.
- .12 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .13 Provide snow removal during period of Work.
- .14 Provide street cleaning as required, see ESG.

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, minimum daily and within 2 hours as directed by Departmental Representative.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

Part 2 - Products

2.1 NOT USED

- .1 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 sediment and erosion control plan, specific to site, that complies with 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 Ontario Provincial Standard Specifications (OPSS) and Ontario Provincial Standard Drawings (OPSD).
- .2 Ontario Ministry of Transportation, Book 7 of the Ontario Traffic Manual – Temporary Conditions.

1.2 INSTALLATION AND REMOVAL

- .1 Provide temporary controls in order to execute Work expeditiously.
- .2 Erect and maintain temporary site enclosures and barriers to delineate the Work area and restrict public access to the Work Area.
- .3 Provide and maintain navigation warning signage and markers regarding construction within or near the waterway, upstream and downstream.
- .4 Provide secure rigid guide rails and barricades around excavation and at the dam in the area of the open water.
- .5 Remove from site all such work after use.

1.3 ACCESS TO SITE

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

1.4 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.

1.5 FIRE ROUTES

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

1.6 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.

1.7 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 - Products

2.1 NOT USED

.1 Not Used.

Part 3 - Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 - General**1.1 REFERENCES**

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

1.2 OPSS Ontario Provincial Standard

- .1 Whenever OPSS Ontario Provincial Standard Specifications and OPSD Ontario Provincial Standard Drawings are being quoted in these specifications, any standards, specifications or publications which are referred to within the specified OPSS or OPSD form an integral part of those documents and thus form an integral part of these specifications, unless specifically otherwise mentioned.
- .2 OPSS Ontario Provincial Standard Specifications and OPSD Ontario Provincial Standard Drawings quoted in these specifications are available online at <http://www.ragsa.mto.gov.on.ca/techpubs/ops.nsf/OPSHomepage>
- .3 Unless explicitly stated, ESG requirements are the standard for environmental controls.

1.3 QUALITY

- .1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of Products provided. Salvage materials as identified for reuse shall be safely and securely stored.
- .2 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.
- .3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions.
- .6 Quality control shall be provided by the Departmental Representative as set out in Section 01 45 00.

1.4 AVAILABILITY

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.5 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 on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .8 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.6 TRANSPORTATION

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Transportation cost of products supplied by Owner will be paid for by Contractor. Unload, handle and store such products.

1.7 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.

1.8 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.

1.9 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.

1.10 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.

1.11 EXISTING UTILITIES

- .1 Do not disturb any existing utilities. Conduct underground utility locates prior to digging. Be mindful of any suspended in water utilities cables and conduit runs. Coordinate work around existing utilities. Where new work is to interfere with existing utilities, stop work and notify Departmental Representative immediately.

Part 2 - Products**2.1 NOT USED**

- .1 Not Used.

Part 3 - Execution**3.1 NOT USED**

- .1 Not Used.

END OF SECTION

Part 1 - General

1.1 REFERENCES

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

1.2 SURVEY REFERENCE POINTS

- .1 Existing base horizontal and vertical control points are designated on drawings.
- .2 Locate, confirm and protect control 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 If the removal of a Benchmark (e.g. monument) is required to facilitate the work, the Contractor shall place a temporary benchmark (TBM) and tie-in the elevation with a survey measurement. The Departmental Representative will perform their own survey to check the transfer of the TBM. The Contractor will be permitted to remove the BM only once approval is received from the Departmental Representative.
- .5 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .6 Require surveyor to replace control points in accordance with original survey control.

1.3 SURVEY REQUIREMENTS

- .1 Establish two permanent benchmarks on site (including a new brass monument on the new deck, see contract drawings for location), referenced to established benchmarks by survey control points. Record locations, with horizontal and vertical data in the Project Record Documents.
- .2 Establish lines and levels, locate and layout, by instrumentation.

1.4 EXISTING SERVICES

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.
- .2 Protect any line encountered during construction.

1.5 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.
- .3 Record locations of maintained, re-routed and abandoned service lines.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit name and address of Surveyor (Survey Firm registered in the Province of Ontario having experience in setting out Works for construction and in measuring constructed Works as part of an as built record) to Departmental Representative.
- .2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work. Survey information is to be provided electronically and hard copy formats. The interpretation of the survey documentation to address the construction specifications and standards shall be at the sole discretion of the Departmental Representative. The Contractor shall not claim any delay as a result of the time required between obtaining and reviewing this information by the Departmental Representative.
 - .1 Contractor shall perform a pre-construction survey and shall include the local benchmarks and, at a minimum, elevations of each sill, deck elevation and other major dam components.
- .3 Submit certificate signed by qualified survey firm certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

1.7 SUBSURFACE CONDITIONS

- .1 Promptly notify Departmental Representative in writing if subsurface conditions at Work Area differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.
- .2 After prompt investigation, should Departmental Representative determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

Part 2 - Products**2.1 NOT USED**

- .1 Not Used.

Part 3 - Execution**3.1 NOT USED**

- .1 Not Used.

END OF SECTION

Part 1 - General**1.1 PROJECT CLEANLINESS**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than 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 project site and staging areas. Temporarily bank/pile snow within work limits and/or remove from site as required.
- .4 Clean road surfaces affected by contractor activity.
- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .6 Provide on-site containers for collection of waste materials and debris.
- .7 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .8 Dispose of waste materials and debris off site.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

1.2 FINAL CLEANING

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

1.3 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 - Products

2.1 NOT USED

- .1 Not Used.

Part 3 - Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 - General**1.1 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 PCA's Waste Management Goal is for 75 percent of total Project Waste to be diverted from landfill sites. Provide Departmental Representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.
- .3 Accomplish maximum control of solid construction waste.
- .4 Preserve environment and prevent pollution and environment damage.

1.2 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.
- .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 Protect structural components not removed for demolition from movement or damage.
- .6 Separate and store materials produced during dismantling of structures in designated areas.
- .7 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled materials to off-site processing facility for separation.
 - .3 Provide waybills for separated materials.

1.3 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste into waterways, storm, or sanitary sewers.
- .3 If the Contractor uses a waste disposal site that is not a registered landfill, the Contractor must obtain the applicable waste disposal permit from the local authority, and obtain a signed agreement from the landowner for the acceptance of environmentally approved materials from the Coboconk Dam site. The Contractor must take full responsibility for the generation and nature of the materials being disposed. The Departmental Representative shall acknowledge the waste disposal site upon the Contractor providing all related documentation.

1.4 USE OF SITE AND FACILITIES

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

1.5 SCHEDULING

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

Part 2 - Products

2.1 NOT USED

- .1 Not Used.

Part 3 - Execution

- .1 Not Used.

END OF SECTION

Part 1 - General

1.1 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor and all Subcontractors shall 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's Inspection:
 - .1 Consultant to inspect Work and identify defects and deficiencies.
 - .2 Contractor to correct Work as directed.
 - .3 Environmental testing of soils is to be undertaken by the Contractor at the external staging areas to confirm that there has been no impact to the soils. Any issues arising from the testing shall be addressed by the contractor at their expense.
 - .4 The contractor shall provide a release from owners of adjacent lands indicating that there are no impacts to their services and utilities (water, sanitary, storm drainage, electricity, communications) as a result of the Coboconk Dam construction activities.
 - .5 The contractor shall provide a release from the municipality and/or County regarding restoration of the access road and reconstruction of roads in the immediate vicinity of the dam.
 - .6 The contractor shall provide certification that the construction activities have not impacted the structural integrity of the dam and associated structures to the best of their knowledge along with a report on all related monitoring activities and of final inspection (video) of underwater concrete.
 - .7 The contractor shall provide a release from any waste transfer / receiving station and/or registered landfill as part of the Waste Management Workplan.
 - .8 The contractor shall provide a release from landowners whose lands have been used as a construction staging area indicating their acceptance of the site clean-up/grading/restoration.
- .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.

- .2 When Work incomplete according to Owner/Departmental Representative, complete outstanding items and request re-inspection.
- .5 Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
- .6 Commencement of Lien and Warranty Periods: date of Owner's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
- .7 Final Payment:
 - .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment. The as-built records must also be completed and acceptable to the Departmental Representative.
 - .2 When Work deemed incomplete by Departmental Representative, complete outstanding items and request re-inspection.

1.2 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 - Products

2.1 NOT USED

- .1 Not Used.

Part 3 - Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 - General

1.1 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of maintenance manuals in English.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

1.2 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 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .4 Arrange content by under Section numbers and sequence of Table of Contents.
- .5 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .6 Text: manufacturer's printed data, or typewritten data.
- .7 Drawings: provide with reinforced punched binder tab.
 - .1 Bind in with text; fold larger drawings to size of text pages.

1.3 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 Departmental Representative and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.

- .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

1.4 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
 - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
 - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
 - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.
- .6 Submit one set of paper red-lined as-built drawings and specifications to the Departmental Representative.
- .7 Submit one set (paper copy and electronic copy) of record survey drawings as set out in Section 01 77 00 to the Departmental Representative. Survey information is to include the upper and the founding (lower) coordinates and elevations of the constructed works including the coordinates and elevations of the prepared surface upon which the rehabilitated Work is being placed.

1.5 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.

- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Field changes of dimension and detail.
 - .2 Changes made by change orders.
 - .3 Details not on original Contract Drawings.
 - .4 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications/inspection certifications/field test records required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

1.6 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
 - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to site, place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.
 - .2 Include approved listings in Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
 - .1 Provide special tools, in quantities specified in individual specification section.
 - .2 Provide items with tags identifying their associated function and equipment.
 - .3 Deliver to site; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative.

- .2 Include approved listings in Maintenance Manual.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and for review by Departmental Representative.

1.8 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .3 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.
- .4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .5 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by Departmental Representative.
- .6 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .7 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Owner/Departmental Representative to proceed with action against Contractor.

Part 2 - Products

2.1 NOT USED

.1 Not Used.

Part 3 - Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 - General

1.1 REFERENCES

- .1 Definitions:
 - .1 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, include but not limited to: poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or materials that endanger human health or environment if handled improperly.
- .2 Reference Standards:
 - .1 CSA International
 - .1 CSA-S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
 - .2 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Meetings:
 - .1 See Section 01 31 19.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures and Section 01 74 21 Construction/Demolition Waste Management and Disposal.
- .2 Note that painted steel may contain lead.

1.4 QUALITY ASSURANCE

- .1 Regulatory Requirements: Ensure Work is performed in compliance with applicable Federal, Provincial/Territorial, and Municipal regulations.

1.5 SITE CONDITIONS

- .1 Environmental protection:
 - .1 Ensure Work is done in accordance with Section 01 35 43 - Environmental Procedures.
 - .2 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
 - .3 Fires and burning of waste or materials is not permitted on site.
 - .4 Do not bury rubbish waste materials.
 - .5 Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
 - .1 Ensure proper disposal procedures are maintained throughout project.

- .6 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.
- .7 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction and as directed by Departmental Representative.
- .8 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .9 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.
- .10 Cover dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.

1.6 EXISTING CONDITIONS

- .1 If material resembling spray or trowel applied asbestos or other designated substance listed as hazardous be encountered in course of demolition, stop work, take preventative measures, and notify Departmental Representative immediately. Proceed only after written instructions have been received from Departmental Representative.
- .2 Sheet lead trough is located between the underside of the concrete deck and the crest of the piers (indicated on drawings).
- .3 Provide a pre-construction condition survey and assessment of adjoining structures and infrastructure, utilities and services in accordance with Section 01 48 00.
- .4 Structures to be demolished are based on their condition at time of examination prior to commencement of work.
 - .1 Remove, protect and store salvaged items as directed by Departmental Representative. Salvage items as identified by Departmental Representative.
 - .2 Undertake a condition assessment of items to be salvaged with Departmental Representative.

Part 2 - Products

2.1 EQUIPMENT

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

Part 3 - Execution

3.1 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to: requirements of authorities having jurisdiction.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during demolition.

- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal after completion of demolition work.
- .2 Protection of in-place conditions:
 - .1 Work in accordance with Section 01 35 43 - Environmental Procedures.
 - .2 Prevent movement, settlement or damage to existing components of the dam that are to remain, and of adjacent structures, services, walks, paving, trees, landscaping, adjacent grades, properties.
 - .1 Provide bracing, shoring as required.
 - .2 Repair damage caused by demolition as directed by Departmental Representative.
 - .3 Support affected structures and, if safety of structure being demolished appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.
 - .4 Prevent debris from blocking surface drainage system and mechanical systems which must remain in operation.

3.2 DEMOLITION

- .1 Perform demolition work in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
- .2 Blasting operations not permitted during demolition.
- .3 Remove contaminated or dangerous materials as defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal (as indicated on the contract drawings, lead sheets are installed at the pier-deck joints. The Contractor must remove and transport the lead sheets to a steel recycling facility that is authorized to accept it).
- .4 Prior to start of Work remove contaminated or hazardous materials as directed by Departmental Representative from site and dispose of in safe manner and in accordance with applicable requirements.
- .5 Demonstrate to Departmental Representative that the methodology of demolition will not result in physical or structural damage to dam works remaining and other site works, buildings and infrastructure.
- .6 Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as work progresses.
- .7 At end of each day's work, leave Work in safe and stable condition.
- .8 Demolish to minimize dusting. Keep materials covered as directed by Departmental Representative.
- .9 Remove and dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.

3.3 CLEANING

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

- .2 Designate appropriate security resources / measures to prevent vandalism, damage and theft.
- .3 Stockpiling demolition materials on site is prohibited.

END OF SECTION

Part 1 - General

1.1 REFERENCES

- .1 Definitions:
 - .1 Dangerous Goods: product, substance, or organism specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.
 - .2 Hazardous Material: product, substance, or organism used for its original purpose; and is either dangerous goods or material that will cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.
 - .3 Hazardous Waste: hazardous material no longer used for its original purpose and that is intended for recycling, treatment or disposal.
- .2 Reference Standards:
 - .1 Canadian Environmental Protection Act, 1999 (CEPA 1999)
 - .1 Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149).
 - .2 Department of Justice Canada (Jus)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDG Act) [1992], (c. 34).
 - .2 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2001-286).
 - .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
 - .4 National Research Council Canada Institute for Research in Construction (NRC-IRC)
 - .1 National Fire Code of Canada-2005.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for hazardous materials and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures to Departmental Representative for each hazardous material required prior to bringing hazardous material on site.
 - .3 Submit hazardous materials management plan to Departmental Representative that identifies hazardous materials, usage, location, personal protective equipment requirements, and disposal arrangements.
 - .4 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

- .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged
- .5 Low-Emitting Materials: submit listing of adhesives, sealants, paints and coatings used in building, comply with VOC and chemical component limits or restrictions requirements.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Transport hazardous materials and wastes in accordance with Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.
 - .1 When exporting hazardous waste to another country, ensure compliance with Export and Import of Hazardous Waste and Hazardous Recyclable Materials Regulations.
- .4 Storage and Handling Requirements:
 - .1 Co-ordinate storage of hazardous materials with Departmental Representative and abide by internal requirements for labelling and storage of materials and wastes.
 - .2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
 - .3 Store and handle flammable and combustible materials in accordance with National Fire Code of Canada requirements.
 - .4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.
 - .1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.
 - .2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Departmental Representative.
 - .5 Transfer of flammable and combustible liquids is prohibited within buildings.
 - .6 Transfer flammable and combustible liquids away from open flames or heat-producing devices.
 - .7 Solvents or cleaning agents must be non-flammable or have flash point above 38 degrees C.
 - .8 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.
 - .9 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.

- .10 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:
 - .1 Store hazardous materials and wastes in closed and sealed containers.
 - .2 Label containers of hazardous materials and wastes in accordance with WHMIS.
 - .3 Store hazardous materials and wastes in containers compatible with that material or waste.
 - .4 Segregate incompatible materials and wastes.
 - .5 Ensure that different hazardous materials or hazardous wastes are stored in separate containers.
 - .6 Store hazardous materials and wastes in secure storage area with controlled access.
 - .7 Maintain clear egress from storage area.
 - .8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.
 - .9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.
 - .10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.
 - .11 When hazardous waste is generated on site:
 - .1 Co-ordinate transportation and disposal with Departmental Representative.
 - .2 Comply with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.
 - .3 Use licensed carrier authorized by provincial authorities to accept subject material.
 - .4 Before shipping material obtain written notice from intended hazardous waste treatment or disposal facility it will accept material and it is licensed to accept this material.
 - .5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.
 - .6 Only trained personnel handle, offer for transport, or transport dangerous goods.
 - .7 Provide photocopy of shipping documents and waste manifests to Departmental Representative.
 - .8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide photocopy of completed manifest to Departmental Representative.
 - .9 Report discharge, emission, or escape of hazardous materials immediately to Departmental Representative and appropriate provincial authority. Take reasonable measures to control release.
 - .10 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.

- .11 Report spills or accidents immediately to Departmental Representative. Submit a written spill report to Departmental Representative within 24 hours of incident.
- .5 Develop Construction Waste Management Plan related to Work of this Section.
- .6 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 - Products

2.1 MATERIALS

- .1 Description:
 - .1 Bring on site only quantities hazardous material required to perform Work.
 - .2 Maintain MSDS in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

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.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
 - .2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.
 - .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
 - .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
 - .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
 - .6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.
 - .7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.
 - .8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:

- .1 Hazardous wastes recycled in manner constituting disposal.
- .2 Hazardous waste burned for energy recovery.
- .3 Lead-acid battery recycling.
- .4 Hazardous wastes with economically recoverable precious metals.

END OF SECTION

Part 1 - General**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA-O86.1-01(R2006), Engineering Design in Wood
 - .3 CSA-O86.1 S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
 - .4 CSA-O121-08, Douglas Fir Plywood.
 - .5 CSA-O151-09, Canadian Softwood Plywood.
 - .6 CSA-O153-M1980(R2008), Poplar Plywood.
 - .7 CAN/CSA-S269.3-M92(R2008), Concrete Formwork, National Standard of Canada

1.2 SUBMITTALS

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

Part 2 - Products**2.1 MATERIALS**

- .1 Formwork materials:
 - .1 Use wood and wood product formwork materials to CAN/CSA-O86.
- .2 Tubular column forms: round, internally treated with release material.
 - .1 Spiral pattern not to show in hardened concrete.
- .3 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.
- .4 Form liner:
 - .1 Plywood: Douglas Fir to CSA-O121, Canadian Softwood Plywood to CSA-O151 square edge, 16 mm thick.
- .5 Form release agent: non-toxic, biodegradable, low VOC.
- .6 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 15 to 24 mm²/s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.

Part 3 - Execution**3.1 FABRICATION AND ERECTION**

- .1 Concrete deck to be pre-cast off site. All formwork and concrete work related to concrete deck must be completed off site. Refer to drawings for locations and quantities.
- .2 Verify lines, levels and centres before proceeding with formwork and ensure dimensions agree with drawings.
- .3 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .4 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .7 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.
- .8 Align form joints and make watertight.
 - .1 Keep form joints to minimum.
- .9 Use 25 mm chamfer strips on external corners, unless specified otherwise.
- .10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .11 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
- .12 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 REMOVAL AND RESHORING

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 7 days
- .2 Remove formwork when concrete has reached 75% of its design strength or minimum period noted above, whichever comes later.
- .3 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

END OF SECTION

Part 1 - General

1.1 PRICE AND PAYMENT PROCEDURES

- .1 Measurement and Payment:
 - .1 No measurement will be made under this Section.

1.2 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 ASTM International
 - .1 ASTM A775/A775M-07b, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
- .3 CSA International
 - .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A23.3-04(R2010), Design of Concrete Structures.
 - .3 CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .4 CSA-W186-M1990(R2007), Welding of Reinforcing Bars in Reinforced Concrete Construction.
 - .5 CAN/CSA-G30.18-M, Billet Steel Bars for Concrete Reinforcement
- .4 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.3 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
 - .1 Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Lists.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
 - .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.

1.4 QUALITY ASSURANCE

- .1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
 - .1 Mill Test Report: upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel.
 - .2 Submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .2 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .3 Develop Waste Reduction Workplan related to Work of this Section.

Part 2 - Products

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Cold-drawn annealed steel wire ties: to ASTM A82/A82M and CSA G30.3-M.
- .4 Deformed steel wire for concrete reinforcement: ASTM A82/A82M and CSA G30.14-M.
- .5 Welded steel wire fabric: to ASTM A185/A185M.
- .6 Epoxy Coating of non-prestressed reinforcement: to ASTM A775/A775M.
- .7 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .8 Mechanical splices: subject to approval of Departmental Representative.
- .9 Plain round bars: to CSA-G40.20/G40.21.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 SP-66 Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
 - .1 SP-66 unless indicated otherwise.
- .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA-W186.

- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.
 - .1 Ship epoxy coated bars in accordance with ASTM A775A/A775M.

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 2 weeks prior to beginning reinforcing work.
- .2 Upon request inform Departmental Representative of proposed material source.

Part 3 - Execution

3.1 FIELD BENDING

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars which develop cracks or splits.

3.2 PLACING REINFORCEMENT

- .1 Place reinforcing steel in accordance with CSA-A23.1/A23.2.
- .2 Use plain round bars as slip dowels in concrete.
- .3 Prior to placing concrete, Departmental Representative's approval of reinforcing material and placement is required.
- .4 Ensure cover to reinforcement is maintained during concrete pour.
- .5 Protect epoxy coated portions of bars with covering during transportation and handling.

3.3 FIELD TOUCH-UP

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 - General

1.1 PRICE AND PAYMENT PROCEDURES

- .1 Measurement and Payment:
 - .1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.
 - .2 Concrete will not be measured but will paid for as fixed price item.

1.2 REFERENCES

- .1 Abbreviations and Acronyms:
 - .1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.
 - .1 Type GU, GUb and GUL - General use cement.
 - .2 Type MS and MSb - Moderate sulphate-resistant cement.
 - .3 Type MH, MHb and MHL - Moderate heat of hydration cement.
 - .4 Type HE, HEb and HEL - High early-strength cement.
 - .5 Type LH, LHb and LHL - Low heat of hydration cement.
 - .6 Type HS and HSb - High sulphate-resistant cement.
 - .2 Fly ash:
 - .1 Type F - with CaO content less than 15%.
 - .2 Type CI - with CaO content ranging from 15 to 20%.
 - .3 Type CH - with CaO greater than 20%.
 - .3 GGBFS - Ground, granulated blast-furnace slag.
- .2 Reference Standards:
 - .1 ASTM International
 - .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309-07, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M-10a, Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM C1017/C1017M-07, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - .5 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - .6 ASTM D624-00(2007), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
 - .7 ASTM D1751-04(2008), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

- .8 ASTM D1752-04a(2008), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
- .3 CSA International
 - .1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-A283-06, Qualification Code for Concrete Testing Laboratories.
 - .3 CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide testing/inspection results for review by Departmental Representative, do not proceed without written approval when deviations from mix design/parameters are found.
- .3 Contractor is to place thermocouples in and on the concrete to monitor the temperature at the surface and interior of the element that is being cast as well as the external air temperature, at the pier extensions and the precast deck panels. The Contractor is to provide a plan of the placement of the thermocouples acceptable to the Departmental Representative. The contractor is to take continuous temperature readings for a minimum period of 7 days or until the forms are removed. The concrete surface is to be repaired where the wires are exposed at the concrete surface.
- .4 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
- .5 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.
- .6 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Provide Departmental Representative minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
 - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.

- .3 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
 - .1 Hot weather concrete.
 - .2 Cold weather concrete.
 - .3 Curing.
 - .4 Finishes.
 - .5 Formwork removal.
 - .6 Joints.
- .4 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Delivery and Acceptance Requirements:
 - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
 - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA-A23.1/A23.2.
 - .2 Deviations to be submitted for review by Departmental Representative.
 - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA-A23.1/A23.2.
- .2 Packaging Waste Management: remove for reuse in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 - Products

2.1 DESIGN CRITERIA

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

2.2 PERFORMANCE CRITERIA

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

2.3 MATERIALS

- .1 Portland Cement: to CSA-A3001, Type GU (LH for Pier nose extensions).
- .2 Blended hydraulic cement: Type GUb to CSA-A3001.
- .3 Portland-limestone cement: Type GUL to CSA-A23.1.
- .4 Water: to CSA-A23.1.
- .5 Aggregates: to CSA-A23.1/A23.2.

.6 Admixtures:

- .1 Air entraining admixture: to ASTM C260.
- .2 Chemical admixture: to ASTM C494 ASTM C1017. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

2.4 MIXES

- .1 Performance Method for specifying concrete: to meet performance criteria to CSA-A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
 - .2 Provide concrete mix to meet following plastic state requirements:
 - .1 Uniformity: no segregation.
 - .2 Workability: free of surface blemishes, loss of mortar, colour variations, segregation.
 - .3 Finishability: to satisfaction of Departmental Representative.
 - .4 Set time: to conditions of pour and to satisfaction of Departmental Representative.
 - .3 Provide concrete mix to meet following hard state requirements for concrete deck and piers:
 - .1 Durability and class of exposure: F-1 (air content range $6.5\% \pm 1.5\%$)
 - .2 Compressive strength at 28 days: 35 MPa minimum.
 - .3 Intended application: Pier extensions, wingwall extension.
 - .4 Aggregate size 20 mm maximum.
 - .4 Provide quality management plan to ensure verification of concrete quality to specified performance.
 - .5 Concrete supplier's certification: both batch plant and materials meet CSA-A23.1 requirements.

Part 3 - Execution

3.1 PREPARATION

- .1 Obtain Departmental Representative's written approval before placing concrete.
 - .1 Provide 24 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.

- .6 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .7 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 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
 - .1 Place steel dowels and pack solidly with shrinkage compensating grout or epoxy grout to anchor and hold dowels in positions as indicated.
- .11 Do not place load upon new concrete until authorized by Departmental Representative.

3.2 INSTALLATION/APPLICATION

- .1 Do cast-in-place concrete work to CSA-A23.1/A23.2.
- .2 Follow ESG for concrete and grouting. Washing of concrete pouring, grouting and sealing tools and equipment in any body of water is prohibited. All concrete pouring, grouting and sealing equipment must be washed in a wash-down area.
 - All wash-down area and containment facility locations must be identified in the site-specific EMP and accepted by PCA.
 - All concrete products, grouts and sealants shall be stored under cover, away from watercourse, stormwater drains, ditches or street gutters.
 - Prior to commencement of the work, ensure water, and sediment control measures are designed to ensure that concrete is not deposited directly or indirectly into any watercourse, stormwater drain, ditch or street gutter.
 - No excess concrete shall be deposited on-site.

Normal Concrete Pour Operations

- PCA shall be notified within 48 hours prior to the commencement of any significant concrete pour operations (e.g., foundations) and for all Tremie pour operations.
- Maintain complete isolation of cast-in-place concrete for a minimum of 48 hours if the ambient air temperature is above 0°C (for the entire period) and for a minimum of 72 hours if ambient air temperature is below 0°C;
- All water that contacts uncured or partly cured concrete, all leachates or wastewater with high pH (greater than 9) shall be captured in a wastewater containment area.
- The waste water containment area shall be designed by a Qualified Professional(s) and sized to hold twice the volume of anticipated water run-off, leachate or wastewater.
- Carbon dioxide (CO₂) or neutralizing acids shall be used to neutralize waters with high pH (greater than 9).
- Sufficiently sized carbon dioxide (CO₂) tanks with regulators, hoses and gas diffuser, shall be readily available during normal concrete pour operations. The tank shall be used to release carbon dioxide gas into an affected area to neutralize pH levels should a concrete spill occur. Workers shall be trained in the use of the tank.

- Neutralizing acids must be contained in a professionally established system operated by a Qualified Professional.
- Any use of carbon dioxide (CO₂) or neutralizing acids to modify pH levels shall be reported to PCA as soon as reasonably possible.

.3 Grouting and Sealing

- The type(s) of grouts and sealants proposed for use shall be identified in the site-specific EMP and accepted by PCA.
- Avoid mixing or ordering more grout and sealant material than is required to complete the work.
- Isolate the work site involving grouting to the extent possible. The isolated work site should be sufficiently large to contain water run-off, residues and any waste material.
- Store grout and sealant products under cover, away from watercourse, stormwater drains, ditches or street gutters.
- All grout and sealant products and excess materials shall be removed in a way that will ensure material does not enter the waterway, stormwater drain, ditch or street gutter. Collect excess grout in the “dry”.

Wash-down Areas

- Provide appropriately sized containment facilities for the wash-down water from concrete delivery trucks, concrete pumping equipment.
- Containment structure area should be emptied/changed once 50% full.
- The wash-down area should be located away from a watercourse, stormwater drain, ditch or street gutter on flat even terrain.
- The wash-down area should be conveniently located for washing out equipment and clearly sign-posted.
- All wash-down water is to be contained.
- Concrete wash-down areas are generally not designed for the collection of excess concrete. Excess concrete waste should be returned to the local batching plant for treatment and re-use, or placed in a site receptacle designated for concrete and masonry, and allowed to set.
- To minimize the amount of wash-down water generated, excess concrete should be scraped off the equipment before it is washed and placed in a site receptacle designated for concrete.
- A high pressure, low volume water spray nozzle should be used to reduce water use.

.4 Tremie Pour Operations

- Tremie pour operations must be described in the Construction Plan of the site-specific EMP and accepted by PCA.
- Tremie pour operations may be undertaken where site conditions do not allow work in the “dry” and in still water or near zero flow conditions exist (i.e., <0.5 m/sec). Justification of the need for the Tremie pour operations must be included in the site-specific EMP.
- All Tremie pour equipment shall be operated from the shore.
- All forms shall be examined prior to concrete pours to ensure they are tight.
- The work area for a Tremie pour shall be isolated with a turbidity curtain (See Sediment Control ESG-2-Pre) and/or impermeable material (e.g., sheet piling, sandbags plus impermeable material to line sandbags).

- Carbon dioxide (CO₂) shall be used to neutralize waters with high pH (greater than 9).
- Sufficiently sized carbon dioxide (CO₂) tanks with regulators, hoses and gas diffuser, shall be readily available during normal concrete pour operations. The tank shall be used to release carbon dioxide gas into an affected area to neutralize pH levels should a concrete spill or seepage from the concrete form occur. Workers shall be trained in the use of the tank.
- Any use of carbon dioxide (CO₂) to modify pH levels shall be reported to PCA as soon as reasonably possible.
- The use of neutralizing acids to neutralize waters with high pH is prohibited at Tremie pour operations.

.5 Finishing and curing:

- .1 Finish concrete to CSA-A23.1/A23.2.
- .2 Use procedures as reviewed by Departmental Representative or those noted in CSA-A23.1/A23.2 to remove excess bleed water. Do not damage surface.
- .3 Use curing compounds compatible with applied finish on concrete surfaces. Applied finish on concrete: float. Provide written declaration that compounds used are compatible.
- .4 Provide magnesium float swirl finish unless otherwise indicated.

3.3 COLD WEATHER PROTECTION

- .1 For concrete placed when the air temperature (water temperature for tremie concrete) is at or below 5 degrees Celsius, in addition to cold weather requirements of CAN/CSA-A23.1;
 - .1 Protect concrete with a windproof shelter of canvas or other material. At no point allow walls of shelter touch formwork. Provide sufficient space for removal of formwork for finishing. Supply approved heating equipment. Vent the products of combustion outside the protective shelter.
- .2 Maintain concrete/patching material at the following curing temperatures:
 - .1 For the initial 3 days, at a temperature of not less than 27 degrees Celsius at concrete surfaces.
 - .2 Cure at not less than 10 degrees Celsius for an extra 4 days.
 - .3 Keep concrete surfaces moist continuously while protected.
 - .4 Reduce temperature at rate not exceeding 10 degrees Celsius per day until outside temperature has been reached.
- .3 Submit shop drawings for the heating and hoarding in accordance with Section 01 33 00 – Submittal Procedures.

3.4 FIELD QUALITY CONTROL

- .1 Site tests: Owner to conduct tests as follows, in accordance with Section 01 45 00 - Quality Control.
 - .1 Concrete pours.
 - .2 Slump.
 - .3 Air content.
 - .4 Compressive strength at 7 and 28 days.
 - .5 Air and concrete temperature.

- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA-A23.1/A23.2.
 - .1 Ensure testing laboratory is certified to CSA-A283.
- .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting.
- .4 Departmental Representative will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .5 Non-Destructive Methods for Testing Concrete: to CSA-A23.1/A23.2.
- .6 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

3.5 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Divert unused concrete materials from landfill to local quarry/facility after receipt of written approval from Departmental Representative.
 - .2 Provide appropriate area on job site where concrete trucks to be safely washed.
 - .3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by Departmental Representative.
 - .4 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
 - .5 Prevent admixtures and additive materials from entering drinking water supplies or streams.
 - .6 Using appropriate safety precautions, collect liquid or solidify liquid with inert, non-combustible material and remove for disposal.
 - .7 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

3.6 CONCRETE REPAIRS

- .1 Demolition
 - .1 Provide enclosure to contain waste materials in a manner to avoid contamination of river channel.
 - .2 Remove area of concrete shown on drawings to depths shown and to sound concrete using a methodology acceptable to the Departmental Representative.
 - .3 Remove concrete to a minimum 25mm depth behind exposed reinforcing steel and an overall minimum depth of 150mm.

- .4 Do not cut reinforcing steel of existing concrete.
 - .5 Reinforcing steel to be cleaned of loose concrete.
 - .6 Dispose of all waste materials off site at an approved location.
- .2 Installation
- .1 Install steel dowels (15M reinforcement) as shown on drawings (minimum spacing of 450mm x 450mm)
 - .2 Bonding agent for anchoring dowels to existing concrete to Hilti Hit HY-200 (or approved equal).
 - .3 Install welded wire fabric (102x102xMW9.1xMW9.1) as shown on drawings.
 - .4 Patching mortar for repair areas to be polymer modified cementitious non-sag mortar with corrosion inhibitor, such as Sikatop 123 Plus (or approved equal). Mix product as per manufacturer's instructions. Install by hand in lifts as per manufacturer's recommendations. Trowel repair area smooth.

END OF SECTION

Part 1 - General

1.1 REFERENCES

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 ENVIRONMENTAL REQUIREMENTS

- .1 Electrical power:
 - .1 Provide sufficient electrical power to operate equipment normally used during construction.
- .2 Work area:
 - .1 Make work area water tight protected against rain and detrimental weather conditions.
- .3 Temperature:
 - .1 Maintain ambient temperature of not less than 10 degrees C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .4 Safety:
 - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

Part 2 - Products

2.1 PERFORMANCE REQUIREMENTS

- .1 Product quality and quality of work in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

2.2 MIXES

- .1 Mixing ratios in accordance with manufacturer's written instructions.

Part 3 - Execution

3.1 EXAMINATION

- .1 Verify that surfaces are ready to receive work and elevations are as recommended by manufacturer's written instructions indicated on drawings.
- .2 Finish for deck surface to be magnesium float finish.

3.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

3.3 PROTECTION

- .1 Protect finished installation in accordance with manufacturer's instructions.

END OF SECTION

Part 1 - General

1.1 MEASUREMENT PROCEDURES

- .1 Measure precast elements in units supplied, delivered, stored and erected.
- .2 Precast elements measured as individual units, will include cost, supply, delivery, and installation.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .2 ASTM A775/A775M-07b, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - .3 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .4 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.
 - .5 ASTM D2240-05, Standard Test Method for Rubber Property - Durometer Hardness.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-97, Anticorrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.181-99, Ready Mixed Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-A23.4-09 (R2014), Precast Concrete - Materials and Construction.
 - .3 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .4 CAN/CSA-G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4 Ontario Provincial Standards (OPSS)
 - .1 OPSS.MUNI 904 Construction Specifications for Concrete Structures

1.3 DESIGN REQUIREMENTS

- .1 Manufacturer shall design the concrete mix and undertake the curing of the concrete to minimize stress and shrinkage cracking.

1.4 PERFORMANCE REQUIREMENTS

- .1 Tolerance of precast elements to CSA-A23.4.

- .2 Length of precast elements not to vary from design length by more than plus or minus 5mm.
- .3 Cross sectional dimensions of precast elements not to vary from design dimensions by more than plus or minus 5mm.
- .4 Deviations from straight lines not to exceed 1 mm in 1 m.
- .5 Precast elements not to vary by more than plus or minus 5mm from true overall cross-sectional shape as measured by difference in diagonal dimensions.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings in accordance with CSA-A23.4 and include following items:
 - .1 Design calculations for items designed by manufacturer.
 - .2 Details of prestressed and non-prestressed members, reinforcement and their connections.
 - .3 Camber.
 - .4 Finishing schedules.
 - .5 Methods of handling and erection.
 - .6 Openings, sleeves, inserts and related reinforcement.
- .3 Submit 3 copies of detailed calculations and design drawings for typical precast elements and connections for review by Departmental Representative 4 weeks prior to manufacture.
- .4 Shop Drawings: submit drawings stamped and signed by qualified professional engineer registered or licensed in Province of Ontario, Canada.

1.6 QUALITY ASSURANCE

- .1 Quality Control Plan: submit written report, as described in PART 3 - VERIFICATION, to Departmental Representative verifying compliance that concrete provided meets performance requirements of concrete as established in PART 2 - PRODUCTS.

1.7 QUALIFICATIONS

- .1 Fabricate and erect precast concrete elements by manufacturing plant certified in appropriate categories according to CSA-A23.4.
- .2 Precast concrete manufacturer to be certified in accordance with CSA's certification procedures for precast concrete plants.
- .3 Only precast elements fabricated in such certified plants to be acceptable to Departmental Representative and plant certification to be maintained for duration of fabrication, erection until warranty expires.
- .4 Welding companies certified to CSA-W47.1.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Store and manage hazardous materials in accordance with Section 02 41 16 – Structure Demolition.
- .2 Deliver, handle and store precast/prestressed units according to manufacturer's instructions.
- .3 Protect unit corners from contacting earth to prevent from staining.
- .4 Waste Management and Disposal:
 - .1 Separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.9 WARRANTY

- .1 Contractor warrants that precast element will not spall or show visible evidence of corrosion of embedded steel and cracking, except for normal hairline shrinkage cracks (i.e. width < 1mm), for 5 years.

Part 2 - Products

2.1 MATERIALS

- .1 Cement to CAN/CSA-A3001, Type GU.
- .2 Blended hydraulic cement: type GUb to CAN/CSA-A3001.
- .3 Water: to CSA-A23.1/A23.2.
- .4 Reinforcing steel: to CAN/CSA-G30.18, epoxy coated.
- .5 Hardware and miscellaneous materials: to CSA-A23.1/A23.2.
- .6 Forms: to CSA-A23.4.
- .7 Anchors and supports: to CAN/CSA-G40.21 as indicated on drawings.
- .8 Galvanizing: hot dipped galvanizing with minimum zinc coating of 610 g/m² to CAN/CSA-G164.
- .9 Epoxy coating: to ASTM A775/A775M.
- .10 Air entrainment admixtures: to ASTM C260.

2.2 MIXES

- .1 Concrete:
 - .1 Provide concrete mix to meet following hard state requirements:
 - .1 Durability and class of exposure: F-1 (air content 6.5% ± 1.5%).
 - .2 Minimum compressive strength at 28 days: 35 MPa.
 - .3 Intended application: deck.
 - .4 Surface texture: non-skid (magnesium float) finish.
 - .5 Aggregate Size: 20mm maximum.

- .2 Provide quality management plan to ensure verification of concrete quality to specified performance.
- .3 Concrete supplier's certification – both batch plant and materials meet CSA-A23.1 requirements.

2.3 MANUFACTURED UNITS

- .1 Manufacture units in accordance with CSA-A23.4.
- .2 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit not to be exposed.
- .3 Provide hardware suitable for handling elements.

2.4 FINISHES

- .1 Finish units to commercial grade to CSA-A23.4, magnesium float finish for deck surface.

2.5 SOURCE QUALITY CONTROL

- .1 Provide Departmental Representative with certified copies of quality control tests related to this project as specified in CSA-A23.4.
- .2 Provide records from in-house quality control programme based upon plant certification requirements to Departmental Representative for inspection and review.
- .3 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.
- .4 Precast plants should keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and provide to Departmental Representative for review upon request.

Part 3 - Execution

3.1 ERECTION

- .1 Do precast concrete work in accordance with CSA-A23.
- .2 Do welding in accordance with CSA-W59, for welding to steel structures and CSA-W186, for welding of reinforcement.
- .3 Erect precast elements within allowable tolerances as specified.
- .4 Non-cumulative erection tolerances in accordance with CSA-A23-4.
- .5 Set elevations and alignment between units to within allowable tolerances before connecting units.

3.2 VERIFICATION

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in PART 2 - PRODUCTS, by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

3.3 CLEANING

- .1 Use cleaning methods as reviewed by Departmental Representative before cleaning soiled precast concrete surfaces.

END OF SECTION

Part 1 - General

1.1 REFERENCES

- .1 ASTM International
 - .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.
 - .3 ASTM B209M – 14 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 - .4 ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip
- .2 CSA International
 - .1 CSA-G40.20/G40.21-04(R2009), 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-S16-09, Design of Steel Structures.
 - .4 CAN/CSA-S157-05/S157.1-05 (R2015) - Strength Design in Aluminum / Commentary on CSA S157-05, Strength Design in Aluminum.
 - .5 CSA S6-14, Canadian Highway Bridge Design Code
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.2 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 plates/bolts and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
 - .1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Ontario, Canada.
 - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.3 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.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, in dry location 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 Steel sections: to CSA-G40.20/G40.21, Grade 350W. For plate and flat bar, Grade 300W.
- .2 Stainless steel: to ASTM A167, Grade 304L
- .3 Steel pipe: to ASTM A53/A53M standard weight, black finish.
- .4 Welding materials: to CSA-W59.
- .5 Welding electrodes: to CSA-W48 Series.
- .6 Bolts and anchor bolts: to ASTM A307.
- .7 Grout: As indicated on drawings for anchor bolts, otherwise non-shrink, non-metallic, flowable, 15 MPa at 24 hours.
- .8 Aluminum sections and plate: to ASTM B209M – 14
- .9 Aluminum welding materials: to W59.2-M1991 (R2013) - Welded Aluminum Construction and AWS D1.2 Structural Welding Code – Aluminum.
- .10 Aluminum welding electrodes: to W59.2-M1991 (R2013) - Welded Aluminum Construction and AWS D1.2 Structural Welding Code – Aluminum.

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.

2.3 FINISHES

- .1 Galvanizing for Guardrails and Hot-Rolled Steel Sections: hot dipped galvanizing with zinc coating 600g/m² to CAN/CSA-G164.
- .2 Stainless Steel for Pier Nosings: rough and dull finish 1D per ASTM A480.

Part 3 - Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 ERECTION

- .1 Do welding work in accordance with CSA-W59 unless specified otherwise.
- .2 Erect metalwork 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-S16.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 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 REFERENCES AND CODES**

- .1 Canadian Dam Association
 - .1 Signage for Public Safety Around Dams.
- .2 ASTM International
 - .1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 62-GP-9M-80, Prefabricated Markings, Positionable, Exterior, for Aircraft Ground Equipment and Facilities.
 - .2 CGSB 62-GP-11M-78, Marking Material, Retroreflective, Enclosed Lens, Adhesive Backing and Amendment.
- .4 CSA International
 - .1 CAN/CSA-G40.20-04(R2009)/G40.21-04(R2009),
- .5 Green Seal Environmental Standards (GSES)
 - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
- .6 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.

1.2 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for safety signage, including product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada to Section 01 33 00.
 - .2 Indicate items as follows:
 - .1 Sign supporting structures to the satisfaction of the Departmental Representative and the requirements of the Parks Canada manual on dam signage.
 - .2 Mounting requirements to the satisfaction of the Departmental Representative and the requirements of the Parks Canada manual on dam signage.

1.3 DESIGNATED STRUCTURES

- .1 Stop work immediately and notify Departmental Representative if materials which may contain designated substances are discovered in course of work.

1.4 NAVIGATION BUOYS AND MARKERS

- .1 Navigation hazard buoys and markers used on this project are to conform to the Canadian Coast Guard -Canadian Aids to Navigation System (TP 968) and to the Transport Canada – An Owner's Guide to Private Buoys (TP 14799E).
- .2 Provide a Navigation Plan for temporary works related to the dewatering and diversion as approved by Transport Canada and acceptable to the Agency and Departmental Representative. Construct signage to the requirements of Section 10 14 55. Install and maintain signage and buoys during the course of construction

1.5 WATER QUALITY

- .1 The contractor shall not impact the quality of surface water or groundwater.
- .2 The contractor shall obtain all respective permits and approvals to be able to undertake the work.

1.6 TAXES

- .1 Pay applicable Federal, Provincial and Municipal taxes.

1.7 EXAMINATION

- .1 Examine existing conditions and determine conditions affecting work.

Part 2 - Products

2.1 NOT USED

- .1 Not Used.

Part 3 - Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 - General**1.1 REFERENCES**

- .1 ASTM International
 - .1 ASTM D4791-10, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for aggregate materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
 - .1 Allow continual sampling by Departmental Representative during production.
 - .2 Provide Departmental Representative with access to source and processed material for sampling.
 - .3 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.
 - .4 Supply new or clean sample bags or containers according appropriate to aggregate materials.
 - .5 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.
 - .6 Provide water, electric power and propane to Departmental Representative laboratory trailer at production site.
- .4 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged.
 - .2 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with Section 01 35 43 Environmental Procedures.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.

- .3 Storage: store washed materials or materials excavated from underwater 24 hours minimum to allow free water to drain and for materials to attain uniform water content.

Part 2 - Products

2.1 MATERIALS

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
 - .1 Greatest dimension to exceed 5 times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
 - .1 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
 - .2 Reclaimed asphalt pavement.
 - .3 Reclaimed concrete material.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of 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.
 - .4 Reclaimed asphalt pavement.
 - .5 Reclaimed concrete material.

2.2 SOURCE QUALITY CONTROL

- .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks minimum before starting production.
- .2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.
- .3 Advise Departmental Representative 4 weeks minimum in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

Part 3 - Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions are acceptable for topsoil stripping.
 - .1 Visually inspect substrate in presence of Departmental Representative.

- .2 Inform Departmental Representative] of unacceptable conditions immediately upon discovery.
- .3 Proceed with topsoil stripping. only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Topsoil stripping:
 - .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
 - .2 Begin topsoil stripping of areas as directed by Departmental Representative.
 - .3 Strip topsoil to depths as directed by Departmental Representative.
 - .4 Stockpile in locations as directed by Departmental Representative. Stockpile height not to exceed 2m.
 - .5 Dispose of topsoil off site as directed by Departmental Representative.
 - .6 Contractor to adhere to ESG-3-Pre (Soil Stripping, Grubbing, and Stockpiling).
- .2 Aggregate source preparation:
 - .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 directed by Departmental Representative.
 - .2 Where clearing is required, leave screen of trees between cleared area and roadways as directed.
 - .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.
 - .6 Provide silt fence or other means to prevent contamination of existing watercourse or natural wetland features.
- .3 Processing:
 - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
 - .2 Blend aggregates, as required, including reclaimed materials that meet physical requirements of specification is permitted in order to satisfy gradation requirements for material and, percentage of crushed particles, or particle shapes specified.
 - .1 Use methods and equipment approved in writing by Departmental Representative.
 - .4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate gradation.
 - .5 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements.

- .1 Use only equipment approved in writing by Departmental Representative.
- .6 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 300mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300mm 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 1.5m for coarse aggregate and base course materials.
 - .2 Maximum 1.5m for fine aggregate and sub-base materials.
 - .3 Maximum 1.5m for other materials.
 - .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.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .4 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.
- .5 Waste Management: separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

- .6 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.
- .7 Restrict public access to temporary or permanently abandoned stockpiles by means acceptable to Departmental Representative.

END OF SECTION

Part 1 - General**1.1 REFERENCES**

- .1 Environmental Standards and Guidelines, Parks Canada Agency, ESG-3-Pre (Soil Stripping, Grubbing and Stockpiling).
- .2 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

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 stumps, roots, boulders and rock fragments to not less than specified depth below existing ground surface.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Samples:
 - .1 Submit samples of each material listed below for approval prior to delivery of materials to project site.
 - .2 Tree wound paint: one liter can with manufacturer's label.
 - .3 Herbicide: one liter can with manufacturer's label.
- .3 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Submit manufacturer's installation instructions.
- .5 All clearing and grubbing requirements must be included in the Contractor's EMP.

1.4 QUALITY ASSURANCE

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 STORAGE AND PROTECTION

- .1 Prevent damage to fencing, trees, landscaping natural features, benchmarks, existing buildings, existing pavement, utility lines, site appurtenances, watercourses, root systems of trees which are to remain.
 - .1 Repair damaged items to approval of Departmental Representative.
 - .2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse/recycling 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.
 - .1 Trim limbs and tops, and saw into saleable lengths.
 - .2 Stockpile adjacent to site.

Part 2 - Products

2.1 MATERIALS

- .1 Bituminous based paint of standard manufacture specially formulated for tree wounds.
- .2 Soil Material for Fill:
 - .1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.
 - .2 Remove and store soil material for reused.

Part 3 - Execution

3.1 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 sediment and erosion control plan, specific to site.
- .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.
- .4 Adhere to ESG-3-Pre document.

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 line[s] are encountered.
- .2 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.
- .3 Notify utility authorities before starting clearing and grubbing.
- .4 Keep roads and walks free of dirt and debris.

3.3 APPLICATION

- .1 Manufacturer's instructions: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

3.4 CLEARING

- .1 Clearing includes felling and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal.
- .2 Clear as directed by Departmental Representative by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 500mm above ground surface.
- .3 Cut off branches overhanging area cleared as directed by Departmental Representative.
- .4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.5 CLOSE CUT CLEARING

- .1 Close cut clearing to ground level.
- .2 Cut off branches or cut down trees overhanging area cleared as directed by Departmental Representative.
- .3 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.6 ISOLATED TREES

- .1 Cut off isolated trees as directed by Departmental Representative at height of not more than 300 mm above ground surface.
- .2 Grub out isolated tree stumps.
- .3 Prune individual trees as indicated.
- .4 Trim trees designated to be left standing within cleared areas of dead branches 4 cm or more in diameter; and trim branches to heights as indicated.
- .5 Cut limbs and branches to be trimmed close to bole of tree or main branches.
- .6 Paint cuts more than 3cm in diameter with approved tree wound paint.

3.7 GRUBBING

- .1 Remove and dispose of roots larger than 7.5cm in diameter, matted roots, and designated stumps from indicated grubbing areas.
- .2 Grub out stumps and roots to not less than 200mm below ground surface.
- .3 Grub out visible rock fragments and boulders, greater than 300mm in greatest dimension, but less than 0.25m³.
- .4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.8 REMOVAL AND DISPOSAL

- .1 Remove cleared/grubbed materials off site.

3.9 FINISHED SURFACE

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

3.10 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 MEASUREMENT PROCEDURES**

- .1 No measurement for excavated materials.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C117-04, Standard Test Method for Material Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136-06, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422-63 2007, Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .5 ASTM D1557-09, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .6 ASTM D4318-05, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-08, Cementitious Materials for Use in Concrete.
 - .2 CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.3 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock: solid material in excess of 1.00 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

- .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of Work. Soil materials imported from outside the Work area are to be tested and certified for use in a park setting and be free of any environmental contaminants that may impact the watercourse.
- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials:
 - .1 Weak, chemically unstable, and compressible materials.
 - .2 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 ASTM C136 : Sieve sizes to CAN/CGSB-8.1, CAN/CGSB-8.2.
 - .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45
 - .3 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.
- .8 Rip rap: large rock without fines used for erosion protection.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality Control: in accordance with Section 01 45 00 - Quality Control:
 - .1 Submit condition survey of existing conditions as described in EXISTING CONDITIONS article of this Section.
 - .2 Submit for review by Departmental Representative proposed dewatering methods as described in PART 3 of this Section.
 - .3 Submit to Departmental Representative written notice at least 7 days prior to excavation work, to ensure cross sections are taken.
 - .4 Submit to Departmental Representative written notice when bottom of excavation is reached. Provide a plan of survey using UTM coordinates showing the sub-grade elevations at an interval acceptable to the Departmental Representative. Record for the as-built records
 - .5 Submit to Departmental Representative testing & inspection results as described in PART 3 of this Section.

- .6 Submit to Departmental Representative shop drawings for the design of and inspection records during the associated construction activity for cofferdams, shoring, bracing, underpinning and other temporary Works employed to be able to complete the Work in a safe manner and to the requirements of the contract specifications including Section 35 20 22 – Dewatering and Diversion.
- .3 Preconstruction Submittals:
 - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.
 - .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, location plan of relocated and abandoned services, as required.
- .4 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

1.5 QUALITY ASSURANCE

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Submit design and supporting data at least 2 weeks prior to beginning Work.
- .3 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.
- .4 Keep design and supporting data on site.
- .5 Do not use soil material until written report of soil test results are reviewed and approved by Departmental Representative.
- .6 Health and Safety Requirements:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

1.7 EXISTING CONDITIONS

- .1 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site within 25m of the Work area and haul roads from the site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
 - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.

- .5 Prior to beginning excavation Work, notify Departmental Representative, establish location and state of use of buried utilities and structures. Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
- .6 Confirm locations of buried utilities by careful test excavations.
- .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
- .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing.
- .9 Record location of maintained, re-routed and abandoned underground lines.
- .10 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
 - .1 Conduct, with Departmental Representative, condition survey by a qualified firm acceptable to the Department Representative of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, salvaged items, pavement, survey benchmarks and monuments which may be affected by Work.
 - .2 Where required for excavation, cut roots or branches as directed by Departmental Representative.

Part 2 - Products

2.1 MATERIALS

- .1 Type 1 and Type 2 fill: properties to the following requirements:
 - .1 Crushed, pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to sieve sizes in CAN/CGSB-8.1.
 - .3 Table:

Sieve Designation	% Passing	
	Type 1	Type 2
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
0.075 mm	3-8	0-10

- .2 Type 3 fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75mm, cinders, ashes, sods, refuse or other deleterious materials.
- .3 Shearmat: honeycomb type bio-degradable cardboard 100 mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.

- .4 Rip-rap, 200mm to 300mm in diameter, as outlined on project drawings. Hard, with relative density not less than 2.65, durable quarry (shot-rock) stone, free from seams, cracks or other structural defects, clean with no deleterious materials, durable and resistant to weathering by air and water, non-acid generating, acceptable to the Departmental Representative.

Part 3 - Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
- .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.
- .4 Do not allow shoreline to erode into watercourse. Exercise caution when excavating proximate to shoreline.

3.2 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.3 PREPARATION/PROTECTION

- .1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed. Protect adjacent properties to Work area.

3.4 STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas as directed by Departmental Representative after area has been cleared and removed from site.
- .2 Strip topsoil to depths as directed by Departmental Representative.
 - .1 Do not mix topsoil with subsoil.

- .3 Dispose of unused topsoil off site as directed by Departmental Representative.

3.5 STOCKPILING

- .1 Stockpiling materials on site is strictly prohibited on project. See also part 1.7 of environmental procedures Section 01 35 43.

3.6 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Health and Safety Act for the Province of Ontario.
 - .1 Where conditions are unstable, provide methodology to address stability acceptable to the Departmental Representative.
- .2 Obtain permit from authority having jurisdiction for temporary diversion of watercourse.
- .3 During backfill operation:
 - .1 Do not remove bracing until backfilling has reached respective levels of such bracing.

3.7 DEWATERING AND HEAVE PREVENTION

- .1 Adhere to ESG-14-C document.
- .2 Keep excavations free of water while Work is in progress.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
 - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in manner not detrimental to public and private property, or portion of Work completed or under construction.
 - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas. Space at the site is limited, mechanical removal methods will likely be required.

3.8 EXCAVATION

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as indicated.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Do not disturb soil within branch spread of trees or shrubs that are to remain.
 - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.

- .5 Dispose of surplus and unsuitable excavated material off site.
- .6 Do not obstruct flow of surface drainage or natural watercourses.
- .7 Earth bottoms of excavations to be undisturbed 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 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified for footings compacted to not less than 100% of corrected Standard Proctor maximum dry density.
 - .2 Fill under other areas with Type 2 fill compacted to not less than 95 % of corrected Standard Proctor maximum dry density.
- .11 Hand trim, make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

3.9 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated or specified below.
 - .1 Under concrete slabs: provide 150 mm compacted thickness base course of Type 1 fill to underside of slab. Compact base course to 100 % of corrected Standard Proctor maximum dry density.
 - .2 Place unshrinkable fill in areas as indicated.
 - .3 Rip-Rap: Do not permit segregation in the handling and stockpiling. Place rip rap to thickness and details indicated. Consolidate rip rap during placement to avoid breakage and in a manner acceptable to the Departmental Representative.

3.10 BACKFILLING

- .1 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved installations.
 - .2 Departmental Representative has inspected and approved of construction below finish grade.
 - .3 Inspection, testing, approval, and recording location of underground utilities.
 - .4 Removal of concrete formwork.
 - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .2 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .3 Do not use backfill material which is frozen or contains ice, snow or debris.
- .4 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .5 Backfilling around installations:

- .1 Place bedding and surround material as specified elsewhere.
- .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
- .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 1 m.
- .6 Consolidate and level unshrinkable fill with internal vibrators.

3.11 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris and correct defects as directed by Departmental Representative.
- .2 Replace topsoil and grass as per Section 01 35 43 and as directed by Departmental Representative.
- .3 Reinstall lawns to elevation which existed before excavation.
- .4 Reinstall pavements and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation to the satisfaction of the Departmental Representative and local authority having jurisdiction.
- .5 Clean and reinstall areas affected by Work as directed by Departmental Representative.
- .6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
- .7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.

END OF SECTION

Part 1 - General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM A123/A123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM D4491-99a(2009), Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - .3 ASTM D4595-09, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 - .4 ASTM D4716-08, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
 - .5 ASTM D4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-4.2 No. 11.2-2004, Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
 - .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
 - .1 No. 2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
 - .2 No. 3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
 - .3 No. 6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
 - .4 No. 7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
 - .5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.
- .3 CSA International
 - .1 CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .4 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS 1860-November 2010, Material Specification for Geotextiles.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.

- .3 Samples:
 - .1 Submit following samples 4 weeks prior to beginning Work.
 - .1 Minimum length of 2m of roll width of geotextile.
 - .2 Methods of joining.
- .4 Test and Evaluation Reports:
 - .1 Submit copies of mill test data and certificate at least 4 weeks prior to start of Work.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect geotextiles from direct sunlight and UV rays.
 - .3 Replace defective or damaged materials with new.
- .3 Packaging Waste Management: remove for reuse pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 - Products

2.1 MATERIAL

- .1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls.
 - .1 Width: approved by Departmental Representative.
 - .2 Length: as indicated on drawings and to the longest laying length.
 - .3 Composed of: 95% by mass of polypropylene, polyester or other polymers, with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure for 60 days.
- .2 Physical properties:
 - .1 Mass per unit area: to CAN/CGSB-148.1, No. 2, minimum 200g/m².
 - .2 Tensile strength and elongation (in any principal direction): to ASTM D4632.
 - .1 Tensile strength: minimum 690N.
 - .2 Elongation at break: minimum 50%.
 - .3 Trapezoid Tear Strength: to ASTM D4533, minimum 275N.
 - .4 Puncture Resistance: to ASTM D4833, minimum 400N.
 - .5 Mullen Burst: to ASTM D3786, 2.17MPa.
 - .6 UV Stability: to ASTM D4355, 70% at 500h.
 - .7 Hydraulic properties:
 - .1 Apparent opening size (AOS): to ASTM D4751, 0.212mm.

- .2 Water Flow Rate: to ASTM D4991, 4880 l/min/m².
- .3 Permittivity: to ASTM D4991, 1.6 sec⁻¹.
- .3 Securing pins and washers: to CSA-G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m² to CAN/CSA G164.
- .4 Geotextile for temporary sediment and erosion control measures shall be non-woven and as approved by the Departmental Representative.

Part 3 - Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for geotextile material installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied, subject to approval by Departmental Representative.

3.2 INSTALLATION

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with pins as per the manufacturer's recommendations and to the requirements of the Departmental Representative.
 - .1 Orientation of geotextile shall be: first in the direction of the slope and second, in the direction of channel flow. The orientation shall be approved by the Departmental Representative.
 - .2 The geotextile shall be set, together with geocells where applicable, into an anchor trench (0.5m depth and 0.3m wide) and duly secured along the top edge and upstream edge (flow direction) as approved by the Departmental Representative.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile to the approval of the Departmental Representative.
- .4 Overlap each successive strip of geotextile to the manufacturer's recommendation, but to a minimum of 600mm over previously laid strip. Where overlap joints are perpendicular to the channel flow, the overlap joint shall be in the flow direction.
- .5 Pin successive strips of geotextile with securing pins to the manufacturer's recommendation.
- .6 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .7 After installation, cover with overlying layer within 4 hours of placement.

- .8 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
- .9 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.4 PROTECTION

- .1 Vehicular traffic or construction machinery not permitted directly on geotextile.

END OF SECTION

Part 1 - General**1.1 MEASUREMENT PROCEDURES**

- .1 There shall be no separate measurement for payment for: (Include cost in Contract Lump Sum Price)
 - .1 the Preparation of Sub-grade for placing of topsoil at landscape areas;
 - .2 the Placing of Topsoil removed from stockpiles at landscape areas;
 - .3 the supply and application of Amendments including fertilizer at landscape areas;
 - .4 Finish Grading at landscape and other areas;
- .2 Payment shall be made as set out in Section 01 22 01 and shall be included in the applicable item of work for landscaping.
- .3 Testing of topsoil: Departmental Representative will pay for cost of tests as specified in Section 01 45 00.

1.2 REFERENCES

- .1 Agriculture and Agri-Food Canada
 - .1 The Canadian System of Soil Classification, Third Edition, 1998.
- .2 Environmental Standards and Guidelines, Parks Canada Agency, ESG-1-Post (Revegetation)

1.3 DEFINITIONS

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

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality control submittals:
 - .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.

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

1.5 QUALITY ASSURANCE

- .1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 32 16.07 - Construction Progress Schedules - Bar (GANTT) Chart.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 - Products

2.1 TOPSOIL

- .1 Imported Topsoil for seeded areas and planting beds: friable neither heavy clay or light sandy nature mixture of particulates, micro organisms and organic matter which provides suitable medium for supporting intended plant growth, free of invasive species.
 - .1 Soil texture based on The Canadian System of Soil Classification, to consist of 4% organic matter for clay loams and 2% for sandy loams to a maximum of 20%.
 - .2 Contains no toxic elements or growth inhibiting materials.
 - .3 Finished surface free from:
 - .1 Debris and stones over 50mm diameter.
 - .2 Course vegetative material, 10mm diameter and 100 mm length, occupying more than 2% of soil volume.
 - .4 Consistence: friable when moist.

2.2 SOIL AMENDMENTS

- .1 Fertilizer:
 - .1 Not permissible, only compost may be used.
- .2 Peat moss:
 - .1 Derived from partially decomposed species of Sphagnum Mosses.
 - .2 Elastic and homogeneous, brown in colour.
 - .3 Free of wood and deleterious material which could prohibit growth.
 - .4 Shredded particle minimum size: 5mm.

- .3 Sand: washed coarse silica sand, medium to course textured.
- .4 Organic matter: compost Category A in accordance with CCME PN1340 or BNQ AA, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
- .5 Limestone:
 - .1 Ground agricultural limestone.
 - .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

2.3 SOURCE QUALITY CONTROL

- .1 Advise Departmental Representative of sources of topsoil and manufactured topsoil to be utilized with sufficient lead time for testing.
- .2 Contractor is responsible for amendments to supply topsoil as specified.
- .3 Soil testing by recognized testing facility for PH, P and K, and organic matter.
- .4 Testing of topsoil will be carried out by testing laboratory designated by Departmental Representative.
 - .1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

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 sediment and erosion control drawings and sediment and erosion control plan, specific to site, or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 STRIPPING OF TOPSOIL

- .1 Begin topsoil stripping of areas as directed by Departmental Representative after area has been cleared.
- .2 Strip topsoil to depths as directed by Departmental Representative.
 - .1 Avoid mixing topsoil with subsoil where textural quality will be moved outside acceptable range of intended application.
- .3 Stockpile in locations as directed by Departmental Representative.
 - .1 Stockpile height not to exceed 2m.

- .4 Disposal of unused topsoil is to be in an environmentally responsible manner but not used as landfill as directed by Departmental Representative.
- .5 Protect stockpiles from contamination and compaction.

3.3 PREPARATION OF EXISTING GRADE

- .1 Verify that grades are correct.
 - .1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.
- .3 Remove debris, roots, branches, stones in excess of 50mm diameter and other deleterious materials.
 - .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
 - .2 Remove debris which protrudes more than 75mm above surface.
 - .3 Dispose of removed material off site.
- .4 Cultivate entire area which is to receive topsoil to minimum depth of 100mm.
 - .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

- .1 Place topsoil after Departmental Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.
- .3 For sodded areas keep topsoil 15mm below finished grade.
- .4 Spread topsoil to following minimum depths after settlement.
 - .1 150mm for seeded areas.
 - .2 150mm for sodded areas.
 - .3 300mm for flower beds.
 - .4 450mm for shrub beds.
- .5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.5 SOIL AMENDMENTS

- .1 For planting beds: apply and thoroughly mix soil amendments into full specified depth of topsoil at following rates:
 - .1 5 parts topsoil.
 - .2 1 part peatmoss.
 - .3 1 part organic matter.

3.6 FINISH GRADING

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
 - .1 Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.
 - .1 Leave surfaces smooth, uniform and firm against deep foot-printing.

3.7 ACCEPTANCE

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

3.8 SURPLUS MATERIAL

- .1 Dispose of materials except topsoil not required off site.

3.9 CLEANING

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

END OF SECTION

PART 1 – General**1.1 DESCRIPTION**

- .1 This section specifies requirements for Dewatering and Water Diversion Work described by drawings and specifications.
- .2 These temporary measures shall be designed to accommodate:
 - .1 Seasonal navigation on the waterway
 - .2 Maintaining operating levels within normal range (as defined as the maximum and minimum observed water levels, refer to Water Levels, Section 01 14 00 Work Restrictions, Item 1.4).
 - .3 Seasonal flows and winter conditions.
- .3 Work includes but is not limited to:
 - .1 Engaging a Professional Engineer, licensed in the Province of Ontario to design and oversee the implementation of the following:
 - .1 All temporary dewatering frames and structures upstream and downstream of the existing dam;
 - .2 All flow diversion systems and related structures;
 - .3 Methodology and structures to control flows and water levels upstream of the Work in response to varying seasonal conditions (note that PCA will operate the dam during construction);
 - .4 The systems used to remove the water from the Work space (site);
 - .5 Methodology for maintaining the work spaces in a dry state;
 - .6 Methodology for removal of temporary works and for maintaining stability of new and existing Works during the recharging (filling) of the waterway;
 - .7 Producing a risk analysis for Dewatering and Diversion Works.
 - .2 Implementation of dewatering and diversion works according to the Professional Engineer's design following ESG-14-C (Treatment of Discharge Waters).
 - .3 Constructing and maintaining dewatering and diversion structures for the duration of the Work.
 - .4 Providing and maintaining all dewatering equipment for the duration of the Work.
 - .5 Removing water from Work spaces and maintaining these spaces in the dry state for the duration of the Work.
 - .6 Supply of standby equipment to replace dewatering equipment which malfunctions.
 - .7 Removing of temporary dewatering and diversion structures at the end of the Work.
 - .8 Complying with the provisions of Section 01 35 43 - Environmental Procedures and 35 42 19 Turbidity Curtain with respect to turbidity and pollution control at all times.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

- .1 There will be no measurement of Dewatering Work.
- .2 Payment of Dewatering Work shall be included in the Lump Sum Price, refer to Section 01 22 01.

1.3 REGULATORY REQUIREMENTS

- .1 Adhere to local, provincial and federal requirements relating to:
 - .1 Protection of environment;
 - .2 Safety of construction; and
 - .3 Protection of workers.
- .2 Pumping water out of cofferdam enclosure: to Section 01 35 43.
- .3 Obtain and pay costs of all required permits.

- .4 Operation of construction equipment in water is prohibited.
- .5 Underwater blasting is not permitted

1.4 SUBMITTALS

- .1 Shop drawings of all cofferdams, flow diverters, and other dewatering systems to Section 01 33 00 - Submittal Procedures.
 - .1 Shop drawings shall be complete with Professional Engineer's seal & signature.
 - .2 Submit design criteria and calculations of (for each stage of construction):
 - .1 Flow capacity to maintain navigable water levels and seasonal operating levels.
 - .2 Flow characteristics at intake, conveyance and effluent of diverters to meet scoring, erosion, environmental, boater safety concerns, and mitigate scouring.
 - .3 Stability of cofferdams and existing structures and embankments during dewatering and rehabilitated structure during surcharging.
 - .4 Flow diverters and related structures.
 - .3 Provide risk analyses for Dewatering Divers Works based on the design criteria.
- .2 Submit detailed drawings to Regulatory Agencies, as required to satisfy conditions for granting of permits.
 - .1 Modify detailed drawings to meet Regulatory Agency Requirements.
 - .2 Revise details to address site conditions encountered during construction.

1.5 QUALIFICATIONS OF DESIGNER

- .1 Designer of cofferdam, flow diverters and other related dewatering structures must be a Professional Engineer, licensed to practice in the Province of Ontario, with considerable expertise and experience in design of similar structures and systems.
- .2 Designer must: make, check and sign all calculations; check, seal and sign all drawings and related reports; periodically inspect dewatering and diversion structures and systems on site (minimum monthly); and verify their adequacy and safety.

1.6 DESIGN CRITERIA

- .1 Design cofferdams to ensure maintenance of work spaces in a dry state for duration of work.
 - .1 The contract drawings describe a methodology for cofferdams to undertake the Work.
 - .2 The Contractor shall undertake their own evaluation as to the adequacy of this methodology to undertake the Work.
 - .3 The Contractor may choose an alternative methodology for cofferdams to be able to undertake Work, however, use of granular or loose fill cofferdams is not permitted.
- .2 Design flow diverters to pass flow around the work area to the downstream channel.
 - .1 The contract drawings state that the existing dam is to be used to divert flows, a minimum of 4 sluiceways must be operational at all times. A combination of two of the four bays from Sluices #3, 4, 5, 6, or 7 shall be operational at all times.
 - .2 The Contractor shall undertake their own evaluation as to the adequacy of this diversion to undertake the Works.
- .3 Ensure that the cofferdam structures nor any other portion of the Work interferes with the operation of the dam.
- .4 Ensure that neither the cofferdam structures nor the Diversion Works interfere with the passage of river flows past the construction site without causing flooding either upstream or downstream which would not have occurred without the dewatering structures at the site.
 - .1 Upstream water levels which exceed an elevation of 258.30 metres are regarded as flooding.

- .2 Normal water elevations are provided in Section 01 14 00 Work Restrictions.
- .5 At all times, provide Diversion Works with adequate capacity to discharge the river flows for each stage of dewatering, to ensure the achievement of all water control requirements.
 - .1 Provide safe access for operation.
 - .2 Provide measures to protect the Owner and public from temporary works (inlet, outlet and open conveyance).
 - .3 Provide erosion control measures at the inlet, conveyance and outlet works as necessary.
 - .4 Provide measures to prevent blockage by debris at inlet works.
 - .5 At all times, maintain the environmental quality of water to Section 01 35 43 Environmental Procedures
- .6 Plan & design dewatering and diversion systems considering:
 - .1 Access to cofferdams and diversion works, & access to reach any portion of Work.
 - .2 Site constraints including the existing dam structure, access, and any environmental permits.
 - .3 Space required for crews to work in dewatered areas.
 - .4 Sequence of Work.
 - .5 The river flows records, flood levels and winter conditions.
 - .6 The foundation level for the Works.
 - .7 The surcharging of rehabilitated dam.
 - .8 The continued operations of the dam during navigation season.
 - .9 Parks Canada operator access to the dam.
 - .10 Parks Canada operators and public safety.
- .7 At all times, maintain environmental quality of water to Section 01 35 43.
- .8 Ensure that no phase of Work threatens safe performance of cofferdam.
- .9 Design dewatering systems capable of removing the water from the work spaces without causing instability of excavated slopes or foundation soils due to the seepage pressure of infiltration water.
- .10 Provide a minimum of one metre freeboard above the normal operating level to prevent overtopping.

1.7 WATER LEVELS & FLOW RECORDS

- .1 Seasonal operating levels are identified in Section 01 14 00. Parks Canada will manipulate stop logs at the dam to maintain the seasonal operating levels.
- .2 Contractor must be able to pass flow safely through the construction site during the course of the work.
- .3 Refer to Appendix C for Historical Water Levels.

1.8 ENVIRONMENTAL REQUIREMENTS

- .1 Dispose of water so it does not create a safety or health hazard; or cause damage to environment, to adjacent property or to any portion of Work, or cause erosion of river banks or channel banks.
- .2 Prior to dewatering the work area, remove any aquatic species (fish and turtles) according to approved environmental plan. Work to be supervised by a knowledgeable and competent fishery expert.
- .3 Turbidity limit: to Section 01 35 43 and Section 35 49 25.

- .4 During the installation of cofferdam, and construction of diversion system, provide measures to mitigate sediment transport.
- .5 Do not release any silt or other materials into watercourse during construction, including demolition, excavation, haulage and grading or removal of cofferdams and diversion system.

1.9 PROTECTION

- .1 Protect cofferdam and dewatered work spaces from damage due to floods, rain, ice, snow or other adverse climatic conditions.
- .2 Provide measures to permit Parks Canada staff to safely operate the dam Protect the public including any navigation traffic at the dam during all phases of the Work.
- .3 Diversion works shall be constructed to safely pass flows without causing damage to adjacent works. Provide measures to protect Parks Canada staff and the public at these works.
- .4 Train staff for safe operation of dewatering and diversion works.
- .5 Provide monitoring measures to ensure a timely response to any emergency conditions.
- .6 Provide back-up equipment as necessary to maintain a dry working area. Provide measures to monitor dewatering equipment to the satisfaction of the Departmental Representative. The Contractor is to respond in a timely manner. Failure of equipment to maintain the work area in the dry and to maintain suitable conditions for the Work will not be considered as part of any delay claim by the Contractor.
- .7 The diversion works shall be capable of passing the 1:20 year flood, 75 cms, keeping the upstream water levels within normal ranges; if the operational sluiceways are insufficient, then additional diversion measures will be required.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Only use material in good condition, approved by Departmental Representative and suitable for their use in Work.
- .2 Do not use materials which may cause environmental damage to waterway or to land at or near site. This includes materials which would cause turbidity in excess of limits specified in Section 01 35 43 – Environmental Procedures and Section 35 49 35 – Turbidity Curtain.
- .3 Materials and methods proposed for use in Dewatering of the Site and Diversion are to be approved by all of the following:
 - .1 Ontario Ministry of Natural Resources & Forestry.
 - .2 Ontario Ministry of the Environment and Climate Change.
 - .3 Federal Department of Fisheries & Oceans.The Plan (shop drawings) shall clearly demonstrate the materials to be employed and the methodology of installation, operation, maintenance, and removal along with restoration where applicable.
- .4 Granular or loose fill material are not preferred for the cofferdam and flow diverters. Any use of aggregate must be approved and subject to several conditions including, but not limited to, 1. Not in areas subject to high flows, 2. Must be clean washed material.
- .5 If using metre bags, for an interim measure, fill must be washed of fines before placing in the water. Bags are to be made of a synthetic reinforced material suitable for the purpose intended. The Departmental Representative may request a demonstration to confirm the filled bags can be installed and removed without any resulting turbidity.

PART 3 - EXECUTION

3.1 GENERAL

- .1 Evaluate, plan and execute Work in an expert and prudent manner giving due consideration to:
 - .1 Climatic conditions which may occur at work location during period of doing work in its entirety.
 - .2 Safety of personnel and of general public including boating traffic.
 - .3 Safety of Work and, of adjacent property and structures.
 - .4 Safety of removals.
 - .5 Safe operation (including training of staff) of operation of diverters and other equipment to maintain navigation and seasonal water levels.
 - .6 Environmental requirements.
 - .7 Clearance requirements for Work.
 - .8 Irregularities of adjacent surfaces.
 - .9 Changes in water levels.
 - .10 Surcharging the new dam.
 - .11 Minimize and manage risk associated with temporary Works.

3.2 CONSTRUCTION OF COFFERDAMS, FLOW DIVERTERS AND STABILITY WORKS

- .1 To suit the exact locations, and seasonal flow conditions within the immediate vicinity of the Works.
- .2 Sufficiently watertight to permit Work to proceed in the dry.
- .3 To address all Phases of the Work.
- .4 Install temporary works of Cofferdam and Flow Diverters to not unduly compromise the existing structures and works. Provide Stability measures to protect existing structures and works during the installation of temporary works and site preparation including excavation for the Works.
- .5 Install temporary works including stability measures in a progressive manner without delays according to the approved schedule.
- .6 Operate temporary measures to minimize potential environmental damage.

3.3 DEWATERING

- .1 Dewater work spaces for the various task involved with the Work and maintain them in a fully dewatered state until Work is finished.
- .2 Continue dewatering operations, to enable Work to proceed in the dry, for duration of Work.
- .3 Repeat entire dewatering procedure as often as may be necessary if flooding or other damage occurs before completion of Work.
- .4 Maintain the dewatered state by pumping from well-points and/or sumps.
- .5 Ensure that any drawdowns of the water surface due to pumping does not affect:
 - .1 The safety or quality of the Work.
 - .2 The stability of adjacent structures and embankments.
 - .3 Adjacent property in an adverse manner including domestic and other water supplies(wells).

3.4 WATCHKEEPER

- .1 Ensure continuity of dewatering by designating a Watchkeeper to make periodic checks at times when Work is not in progress. Watchkeeper's qualifications under this Section are to be sufficient to perform, on dewatering equipment, such duties as:
 - .1 Preventive maintenance and refuelling of generators normally performed during any shift.
 - .2 Emergency repairs of minor complexity.
 - .3 Placing standby items in service.

3.5 EQUIPMENT

- .1 General:
 - .1 Provide equipment in safe operating condition and maintain it in a safe operating condition for entire period of use and/or standby for use on Work.
 - .2 Provide skilled operators for equipment.
 - .3 Undertake service and maintenance of equipment according to approved environmental procedures.
- .2 Standards and performance:
 - .1 Provide equipment of such quality & in such quantity as to provide sufficient capability to perform essential functions of Work to the approved schedule.
 - .2 Equipment that is working in channel /river shall meet all environmental requirements.
 - .3 Provide emergency equipment for spills of deleterious substances.
 - .4 Provide standby replacement for pumps and other essential dewatering equipment which may break down during Work.
 - .5 Keep this replacement equipment available on site for immediate use.

3.6 REMOVALS OF COFFERDAMS, FLOW DIVERTER AND STABILITY WORKS

- .1 At approved stages in Work, remove all cofferdams, temporary improvements, and dewatering systems to original bottom level.
- .2 Remove all cofferdam materials to the founding soils (below erosion control measures).
- .3 Remove entirely all flow diverters. Restore the site to the original condition or better.
- .4 Remove all stability works other those approved to remain. Restore the site to the original condition or better.
- .5 Remove all temporary measures. Restore the site to the original condition or better.
- .6 Dispose of all unwanted materials in approved manner off site.
- .7 Do not dispose of any materials in river.

3.7 CLEAN-UP AND RECTIFICATION

- .1 In accordance with Section 01 74 11.

END OF SECTION

Part 1 - General

1.1 SECTION INCLUDES

- .1 This section specifies requirements for safety booms as part of the safety requirements for navigation as set out by Transport Canada Navigable Waters.

1.2 MEASUREMENT PROCEDURES

- .1 There will be no separate measurement for payment for safety booms anchors, assembled safety boom and navigation warning marking for in-water anchors used as part of the permanent works. Include cost in Contract Lump Sum Price.
 - .1 Upstream Safety Boom
14 boom units with English graphics and 14 boom units with French graphics (plus 6 buoy units) shall be supplied/installed by Contractor as indicated on Contract drawings.
 - .2 Downstream Safety Boom
9 boom units with English graphics and 9 boom units with French graphics (plus 2 buoy units) shall be supplied and installed by Contractor as indicated on Contract drawings.
- .2 Payment shall be made as set out in Section 01 22 01 and shall be included in applicable item of work for safety booms and temporary works.

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM) ASTM D1505-68, Standard Test Method for Density of Plastics by the Density-Gradient Technique
- .2 ASTM A572, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
- .3 ASTM C578, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.

1.4 DESCRIPTION OF SAFETY BOOM SYSTEM

- .1 Floatation units shall be new units not previously used.
- .2 Floatation units shall consist of an external encasement, internal foam fill and internal structural steel channel through which all external inter boom connections are attached.
- .3 Each floatation unit shall be approximately cylindrical in shape.
- .4 The nominal diameter shall be 406 mm diameter and 3.05 m in length.
- .5 Each floatation log shall be designed to have a minimum buoyancy of 317kg.
- .6 Each floatation unit shall be designed to maintain its original buoyancy even if it is structurally damaged or punctured.
- .7 Floatation units are to be yellow in colour (FS-13655) as per Transport Canada requirements.

PART 2 - PRODUCTS

2.1 BOOM UNITS AND BUOYS

- .1 New boom units are to match manufacturer and custom model of booms installed at other locations on the Trent-Severn Waterway.

2.2 INTER BOOM AND ANCHOR CONNECTION HARDWARE

- .1 All connecting hardware between floatation units and anchor shall consist of:
 - .1 Bottom steel connector plate
 - .2 Load-rated safety clevis (shackle)

- .3 Load-rated welded links (chain).
- .2 The connections between floatation units shall be engineered to minimize wear and maximize load-bearing capacity.
- .3 Structural steel: ASTM 572, Grade 50 steel, or approved equivalent.
- .4 Galvanizing: all fabricated component and hardware under this section are to have hot dipped galvanizing to ASTM A123/A123M. Galvanization grade and weight to be in accordance with the manufacturer's recommendation.
- .5 Bolts, nuts and washers: to ASTM A325/A325M, hot dipped galvanized to ASTM A153/A153M, unless otherwise approved.
- .6 Connection clevis (shackle) shall:
 - .1 Have a minimum pin diameter of 3/4-inch, be stainless steel or hot dipped galvanized steel, be of a safety type with a heavy-hex style castle nut, lock washer and stainless steel (Type 304 or 316) cotter pin.
 - .2 Have a Working Load Limit of not less than 4.3 tonnes. The Working Load Limit rating shall be clearly identified on the body of each clevis.
- .7 Chain: Hot dipped galvanized, grade 30 proof coil, 19mm size. Contractor to supply interconnector chain segments between the boom units, chain segments shall be of a length resulting in the complete connector assembly providing a clear spacing between floatation units of 1000mm as per the contract drawings. Contractor to supply sufficient chain length to anchor the safety boom to the shoreline anchors as indicated on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Contractor shall be responsible to place/align all field placed shoreline and in-water anchors.
- .2 Install in accordance with manufacturer's instructions and as indicated on the Contract drawings.
- .3 Do not make alteration to system components without written permission of Departmental Representative.
- .4 Individual section of boom shall be connected to shoreline anchor or in-water anchor with separate clevis (shackle), unless otherwise indicated.
- .5 Ensure the warning message is facing upstream for the upstream boom, and facing downstream for the downstream boom. Alternatively place boom units with English and French warning message.

3.2 CONSTRUCTION

- .1 Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
- .2 For installation of anchors, provide sediment control measures acceptable to the Departmental Representative. Do not spill concrete into open water.

3.3 FIELD QUALITY CONTROL

- .1 Site Tests/Inspections - Inspect boom floatation units and buoys prior to installation. Any units that are damaged during delivery, handling or installation are to be replaced by contractor
- .2 Evidence of units having a lack of buoyancy, or being damaged, as determined by the Departmental Representative, will be cause for rejection.

END OF SECTION

Part 1 - General**1.1 ENVIRONMENTAL REQUIREMENTS**

- .1 Operation of construction equipment in water is prohibited.
- .2 Design and construct temporary crossings to minimize environmental impact to watercourse.
- .3 Constructing temporary crossings of watercourses where spawning beds are indicated is prohibited.
- .4 Dumping excavated fill, waste material, or debris in watercourse or wetland is prohibited.
- .5 Underwater blasting is not permitted.
- .6 Refer to Section 01 35 43 Environmental Procedures.

1.2 REFERENCES

- .1 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.
 - .2 Section 01 35 43 Environmental Procedures
 - .3 Erosion and Sediment Control Guidelines for Urban Construction, December 2006

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Sustainable Design Submittals:
 - .1 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with authorities having jurisdiction.

Part 2 - Products**2.1 Preparation**

- .1 Obtain work permits from governing Federal, Provincial and/or Municipal Conservation authority.

Part 3 - Execution**3.1 EXISTING CONDITIONS**

- .1 Maintain existing flow pattern in natural watercourse systems.
- .2 In natural systems maintain existing riffle pool and step pool patterns.
- .3 In wetland systems, maintain existing hydrological conditions.

3.2 SITE CLEARING AND PLANT PROTECTION

- .1 Conduct work to provide minimal disturbance to vegetated buffer zones. Protect trees and plants on site and adjacent properties where indicated.
- .2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes.
- .3 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 zone.
- .4 Leave cuttings from trees and other vegetation on site as brush piles to allow for natural degradation. Secure large piles with degradable materials to prevent interference with watercourse.

- .5 Remove only trees that may offer future blockage problems as instructed by Departmental Representative.
- .6 Leave roots mass and stumps in place.
- .7 Maintain temporary erosion and pollution control features installed under this contract.

3.3 DRAINAGE

- .1 Pumping water containing suspended materials into watercourse is prohibited.
- .2 Establish rock chute spillways to accommodate safe surface water entry to watercourse as approved by the Departmental Representative.
- .3 Install drop pipe inlet system as approved by Departmental Representative.

3.4 SITE RESTORATION

- .1 All disturbed areas of ground are to be restored to existing or better condition than documented prior to construction. All disturbed areas of lawn must be restored by re-grading and restoring lawn with minimum 100mm of topsoil and sod. This includes all excavations and tire ruts for which a minimum 300mm wide row of topsoil and sod is to be placed along tire ruts in surface.
- .2 All watering of new grass is responsibility of Contractor until such time new grass has rooted. Sod rooting will be based on 'tug test' Seeded areas rooting will be based on 25mm blade growth and 98% coverage of restored area. Burned sod must be replaced within 2 weeks. Water may be drawn from adjacent watercourse for lawn watering. Remove lawn watering equipment at end of each visit. Do not draw water for any other purposes such as concrete mixing or cleaning of equipment, etc. Use only fertilizer. Pesticides and herbicides are strictly prohibited.
- .3 All other areas of disturbance on site and along access routes as a result of contractor forces and/or work are to be restored to conditions equal to existing or better than documented prior to mobilization.
- .4 Take site photographs of all intended works areas and along access routes prior to mobilization and ongoing during work as necessary. Photos serve as a reference for potential surface defect repairs and other damages made during or at completion of work. Departmental Representative will do same. Photos will also serve as a means of settling disputes regarding damages on site.
- .5 Photograph, document and notify Departmental Representative immediately when it is noticed that any disturbances are being made as a result of work or by natural causes such as wind or erosion due to rainfall surface run-off, etc.

END OF SECTION

Part 1 - General**1.1 ENVIRONMENTAL REQUIREMENTS**

- .1 Operation of construction equipment in water is prohibited.
- .2 Design and construct temporary crossings to minimize environmental impact to watercourse.
- .3 Constructing temporary crossings of watercourses where spawning beds are indicated is prohibited.
- .4 Dumping excavated fill, waste material, or debris in watercourse or wetland is prohibited.
- .5 Underwater blasting is not permitted.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

- .1 There will be no measurement of Turbidity Curtain.
- .2 Payment of Turbidity Curtain shall be included in the Lump Sum Price.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM D4491-99a(2009), Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - .2 ASTM D4595-09, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 - .3 ASTM D4716-08, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
 - .4 ASTM D4751-04, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-4.2, Textile Test Methods.
 - .2 CAN/CGSB-148.1, Methods of Testing Geosynthetics.
 - .1 No.2-M85, Mass per Unit Area.
 - .2 No.3-M85, Thickness of Geotextiles.
 - .3 No.6.1-93, Bursting Strength of Geotextiles Under No Compressive Load.
 - .4 No.7.3-92, Grab Tensile Test for Geotextiles.
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel.
 - .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4 Ontario Provincial Standard Drawings (OPSD)
 - .1 OPSD 0219.2600 November 2006, Turbidity Curtain.
 - .2 OPSD 0219.2610 November 2006, Turbidity Curtain, Seam Detail.
- .5 Ontario Provincial Standard Specification (OPSS)
 - .1 OPSS 577 November 2006, Construction Specification for Temporary Erosion and Sediment Control Measures.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit details of the temporary turbidity curtain system to the Departmental representative prior to the start of the Work.

- .2 Submit to Departmental representative details of geotextile material and seam at least 2 weeks prior to commencing work.
- .3 Complete the submission of a Sediment Control Plan as described in the ESG document.

1.5 DELIVERY AND STORAGE

- .1 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: as specified on Contract Drawings.
 - .2 Length: as specified on contract Drawings.
 - .3 Composed of: minimum 85% by mass of polypropylene polyester with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure for 60 days.
- .2 Physical properties:
 - .1 Thickness: to CAN/CGSB-148.1, No. 3, minimum 0.8 mm.
 - .2 Mass per unit area: to CAN/CGSB-148.1, No. 2, minimum 220 g/m².
 - .3 Tensile strength and elongation (in any principal direction): to ASTM D4595.
 - .1 Tensile strength: minimum 1350N, wet condition.
 - .2 Elongation at break: minimum maximum 25%.
 - .3 Seam strength: minimum 1350N equal to or greater than tensile strength of fabric.
 - .4 Mullen burst strength: to CAN/CGSB-4.2, method 11.2, minimum 4000N, equal to or greater than tensile strength of fabric.
- .3 Hydraulic properties:
 - .1 Apparent opening size (AOS): to ASTM D4751.
- .4 Securing pins and washers: to CAN/CSA-G40.20/ G40.21, Grade 300W, minimum 30% recycled content, hot-dipped galvanized with minimum zinc coating of 600 g/m² to CAN/CSA-G164.
- .5 Seams: sewn in accordance with manufacturer's recommendations.
- .6 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

Part 3 - Execution

3.1 GENERAL

- .1 Complete the submission of a Sediment Control Plan as described in the ESG document.
- .2 Supply, install, maintain and remove silt curtains when instructed by the Departmental Representative.
- .3 Monitoring of water turbidity outside the silt curtain will be done by the Contractor. As per the Canadian Water Quality Guidelines for the Protection of Aquatic Life - Total Particulate Matter, the maximum increase of total suspended solids above background levels permitted is 5 mg/L.

3.2 INSTALLATION

- .1 Turbidity curtains shall consist of turbidity curtain geosynthetic, load line, flotation, ballast, anchors, mooring buoys, mooring lines, adjustment lines, and tie-downs.
- .2 Design to conform to Ontario Provincial Standard Specification, OPSS 577 and Ontario Provincial Standard Drawings: OPSD 219.260 and OPSD 219.261 as a minimum.
- .3 Turbidity curtains shall be constructed as follows:
 - .1 The flotation shall provide support along the length of the turbidity curtain.
 - .2 A sleeve shall be formed and heat-sealed or sewn along the entire bottom edge of the turbidity curtain geosynthetic, to contain the ballast in the sleeve. Breaks may be made in the sleeve to facilitate pulling, provided they are a minimum 100 mm in size and spaced at minimum 3 m intervals.
 - .3 Where turbidity curtain geosynthetic is joined to provide a continuous run, the sections shall be connected to provide a continuous seal and prevent the escape of turbid water between the sections.
 - .4 The turbidity curtain, as prepared for installation, shall be of sufficient width to account for water depth and wave action.
 - .5 Adjustment lines shall be placed at maximum intervals of 10 m, and are to encircle the turbidity curtain from top to bottom.
 - .6 The turbidity curtain shall be prepared for installation by furling and tying with furling ties every 1.5 m for the entire length of the curtain.
 - .7 Anchor locations shall be established as is necessary to maintain the turbidity curtain in place and functioning.
 - .8 If curtain is to be used in flowing water, support must be designed appropriately.

3.3 OPERATION AND MAINTENANCE

- .1 Turbidity curtains shall be installed to prevent sediment passage from the area enclosed by the curtain to the exterior waterbody. Turbidity curtains shall be installed and maintained in a manner that avoids entry of equipment, other than hand-held equipment or boats, to the exterior waterbody.
- .2 Equipment is permitted in the work area enclosed by the turbidity curtain.
- .3 Turbidity curtains shall be operated and maintained in the specified location, with the entire top edge above the water surface.
- .4 The curtain shall be free of tears and gaps, and the bottom edge of the curtain is to be continuously in contact with the watercourse bed so that sediment passage from the area enclosed is prevented.
- .5 Curtain not to be used to create a settling area for dewatering.
- .6 Any folds in the turbidity curtain which form next to the flotation collar shall be regularly monitored and freed of collected sediment.
- .7 Monitor and maintain the turbidity curtains booms both during and outside normal working shifts as required. Provide all personnel, materials and equipment necessary to maintain, repair, replace or relocate the silt curtain system. Replace the turbidity curtain bi-monthly and as directed by the Departmental Representative. Remove in a manner acceptable to the Departmental Representative to contain the entrapped sediment on the turbidity curtain.
- .8 Carry out construction operations to minimize impact on fish habitat from both disturbed sediments and fill materials.
- .9 Replace damaged or deteriorated geotextile to approval of Departmental Representative.

- .10 Remove turbidity curtain when authorized by the Departmental Representative after completion of the work. NTU must be below 2 above the background level before the curtain can be removed.

END OF SECTION

APPENDIX A

BASIC IMPACT ANALYSIS FOR COBOCONK DAM REHABILITATION



Parks Canada Basic Impact Analysis Coboconk Dam Rehabilitation



- 1





Environmental Impact Assessment Version Control

This section serves to control the development and distribution of revisions to the Environmental Assessment.

Revision Number	Amendment Number	Date	Brief Description of Change
0		2018-05-31	Original

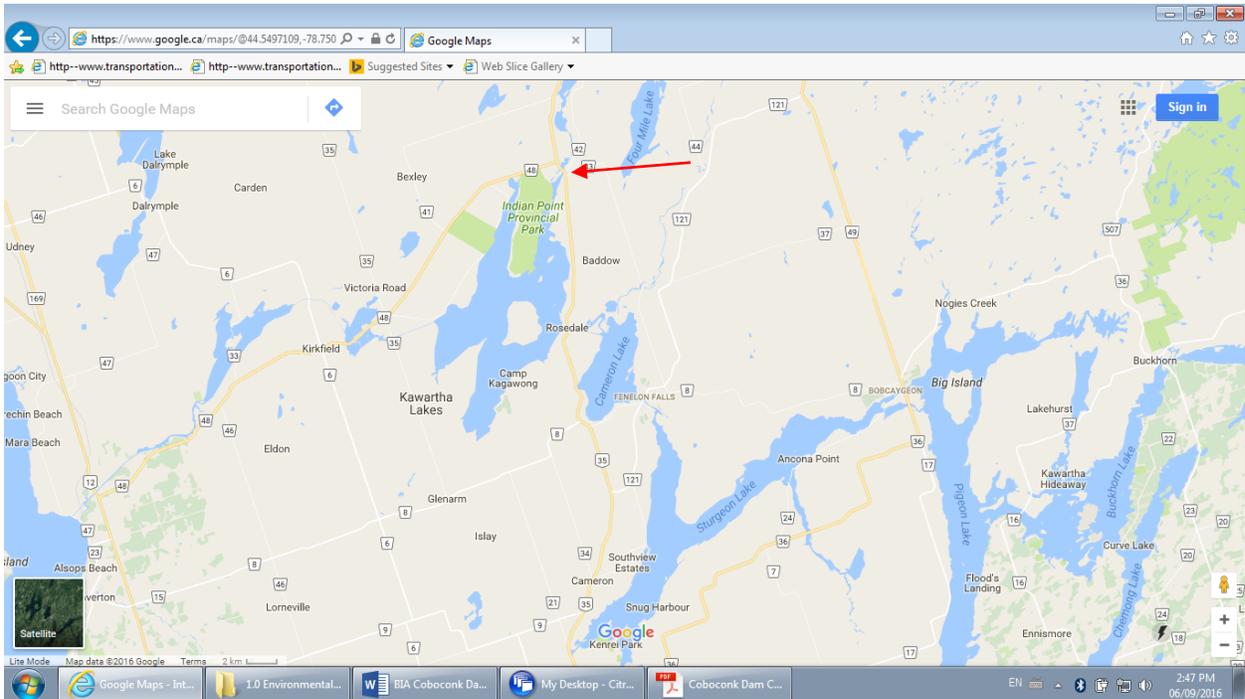




1. PROJECT TITLE & LOCATION:

- a. Coboconk Dam Rehabilitation
- b. Access to the site is from Highway 35 in the Town of Coboconk; the dam is located immediately (approximately 100 m) upstream of the Gull River crossing in the town of Haliburton **44° 39' 34" N, 78° 47' 49" W**

Figure 1: Coboconk dam location



2. PROPONENT INFORMATION

Dave Smallwood, Project Manager
Parks Canada, Trent-Severn Waterway National Historic Site
P.O. Box 567, 2155 Ashburnham Drive
Peterborough, ON K9J 6Z6

3. PROPOSED PROJECT DATES

Planned commencement: 2018-07-31
Planned completion: 2019-08-31





4. FILE NUMBERS

Impact Assessment Tracking: TSW-2016-0007(I)

5. BIA DECISION RATIONAL

This project is being conducted under Parks Canada's Environmental Impact Analysis Process (2015) as a means to meet Parks Canada's legal and mandated obligations to protect Canada's natural and cultural heritage. This Environmental Impact Assessment is under s.67 of the Canadian Environmental Assessment Act (CEAA) 2012, as Parks Canada owns most of the surrounding lands and waters. This project was considered to be a low risk project because there are predictable environmental impacts for the concrete rehabilitation and associated work components including the following reasons:

- Existing and Draft Best Management Practices cover portions of the work (Boom Placement, vegetation removal, working with concrete and dewatering)
 - Work can be conducted outside the timing restrictions for Walleye
 - The dewatering methodology has been reduced to a very small footprint
 - CRM issues are considered to be insignificant
 - There are no impacts on Terrestrial or Aquatic SAR within the projects area
 - Impacts on the downstream and upstream fishery can be fully mitigated
 - Terrestrial impacts can easily be mitigated
-

6. PROJECT BACKGROUND

The Coboconk Dam is located within the community of Coboconk, which is part of the City of Kawartha Lakes (see Location Plan, Figure 1-1). The Coboconk Dam is owned and operated by TSW. It is situated on Gull River, which is part of the Trent River watershed in the Haliburton Sector of the TSW. The Haliburton Sector Office is located just to the east of Haliburton, Ontario on Paradise Cove Road.

The Coboconk Dam is within the Haliburton Sector of the TSW, which covers an area of approximately 3,200 km² and includes 47 dams and water retaining structures that control various reservoir lakes and rivers. The dam controls water levels on Silver, Little Shadow and Shadow Lakes, releasing flow into Balsam Lake.

The Coboconk Dam was built in 1943. The existing dam was constructed of cast-in-place concrete and is approximately 70m long x 7.4m wide. The dam features 2 abutments, 8 piers and 9 sluiceways. The piers have chamfered corners on both the upstream and downstream ends. A concrete deck, approximately 5.4m wide and with an inverted rib design, spans across the piers from shore to shore. The ends of the piers project approximately 1.2m beyond the edges of the deck. Each sluiceway employs a system of stacked logs to control water flow and levels. A system of winches is used to raise and lower the logs. Existing guards consist of steel posts supporting chain link fencing on the upstream side of the deck and

- 4





steel angles supporting 3 horizontal steel wires on the downstream side of the deck. The dam is located on the Gull River in the village of Coboconk, Ontario, close to the main highway bridge and the downtown area.

The Coboconk dam is one of 45 dams in the Trent River Watershed – Reservoir Lakes but is the only one that is designated as a cultural resource. Geological information and site observations indicate that the dam is likely constructed directly on competent bedrock

Project Scope

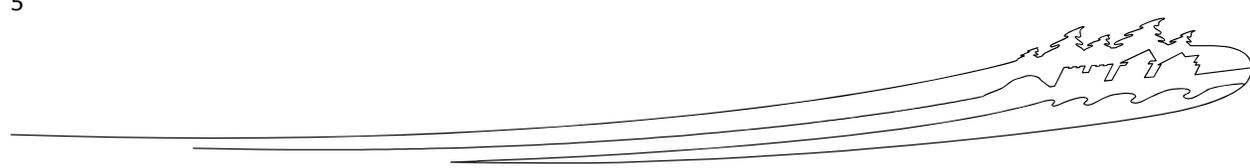
The Dam Safety Review for the dams required the following project scope to address deficiencies:

- Repair/reface concrete on the Dam
- Tremie concrete to extend the sill 0.5m upstream
- Construct Nose Pier extensions with service gains and raise piers
- New precast deck
- Install new guardrails in all required locations
- Install/replace signage as per the 2011 CDA Public Safety Guidelines.
- Installation of safety booms to permit self-rescue.
- Existing winches are being refurbished & site is being planned for introduction of a log lifter
- Erosion protection on North East Bank

In order to carry out the above scope of work the following project components were also assessed for their potential environmental impacts:

Construction Sequence

Project Phase	Physical Works and Activities
Mobilize July 2018	Clear vegetation in the proposed location of the reconstruction and construction staging area; Prepare and manage work zone, including storage of equipment and materials; Install construction limit signage and perimeter fencing; a parking/temporary laydown area will be constructed on leased land adjacent to the west side of the dam.
Install Cofferdam and Dewatering Equipment Aug -September	Dewatering and sediment control installed. As the dam is being refurbished in place a downstream cofferdam will likely be required. Loose aggregate is not preferred, so a form type dam or meter bags will be required. A coffer dam may or may not be used upstream of the Dam. Turbidity curtains will be installed upstream of the upstream of the proposed work phases. A maximum of 3 sluices can be worked on during the first phase, starting from the west bank, to set flows during critical spawning/nursery periods. The next phase of sluice construction cannot occur until after June 30. Subsequent bays will be dewatered and work performed through to September 2018.





Project Phase	Physical Works and Activities
<p>Construction Sept 15 to – March 15</p>	<p>Downstream Nose Pier Extensions may be done in two ways. 1. in the wet, which involves chipping loose concrete around the existing piers by divers. Installation of metal formed nose pier extension and tremie concrete pour. All work will be conducted behind turbidity curtains with appropriate mitigation identified below. (after May 15th) 2. With a form coffer dam (no aggregates) or meter bag filled with washed, free of fines aggregate.</p> <p>An upstream sill is required to be poured and will likely be in the wet with a tremie pour. This work will not occur until after July 15th</p> <p>Once nose pier extensions are completed, up and downstream stoplogs can be placed in the newly created service gains. The interior portions of each sluice bay can be refurbished in the dry. Work will be done in phases as each set of sluices are completed.</p> <p>Once all the bays have had restoration work completed the other aspects of the project can be competed including demolition of existing deck , peir toppings, replacement of deck, new guardrails in all required locations, replace signage as per the 2011 CDA Public Safety Guidelines, installation of safety booms to permit self-rescue, erosion protection, grading, landscaping and, refurbishment of all winches</p>
<p>Demobilization August 2019</p>	<p>The cofferdams, the sediment control and monitoring measures and all construction equipment will be removed from site; restoration activities associated with the Dam construction.</p>
<p>Commissioning and Operation</p>	<p>Conduct operation of the Dam after each phase is complete.</p>

Schedule

Work is expected to begin shortly after award in July and will be completed over the winter. If required, work may be conducted in two phases with the second commencing in mid to Late May in 2018 after Walleye spawn, if approved by PCA.

7. VALUED COMPONENTS POTENTIALLY AFFECTED

Fish

According to the Ontario Ministry of Natural Resources & Forestry (OMNRF), fish species upstream of the dam in Mississagua Lake include warm/cool water species Fish species in Balsam Lake and Gull River include, Rock bass, Smallmouth Bass Largemouth Bass, Black Crappie, Common Carp, White Sucker, Pumpkinseed Cisco, Walleye, Yellow Perch, Muskilunge, yellow bullhead, Brown Bullhead, Norther Pike and Burbot(OMNRF fish-on-line and Niblett data). Known walleye spawning

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(from Balsam Lake) is located downstream of the dam. Maintaining sufficient and sustained flows during spawning is a limiting factor for success.

A fish habitat assessment was completed during summer/fall 2016 to help further define fish habitat conditions and likelihood of species presence and use at the project site. Results indicate the species assemblage in the vicinity of the dam are mainly warmwater top predators and cyprinids.

There are spawning areas for Walleye in the vicinity of the Dam therefore, the cool restrictions specific to Walleye will be used for the project (March 15 -May 15). Since the footprint of the downstream coffer dam and the fact that aggregates are not being used there is minimal risk to the warm water species (As discussed in the OMNRF and agreed to by DFO letter of advice dated January 20, 2017).

Water Quality

As part of the fish habitat survey, water quality parameters were measured upstream on June 29, 2016 to assess water quality. Temperature was 23.2 °C, pH 6.3 and dissolved oxygen 7.3 mg/L. Turbidity in the system is normally low – measured as 1.2 NTU at the dam in summer. As reference, ideal water quality parameters are: pH 6.5-9.0 and dissolved oxygen >5m/L. For turbidity there is no guideline however <5 NTU would be considered clear water. Water quality in the Gull River is considered good and all parameters within ranges that support aquatic life.

Birds

Balsam Lake lies in the western portion of 10x10m UTM grid square 17PK74, used for the Atlas of the Breeding Birds of Ontario (<http://www.birdsontario.org/atlas/index.jsp>). The bird list for square 17PK74 contains 133 separate species. Because vegetation will be disturbed, however minor, there is potential to affect breeding birds. The nesting period may be as early as end of March to the end of August, depending on species. For forest birds, which have the greatest potential to be disturbed, the primary nesting period falls between May 24th and July 22nd. The earliest nesting for smaller species occurs on April 2nd and ends as late as August 30th. Large birds of prey (raptors and owls) would potentially begin nesting as early as January and February.

There are eight species that are listed federally or designated species at risk by COSEWIC which are highlighted below.

- | | | |
|--------------------|-----------------------------|-----------------------|
| Alder Flycatcher | Barn Swallow | Blue Jay |
| American Bittern | Barred Owl | Blue-headed Vireo |
| American Crow | Belted Kingfisher | Blue-winged Teal |
| American Goldfinch | Black-and-white Warbler | Bobolink |
| American Kestrel | Black-billed Cuckoo | Broad-winged Hawk |
| American Redstart | Blackburnian Warbler | Brown Creeper |
| American Robin | Black-capped Chickadee | Brown Thrasher |
| American Woodcock | Black-throated Blue Warbler | Brown-headed Cowbird |
| Baltimore Oriole | Black-throated Green | Canada Goose |
| Bank Swallow | Warbler | Canada Warbler |





Cedar Waxwing
Chestnut-sided Warbler
Chimney Swift
Chipping Sparrow
Clay-colored Sparrow
Cliff Swallow
Common Gallinule
Common Grackle
Common Loon
Common Nighthawk
Common Raven
Common Snipe
Common Yellowthroat
Cooper's Hawk
Downy Woodpecker
Eastern Bluebird
Eastern Kingbird
Eastern Meadowlark
Eastern Phoebe
Eastern Screech-Owl
Eastern Towhee
Eastern Wood-Pewee
European Starling
Field Sparrow
Golden-crowned Kinglet
Golden-winged Warbler
Gray Catbird
Gray Jay
Great Crested Flycatcher
Green Heron
Hairy Woodpecker
Hermit Thrush
Herring Gull
Hooded Merganser
House Finch
House Sparrow
House Wren
Indigo Bunting
Killdeer
Least Flycatcher
Loggerhead Shrike
Magnolia Warbler
Mallard
Marsh Wren
Merlin
Mourning Dove
Mourning Warbler

Nashville Warbler
Northern Cardinal
Northern Flicker
Northern Goshawk
Northern Harrier
Northern Mockingbird
Northern Rough-winged Swallow
Northern Saw-whet Owl
Northern Waterthrush
Osprey
Ovenbird
Philadelphia Vireo
Pied-billed Grebe
Pileated Woodpecker
Pine Siskin
Pine Warbler
Purple Finch
Purple Martin
Red-bellied Woodpecker
Red-breasted Nuthatch
Red-eyed Vireo
Red-headed Woodpecker
Red-shouldered Hawk
Red-tailed Hawk
Red-winged Blackbird
Ring-necked Pheasant
Rock Pigeon
Rose-breasted Grosbeak
Ruby-throated Hummingbird
Ruffed Grouse
Savannah Sparrow
Scarlet Tanager
Sharp-shinned Hawk
Song Sparrow
Sora
Spotted Sandpiper
Swainson's Thrush
Swamp Sparrow
Tree Swallow
Trumpeter Swan
Turkey Vulture
Upland Sandpiper
Veery
Vesper Sparrow
Virginia Rail
Warbling Vireo

Whip-poor-will
White-breasted Nuthatch
White-throated Sparrow
Wild Turkey
Willow Flycatcher
Winter Wren
Wood Duck
Wood Thrush
Yellow Warbler
Yellow-bellied Sapsucker
Yellow-rumped Warbler



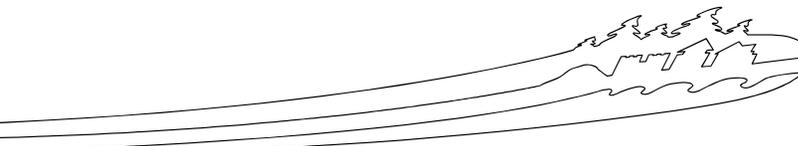


Reptiles and Amphibians

Balsam Lake lies in the grid square 17PK74. The *Ontario Reptile and Amphibian Atlas Program* lists 18 species and 100 records (1980-2015). (http://www.ontarionature.org/protect/species/herpetofaunal_atlas.php) Although Western Chorus Frog is listed there is no habitat in the vicinity of the project.

Table 1: Reptile and amphibian summary

Turtles	3 species and 17 records	Blandings Turtle (2), Midland Painted Turtle (5), snapping Turtle (10)
Snakes	6 species and 30 records	Milksnake (3), Eastern Hog-nosed Snake (1), Eastern Gartersnake (12), Eastern smooth green Snake (4) Northern Water Snake (5) Red-bellied Snake (5)
Lizard	No records	
Salamanders	5 species and 8 records	Eastern Red-backed Salamander (3) Blue Spotted Salamander (1) Blue Spotted/Jefferson hybrid (2) Norther Two-Lined Salamander(2), Eastern Newt (3)
Frogs and Toads	8 species and 22 records	American Bullfrog (2) American Toad (4) Gray Treefrog (2). Green Frog (2) Northern Leopard Frog (6) Spring Peeper (2), Western Chorus Frog (1 – 1968) Wood Frog (3)



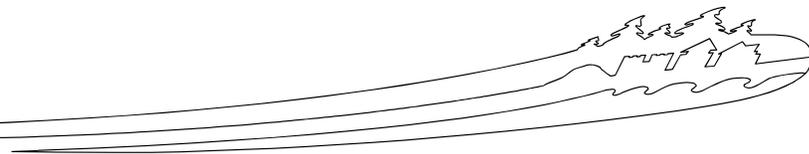


Species at risk

The following table summarizes the federally and provincially listed species in the Balsam Lake, Coboconk dam area:

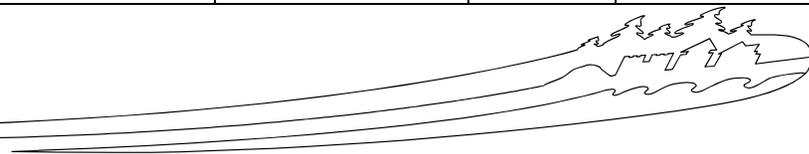
Table 2: ESA/SAR species list

Common Name	Scientific Name	SARA Status	ESA Status	Habitat Potential on Project Site	Preferred Habitat	Likelihood to be Found on Project Site
Birds						
Barn Swallow	<i>Hirundo rustica</i>	No Status	Threatened	Yes	Nest almost exclusively on man-made structures (bridges, culverts, barns); these swallows nest on dam structures with ledges under the deck.	No Records of barn swallow nesting in the dam
Bobolink	<i>Dolichonyx oryzivorus</i>	No Status	Threatened	Marginal	Bobolink nest in tall grass prairie and other open meadows, including hayfields.	Manicured lawn in the laydown area of the project – not likely
Canada Warbler	<i>Cardellina canadensis</i>	Threatened	Threatened	No	It is also found in riparian shrub forests on slopes and in ravines and in old-growth forests with canopy openings and a high density of shrubs, as well as in stands regenerating after natural disturbances, such as forest fires, or anthropogenic disturbances, such as logging.	No
Chimney Swift	<i>Chaetura pelagica</i>	Threatened	Threatened	No	The Chimney Swift spends the major part of the day in flight feeding on insects. Flocks can often be seen near bodies of water due to the abundance of insects. due	No



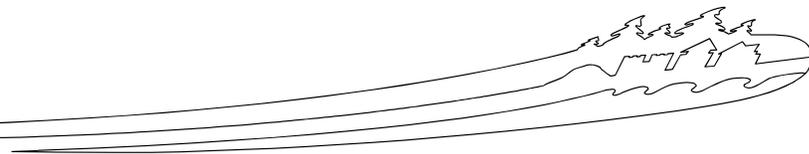


Common Name	Scientific Name	SARA Status	ESA Status	Habitat Potential on Project Site	Preferred Habitat	Likelihood to be Found on Project Site
					to the land clearing associated with colonization, hollow trees became increasingly rare, which led Chimney Swifts to move into house chimneys.	
Eastern Meadowlark	<i>Sturnella magna</i>	No Status	Threatened	No	Nest in moderately tall grasslands, such as pastures and hayfields, but also nest in alfalfa fields, weedy borders of croplands, roadsides, orchards, shrubby overgrown fields, or other open areas.	Manicured lawn in the laydown area of the project – not likely
Eastern Wood-pewee	<i>Contopus virens</i>	No Status	Special Concern	No	Eastern Wood-pewee is mostly associated with the mid-canopy layer of forest clearings and edges of deciduous and mixed forests. It is most abundant in forest stands of intermediate age and in mature stands with little understory vegetation.	No
Golden-winged Warbler ¹	<i>Vermivora chrysoptera</i>	Threatened	Special Concern	No	Regeneration areas (old fields, hydro right-of-ways) surrounded by mature forest	No
Whip-poor-will, <i>Caprimulgus vociferous</i>	Threatened (schedule status pending)	Threatened		No	Semi-open forests or patchy forests with clearings, such as barrens or forests that are regenerating following major disturbances, are preferred as nesting habitat. Areas with little ground cover are also preferred.	No
Wood Thrush	<i>Hylocichla mustelina</i>	Threatened	Special Concern	No	The wood thrush lives in mature deciduous and mixed (conifer-	No



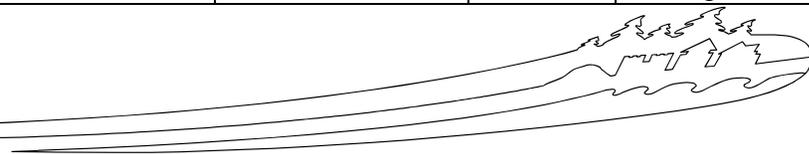


Common Name	Scientific Name	SARA Status	ESA Status	Habitat Potential on Project Site	Preferred Habitat	Likelihood to be Found on Project Site
					deciduous) forests. They seek moist stands of trees with well-developed undergrowth and tall trees for singing perches. These birds prefer large forests, but will also use smaller stands of trees. They build their nests in living saplings, trees or shrubs, usually in sugar maple or American beech.	
Reptiles and Amphibians						
Blanding's Turtle	<i>Emydoidea blandingii</i>	Threatened	Threatened	Yes - upstream	Blanding's Turtles can be found in several types of freshwater environment, including lakes, permanent or temporary pools, slow-flowing streams, marshes and swamps. They will travel long distances overland (>410m) for basking and nesting sites. Unlikely to hibernate in this location of the canal cut due to lack of sediments	Possible
Snapping Turtle	<i>Chelydra serpentina</i>	Special	Special Concern	Yes	Usually found in large bodies of water, but will sometimes inhabit small ponds. Rarely leave water except to nest and migrate to overwintering habitat.	Possible
Northern Map Turtle	<i>Graptemys geographica</i>	Special Concern	Special Concern	Yes - nesting	lakes and rivers; preference for slow moving currents, muddy bottoms, abundant aquatic	Possible



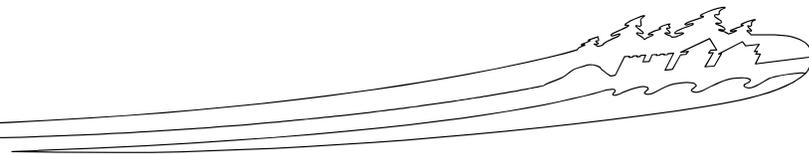


Common Name	Scientific Name	SARA Status	ESA Status	Habitat Potential on Project Site	Preferred Habitat	Likelihood to be Found on Project Site
					vegetation, suitable basking sites (such as rocks and logs)	
Western Chorus Frog	<i>Pseudacris triseriata</i>	Threatened	Not Listed	No	marshes or wooded wetland areas; it is found on the ground or in low shrubs and grass	No
Eastern Milksnake	<i>Lampropeltis triangulum triangulum</i>	Special Concern	Special Concern	Yes	Various habitats including rural areas that have suitable locations for basking and egg-laying -prairie, pastures and hayfields, rocky hillsides and a wide variety of forest types. Often in close proximity to water	Possible
Insects						
Rusty-patched Bumble Bee	<i>Bombus affinis</i>	Endangered	Endangered	Yes	generalist species that uses open habitats; it has been found in a variety of habitats, such as mixed farmland (cropping and livestock use), savannah, sand dunes, marshes, and urban and wooded areas	Possible
Monarch Butterfly	<i>Danaus plexippus</i>	Special Concern (COSEWIC Endangered)	Special Concern	Possible	Where milkweed and wildflowers (such as Goldenrod, asters and Purple Loosestrife) grow. Potentially present on Project site and field habitat.	Possible
15	Mammals					
Little Brown Myotis	<i>Myotis lucifugus</i>	Endangered	Endangered	No	Hibernate from October or November to March or April, most often in caves or abandoned mines that are humid and remain above freezing. In summer they forage at	Low – in area but not project site





Common Name	Scientific Name	SARA Status	ESA Status	Habitat Potential on Project Site	Preferred Habitat	Likelihood to be Found on Project Site
					night and roost in trees and buildings during the day.	
Northern Myotis	<i>Myotis septentrionalis</i>	Endangered	Endangered	No	Similar habitat preferences to Little Brown Myotis - they bats hibernate from October or November to March or April, most often in caves or abandoned mines. Northern Myotis often roost under loose bark or in tree cavities.	Low – in area but not project site
Tri-coloured Bat	<i>Perimyotis subflavus</i>	Endangered	Endangered	No	Often found hibernating in same locations as Little Brown Myotis and Northern Myotis – abandoned mines and caves. Relatively rare species in Canada.	Low – in area but not project site
Flora						
Butternut	<i>Juglans cinerea</i>	Endangered	Endangered	Yes	Rich, moist, and well- drained soils often found along streams. The property is within the range for this species but it has not been found within the project location.	unlikely – known occurrence is several hundred meters away
Critical Habitat						
Potential habitat						





Invasive Species

The following Table from EDDMaps summarizes the known invasive species in Balsam Lake and Balsam Lake Provincial Park:

Search:

ID	Subject	Location
4424226	banded mysterysnail- <i>Viviparus georgianus</i>	9/25/2015
3970613	dog-strangling vine, European swallowwort- <i>Vincetoxicum rossicum</i>	9/22/2014
4207564	<u>purple loosestrife</u> - <i>Lythrum salicaria</i>	7/26/2013

Soil & landforms

Borehole records in the area indicate sand and sand clay soils in the area. Erosion and sediment control should manage for both fine and coarse particles.

Flora

The area consists mainly isolated trees, and manicured lawn coniferous trees. There are very few trees that will be required to be removed and consist of Manitoba Maple and Weeping willow.

Cultural resources

The Coboconk dam is a cultural resource of other heritage value for its role in in-land water transportation, water management and the evolutionary development of the Trent-Severn Waterway.





The dam contributes to the working assemblage of engineering structures that make the TSW an operational system of through-navigation.

The engineering structures on the Trent-Severn Waterway that are cultural resources of other heritage value are valued for:

- their historic association with Canada’s national canal system, the evolutionary construction and operation of the Waterway and, aspects of local/community development;
- their design and/or functional qualities including the integrity of their original form, fabric and function and;
- their environmental qualities which include landmark status and the integrity of the historic character of the landscape.

Character-Defining Elements:

Key elements contributing to the heritage value of the Coboconk dam include:

- its in-situ location on the Trent-Severn Waterway
- its continued functional use
- its overall form, design and massing
- its manual mode of operation
- its contribution to the cultural landscape as a large, prominent landmark in community and a component of the working assemblage of engineering structures.

Archeology

An Archeology Overview Assessment was conducted internally in March of 2016 and the findings are summarized as follows:

No known archaeological assessments have been carried out within the Project Area by Parks Canada and there are no records to indicate previous archaeological work was done prior to Parks Canada acquiring the land. Archaeological assessments completed around Balsam Lake, however, have uncovered several pre- and postcontact Aboriginal sites, including ancestral Huron Wendat sites and a small indeterminate campsite of chipping debitage (Williamson 2014; Butler 2016: pers. comm).

The presence of First Nations sites is not surprising, given Coboconk is located at the confluence of Balsam Lake and Gull River, water bodies hosting an array of fish such as bass, walleye, crappie, perch, trout and muskie. Local chert sources include Balsam Lake chert and Gull River chert, used in the production of lithics (Eley and Von Bitter 1989; Fox 2010). Additionally, Coboconk is flanked by limestone ridges, a material used as net sinkers, and grinding stones, and later in the historical period as fertilizer and in buildings. During the 19th century, Coboconk was a thriving industrious area invested in the lumber trade and a small village developed. The

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attractive environmental context for habitation and industrious ventures, coupled with the proximity to major water sources with marine resources, indicate that Coboconk has potential for archaeological resources pertaining to both Aboriginal and historical occupations.

Underwater

A Non-Disturbance Underwater Archaeology Survey was conducted at the Coboconk Dam in June 2017. The areas above and below the existing dam at Coboconk were surveyed to identify and record any cultural resources that may be impacted as a result of a proposed dam rehabilitation project at the Coboconk Dam.

Given the potential for historically significant features or artifacts to be discovered and/or disturbed during construction excavations, visual inspection of the lakebed zone to be affected by the construction was required to determine the presence or absence of cultural resources.

No significant archaeological remains or artifacts were encountered during the visual survey of the area 20 m above and below the existing dam. Remnants of the 1940-1 rock filled timber crib cofferdam for the construction of the current dam were identified. These cribbing sections line up perfectly with mapped cofferdam sections from a 1940 plan.

Based on the results of this investigation it is recommended that:

1. No further archaeological study is required for the study property as delineated in Map 1.
2. Should construction impacts extend beyond the area assessed in this report, further archaeological assessment of those areas should precede any construction activity.

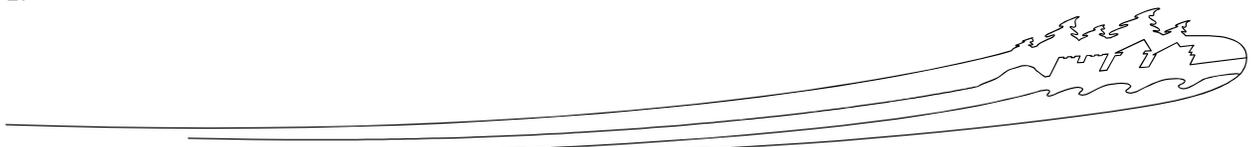
Human Health

The Trent Severn Waterway has a long history of industrial activities including mining, lumber, foundries, milling, manufacturing and commercial transport. Contaminants of potential concern (COPCs) associated with historical and current activities upstream of the Coboconk Dam include metals and inorganics, PHCs, polycyclic aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs).

These contaminants were assessed in the sediment at surface and depth in areas where construction activities are proposed. For sites which will undergo construction (new structure construction, demolition, repair, upgrade, and modification), determine if the construction activities will expose workers to contaminated sediments and if so, provide recommendations for risk management/remediation to minimize impacts to human health; and 2) determine the implications of sediment resuspension. Also impacts associated with redistribution downstream by construction activities and subsequent changes in hydrodynamic flow around new structures. The results of the investigation have been used to make recommendations for worker exposure to sediment and appropriate safety precautions during proposed construction activities, as well as for mitigation and control of sediment dispersion during construction. More information can be found in the following document: CANAL SEDIMENT INVESTIGATION REPORT – COBOCONK DAM AND TRENTON DAM #1 AND LOCK #1, 2017.

8. EFFECTS ANALYSIS

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Water/Fish

There is expected to be little to no effect on water resources due to the nature and scale of the project. In terms of project extent, it would be considered a “Low Risk” – a localized effect; a small portion of the ecological unit of Balsam Lake. Since the project is to be a repair, there will be little change to the existing footprint of the dams.

The dewatering methodology for each dam has been reduced to a very small footprint (a few square meters). The proposed dewatering methods for construction involve the installation of a dewatering gain immediately upstream and downstream of the dam which does not require a large footprint coffer dam. Only 3 bays of the existing dam can be reconstructed at one time to allow for flow capacity in the remaining bays, thereby eliminating the need for a bypass channel construction. The localized cofferdams will require, standard mitigation including turbidity control and fish relocation will be required as per the **Environmental Standards and Guidelines for Dewatering**. Fish are to be released downstream of the dam.

The areas immediately downstream of the dam that may be dewatered during construction have little habitat value as it is highly turbulent under normal operation. Fish removal will be conducted if required and fish placed in the downstream area.

The potential environmental effects of project activities on fish and fish habitat include interference with biological time periods (i.e., migration or spawning), the addition of suspended solids to the water column through erosion and sedimentation, temporary flow reduction and reduced oxygenation in the stream below the fixed-bridge, potential stranding of fish during dewatering and direct mortality of fish.

Erosion and sedimentation events may occur as a result of project activities, potentially increasing the amount of suspended solids in the water column. Such events can cause increased sediment loads potentially harming fish by altering foraging behavior and causing physical damage to gills and scales. Increased sediment loads can also smother benthic invertebrates (a primary food source for many fish species) and cover/infill coarse spawning habitat as silt settles.

Spills of fuels or hydraulic fluid from construction equipment could negatively impact surface water quality.

With the use of utility boats that come from other waterbodies, the transfer of invasive aquatic organisms and diseases were assessed.

Despite the potential effects of project activities, with the proper implementation of mitigation measures to protect against sedimentation, to protect against spills, transfer of invasive species and to ensure work does not occur during sensitive timing windows, it is not anticipated that there will be residual negative impacts to aquatic resources.

All in-water works will be conducted outside the timing restriction of March 15 – June 30 to mitigate impacts to the spawning and nursery periods for fish utilizing the river to Balsam Lake. However, if cofferdam methodologies are minimal as approved by DFO, work may proceed after Walleye fry have dispersed (approximately may 15). If larger footprint coffer dams are proposed, if accepted the March 15 to June 30 window will apply.

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Water quality will not be diminished throughout the project and mitigation identified in the PCA's Environmental Standards and Guidelines document will be implemented.

Birds

Migratory birds, their nests and eggs are protected under the Migratory Birds Convention Act (1994). Project works that are potentially disruptive activities to nesting birds, such as vegetation clearing, should be avoided during the nesting period.

Since the majority of the project area including staging areas are located on private land (exception of the dam) the impacts to existing trees and other flora will be minimized. A barge will be utilized to access the dam from the water, minimizing the need to move equipment through forested areas. Any Tree removal requirements will be done after August 27.

There is critical habitat for golden-winged warbler identified at the project area (Attachment 3). However, the project site is small, at the edge this identified zone and the October 2015 construction timing (fall/winter) will avoid negative impacts on this species, if it is still in the area. In addition the area does not meet the functional habitat requirements for this species.

Mitigation contained in the **Vegetation Removal ESG** will be followed to ensure impacts on Breeding birds is eliminated.

Removal of vegetation surrounding the two dams will result in direct loss of habitat for migratory birds; however, the habitat loss is short-term (vegetation will grow back quickly) and negligible when looking at the amount of vegetation within the entire study area. Construction activity/disturbance also has the potential to displace foraging birds from around the project site, but the displacement will be temporary in duration and will cover a very small footprint.

Species at Risk

As identified in Table 2, a number of species at risk have the potential to be present in the project area. For species that do not have critical habitat identified through a recovery strategy, either the planned works will not impact their habitat or individuals, or mitigation measures will be employed to protect individuals and their habitat.

Barn Swallow

Barn Swallows commonly nest on bridge and under dam decks. This species lays earlier than other Swallows; laying dates range from the 10th of May to the 21st of August in Ontario. Roosts start to build up in July, peak in early to mid-August and are negligible by September. Barn Swallows may use nests from previous years. Second broods are common in Ontario and usually occur in the same nest; Swallows will often repair and rebuild old or previously used nests. Although there is no evidence of Barn Swallow nesting under the dam in this project, general protection will be afforded by respecting the migratory bird nesting timing window of April 1st to August 27th. Work outside of this window will not impact nesting Barn Swallows. Should any nests be observed, do not disturb the nest and contact PCA for further direction.





Turtles

Blanding's Turtle and Snapping Turtle are spring nesters, laying eggs anywhere from May to late June-early July. They all may use sand and gravel banks along waterways, road shoulders, fissures in rocky shorelines and freshly dug gravel and soil. Eggs generally hatch between late August and late October. There is some potential for egg laying at the site. It is expected that soil excavation, stock piling of materials and other forms of landscape disturbance has the potential to attract turtles to the area for nesting. Therefore, project mitigations will consider all turtles, including at risk species. The timing of the construction (mid-summer and after the egg laying period) will necessitate a check prior to construction, for the possibility of nesting sites.

As this is a multi year project, temporary reptile exclusion fencing, may be required to be installed completely around gravel and soil stockpiles and other disturbed areas, in order to prevent turtle nesting in the project area. Should any suspected turtles nests or eggs be encountered during construction, project staging, implementation or demobilization, work would halt immediately and Parks Environmental Assessment Staff would be notified. Additional measures to avoid impacts may be required before work can restart.

If found in the project area, turtles may need to be relocated prior to commencing work. If turtle nests are uncovered during construction, work will stop and Parks Canada will be contacted for next steps. Monitoring of wildlife, including turtles, will occur with particular attention paid to Blandings observations around the construction site. With mitigations in place and with surveillance, the project is not expected to negatively impact the Blanding's Turtle.

Given the manicured, open nature of the area around the dam and lock, terrestrial habitat for turtles is limited.

Insects

Monarch Butterfly

Monarchs in Canada exist primarily wherever milkweed (*Asclepius*) and wildflowers (such as Goldenrod, asters, and Purple Loosestrife) exist. This includes abandoned farmland, along roadsides, and other open spaces where these plants grow. The eastern and western populations of the Monarch annually migrate south, beginning in August and continuing until mid-October. The butterflies actively seek nectar from wildflowers to increase their strength and build up a fat reserve that will maintain them throughout the winter and the early spring (when no nectar is available).

Milkweed and other wildflowers may exist throughout the project area however much of the impacted area is manicured lawn. There may be a temporary loss of available habitat, if present, but will be restored upon completion of the project. The area impacted is small and other suitable habitat is nearby.





Rusty Patch Bumble Bee

This species, like other bumble bees, can be found in open habitat such as mixed farmland, urban settings, savannah, open woods and sand dunes. The most recent sightings have been in oak savannah, which contains both woodland and grassland flora and fauna.

There have been no recent sightings in the area and are not likely to be found at the site. wildflowers may exist throughout the project area however much of the impacted area is manicured lawn. There may be a temporary loss of available habitat, if present, but will be restored upon completion of the project. The area impacted is small and other suitable habitat is nearby.

Little Brown Myotis/Northern Myotis/Tri-coloured Bat/Eastern Small-footed Bat

Within the study area, there are only a couple of trees providing potential roosting habitat for the three SAR bat species identified. If the trees are required to be removed for the project during the breeding bird/bat roosting season a professional will assess if there are nesting/roosting animals. If animals are present then the trees must remain until September. The amount of tree cutting is very small in relation to the amount of available trees in the area that can be utilized as roosting sites.

Critical Habitat- Blandings Turtle

The Species at Risk Act (SARA) provides protection to all species at risk listed under Schedule 1 of the Act. Under SARA, critical habitat is defined as “the habitat that is necessary for the survival or recovery of a listed wildlife species and that is identified as the species’ critical habitat in the recovery strategy or in an action plan for the species”. Section 41 (1)(c) of SARA requires that recovery strategies include an identification of the species’ critical habitat to the extent possible, as well as examples of activities that are likely to result in its destruction. As outlined in Table 1, the project area lies in zones of critical habitat identified in the recovery strategy of Blandings Turtle.

This species utilizes permanent and temporary pools, open or partially vegetated sites and areas that contain thick aquatic vegetation, slow-flowing streams, marshes and swamps. Overwintering sites are generally located within permanent wetlands (e.g., bogs, fens, marshes) and other habitats with unfrozen shallow water. None of these habitat features exist at the dam site. The habitat does not meet the biophysical attributes of critical habitat for Blanding’s turtle. Suitable basking sites are those where the turtle can remove itself from the water and gain access to direct sunlight. These areas do occur in the river margins, however suitable areas are prevalent up or downstream and away from the project site. Basking sites are not in short supply, overwintering habitat will not be impacted and there are only very small areas that could be considered nesting sites for the species, which will require exclusion fencing to restrict access. Suitable nesting sites are also prevalent, therefore while the habitat does meet the biophysical attributes for nesting and movement, there are no threats to this species recovery because of the project.

Conclusion

Activities undertaken in relation to the project shall be in compliance with the federal Species at Risk Act and the Ontario Endangered Species Act, S.O. 2007, c. 6. According to that legislation, if work can be conducted in a manner that avoids adverse effects on protected species and habitats, an authorization is





not required. Parks Canada intends to fully protect SAR species and project mitigation will result in no negative effects on these species.

Soil & landforms

The project site has sands, sand/clay soils over bedrock and rock. There may be increased soil exposure on the laydown areas and areas immediately adjacent to the dam and wing-walls where workers will be staging, resulting in potential for erosion and downslope watercourse sedimentation. Also machinery traffic on unpaved roads can lead to stability and potential erosion.

Placement of any dredged material from immediately upstream of the dam can cause unwanted sedimentation to adjacent areas including the lake and river downstream.

The laydown area is already an existing gravel roadway that will not be impacted from the machinery and materials. A new access road will be installed, which will have appropriate sediment controls applied. Considering the soil types potentially encountered erosion and sediment control will require measures to mitigate the movement of clay sized particles. With the implementation of effective Erosion and sediment controls, impacts to the aquatic environment can be kept to a minimum.

Terrestrial Vegetation

Project activities will require the removal of a small amount of terrestrial vegetation immediately surrounding the two dams. The vegetation removed may include a few common trees, shrubs, and grasses. This loss of vegetation will be short-term in nature, since the area will be re-vegetated with native species after construction, and the amount of vegetation lost is negligible when looking the whole study area.

There is also the risk of transporting invasive terrestrial organisms through equipment brought to the site. Mitigation measures to reduce this risk will be in place by following clean equipment protocol and sourcing appropriate materials.

Cultural resources

At the time of the BIA completion, the Cultural Resource Impact Assessment was not available for inclusion. Once the CRIA is complete, the BIA will be amended to include the valued components and affects analysis, including any required mitigation. The CRM advisor has provided preliminary input to the design of the project.

Archaeological Requirements

The following mitigation measures are required for the Project:

If the project design changes and/or if any activities are proposed to occur along the shoreline or grassed areas inland, a separate AOA will be required. Activities include excavation, vehicular access routes,

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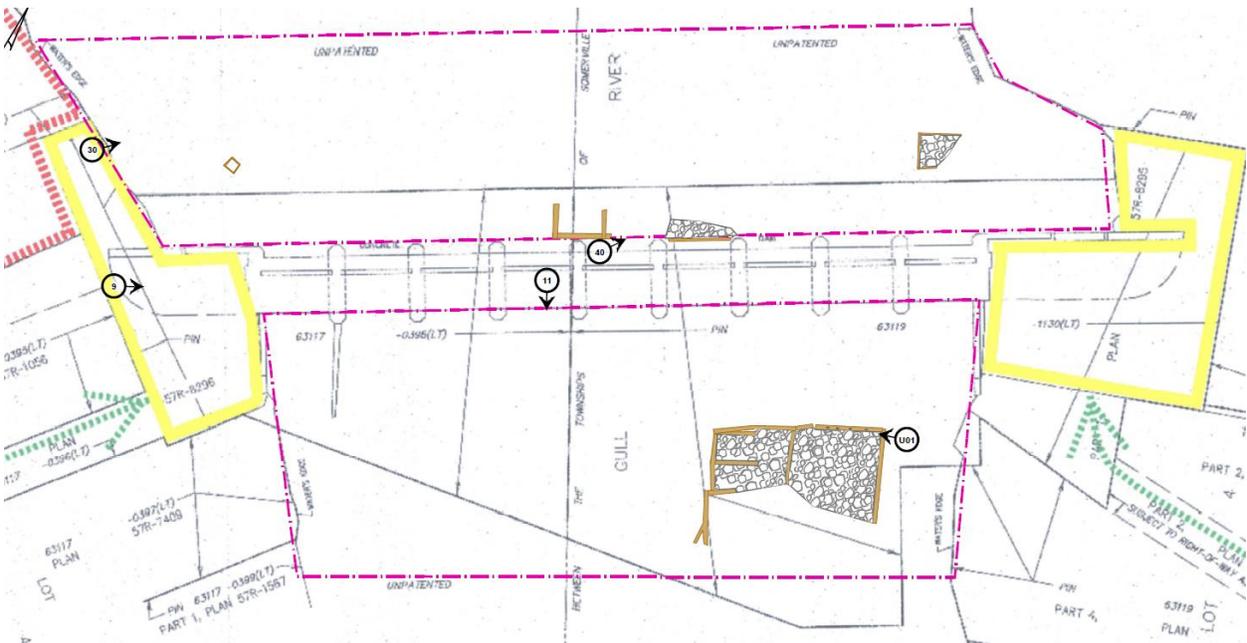
staging areas, landscaping, installation of signage and inadvertent water rerouting due to the cofferdam.

If significant features (i.e., structural remains and/or high artifact concentrations) are encountered, excavation should cease in the immediate area and the Parks Canada project manager be informed. The project manager should then contact Parks Canada's Terrestrial Archaeology section for advice and assessment of significance, which will in turn determine what will be required to mitigate the find.

Underwater

Based on the results of this investigation it is recommended that:

1. No further archaeological study is required for the study property as delineated in Map 1.

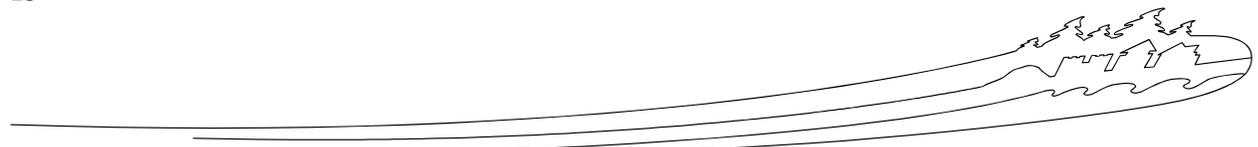


2. Should construction impacts extend beyond the area assessed in this report, further archaeological assessment of those areas should precede any construction activity.

Human Health

Sediments at the Coboconk Dam were assessed for potential contamination and the river bed conditions along the dam faces as well as up and downstream of the dams were found to be scoured and lacking fine sediment suitable for sampling. Some gravel, cobbles and boulders were observed in high flow sections of the river. Field staff modified sampling locations to the extent practical to find sufficient sediment for sampling. Lowest flow areas along river banks did yield some sediment and samples were collected from the proposed construction areas as well as in upstream and downstream reference locations. The following points summarize the field data:

- Sediment adjacent to the Coboconk Dam is impacted with PAH compounds and to lesser extent with metals, and PCBs in one location.
 - Sediment collected at reference locations upstream and downstream of the dam showed a comparable profile of PAH contaminants at similar concentrations.
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- The study area appears to have the same sediment quality as the rest of the river.

A preliminary assessment of risk to ecological and human health receptors found the following:

- There is no incremental increase in risk at the dam compared to the rest of the river.
- There is no unacceptable risk expected for construction workers exposed to sediments during dam works.
- There is no incremental increase in risk to receptors in the downstream environment.
- Should there be any requirement to excavate sediment from behind coffer dams, the material should be tested to ensure appropriate disposal.

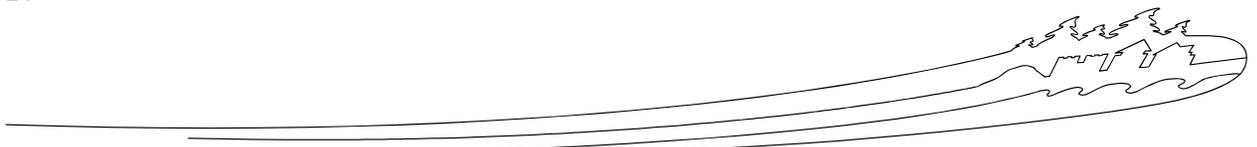
More information can be found in the following document: CANAL SEDIMENT INVESTIGATION REPORT – COBOCONK DAM AND TRENTON DAM #1 AND LOCK #1, 2017.

9. MITIGATION MEASURES

General

1. Inform the Departmental Representative and the PCA Environmental Authority (Environmental Assessment Officer), regarding any changes to project plans and/or scheduling. Any changes not assessed under this BIA will require approval from PCA and may require further mitigation measures.
2. Contractor is required to submit an Environmental Management Plan (EMP) to the Departmental Representative and Parks Canada that outlines all the measures to be implemented by the contractor on the project site to eliminate or reduce environmental effects and address mitigation measures outlined in this BIA. In order to allow for the timely commencement of project activities, the EMP can be submitted as separate components as project details become available. The EMP, or its components, will be submitted in writing prior to implementation of project activities and must be accepted by Parks Canada and the Departmental Representative.
3. It is recommended that an environmental professional(s) (EP) prepare the EMP or its component plans in accordance with PCA's Environmental Standards and Guidelines - Ontario Waterways (2017). The EMP will detail frequency of monitoring and list high-risk construction activities where an environmental professional must be onsite. Monitoring and testing should be adaptable to changing site conditions and will capture any event/incident for the length and scope of that event.
4. Parks Canada's Environmental Authority (EA), Trent-Severn Waterway will outline all the prescribed mitigation measures, including those found in BMPs, in a construction start-up meeting with the project manager and the contractor, to ensure that all on-site personnel are aware of these mitigation measures.
5. The contractor is to ensure that all on-site personnel are aware of, and comply with the prescribed mitigation measures within this BIA and any measures outlined within subsequent amendments to this BIA.
6. Should conditions at the work site indicate that there are unforeseen negative impacts to fish, wildlife, cultural or visitor experience resources, all works shall cease until the problem has been

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corrected and/or any required input can be obtained by Parks Canada or other relevant authorities. The Trent-Severn Waterway has the right to require that work be altered or ceased immediately.

7. As per the *Historic Canal Regulations* applicable to lands administered by the Trent-Severn Waterway National Historic Site of Canada, a permit signed by Parks Canada's Ontario Waterways Director will be required to authorize the project work prior to commencement of the project.

Spills Management

8. All materials and equipment used for the purpose of site preparation and project completion shall be operated and stored in a manner that prevents any deleterious substance (e.g. petroleum productions, debris etc.) from entering the water. Ensure measures are in place to minimize impacts of accidental spills.
9. Store all oils, lubricants, fuels and chemicals in secure areas on impermeable pads.
10. All machinery and equipment shall be clean, free of leaks, in optimal working condition.
11. Use well-maintained heavy equipment and machinery, preferably fitted with fully functional emission control systems/muffler/exhaust baffles, engine covers, etc.; machines shall not be left to unnecessarily idle in order to avoid emissions.
12. Vehicle and equipment re-fueling and/or maintenance shall be conducted off of slopes and away from the water at a recommended distance of 30 m if possible. If not possible this, fuelling sites will be as per Environmental Management Plan and mitigations to prevent substances from entering the water course applied.
13. A designated re-fueling depot will minimize the potential for extensive impacts at the site due to accidental releases of substances; proper spill management equipment shall be in place for fueling. Drip trays shall be placed under fuel-powered equipment.
14. Only the working part of a machine is to enter the water; any part of a machine or equipment entering the water shall be free of fluid leaks and externally degreased to prevent any deleterious substance from entering the water. Complete the in-water activity as quickly as possible to minimize the time equipment is in the water; do not leave equipment in water during breaks in work activity.
15. Only clean material free of fine particulate matter shall be placed in the water.
16. Spill control and emergency plans will be in place prior to initiation of construction. A spills kit will be maintained on site and the contractor will ensure that adequate additional resources are available. Spills shall be reported as soon as possible to the Parks Canada Project Manager. The Ontario Ministry of Environment and Climate Change Spills Action Center, (1-800-268-6060) shall be notified, if required.
17. In the event of a spill, remediation will be conducted immediately contain and clean up in accordance with federal regulatory requirements and to the satisfaction of Parks Canada. Documentation of remediation, testing and results will be provided to Parks Canada.
18. No tools, equipment, temporary structures or parts thereof, used or maintained for the purpose of this project, shall be permitted to remain at the site after completion of the project.

Vegetation

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19. Phase vegetation removal to reflect construction activity; grubbing should not be conducted too far ahead and too large an area to be properly mitigated with Erosion and Sediment controls.
20. All disturbed areas of the work site shall be stabilized immediately with erosion protection. All exposed areas should be covered with erosion control blankets or other measures such as mulch to keep the soil in place and prevent erosion until vegetated in the spring.
21. Trees, shrubs and vegetation which are to remain throughout construction should be properly identified and delineated and protected.
22. Where practical, the branches of the large trees should be trimmed back as the first option rather than cutting the entire tree.
23. Only cut trees using tools designed for tree cutting activities (e.g. chainsaw, brush saw).
24. Prune limbs close to the tree trunk. For a clean cut, make a shallow undercut first, then follow with the top cut. This prevents the limb from peeling bark off the tree as it falls. Do not use an axe for pruning.
25. In the event that the installation of root-protectant fencing is not possible and/or ideal, alternative measures, as approved by PCA, must then be implemented. Such measures must provide a sufficient amount of soil compaction prevention with regards to the highest level of activity to occur within the immediate area of protection.
26. Alternative methodology for soil-compaction prevention may be utilized (ex. blast mats), as reviewed and approved by PCA.
27. Clear vegetation from unstable or erodible banks by hand, and where possible, avoid the use of heavy machinery. Operate machinery on land and in a manner that minimizes disturbance to the banks of the water body.
28. Should any vegetation require chipping/mulching, the after product will be stored onsite for the duration of the project to supplement erosion and sediment control methods.
29. Native grasses, shrubs, etc. should be planted to match existing species growing on the sites. Common milkweed should be actively restored.
30. If there is insufficient time remaining in the growing season, the site should be stabilized (e.g., cover exposed areas with erosion control blankets to keep the soil in place and prevent erosion) and vegetated the following spring.
31. Cleared vegetation will be piled and extracted from a designated area, to be identified by PCA staff. Burning of cleared vegetation is not be permitted on site.

Invasive Species

32. Any equipment or vehicles which are to be used in water, should be thoroughly cleaned before and after use of any visible mud, vegetation, mussels, etc.:
 - Vessels/equipment should be drained of standing water.
 - Vessels/equipment should ideally be cleaned with hot water (>50 °C) at high pressure water (>250 psi).
 - Vessels/equipment should be dried for 2 – 7 days in sunlight before transported between waterbodies.

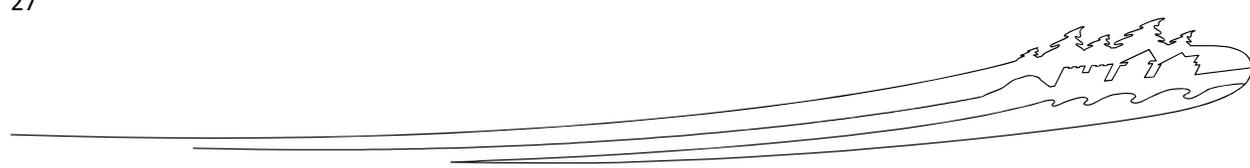




- Cleaning of vessels/equipment should be conducted away from waterbodies at a recommended distance of at least 30 m from the shoreline.
- 33.** Mud, dirt and vegetation should be cleaned from clothing and footwear prior to entering the work site, and prior to leaving the work site.
- 34.** Use weed-free seed and confirm that seed mix to be used for re-vegetation purposes does not (potentially) contain invasive plants.
- 35.** Seed purchased commercially should have a label that states the following:
 - Species;
 - Purity: Most seed should be no less than 75% pure and preferably over 85% pure. The rest is inert matter, or other seed;
 - Weed seed content: The tag should state NO invasive plants are present. Only certified weed-free seed should be used; and
 - Germination of desired seed: Germination generally should not be less than 50% for most species, although some shrubs and forbs will have lower percentages.
- 36.** Move only weed/contaminate-free materials into non-infested areas. Moving materials from one infested location to another within a particular zone may not cause contamination, but moving materials from infested to non-infested areas could lead to the introduction and spread of invasive plants.
- 37.** If removal of invasive species occurs, individuals will be disposed of appropriately, offsite to ensure no further propagation.
- 38.** Should an invasive species be encountered (or at least suspected), a photo and report of the specimen should be sent to Parks Canada's EA staff.

Wildlife

- 39.** Site clearing/commencement of construction should be planned to occur outside of sensitive nesting times - April 1 to August 31. If this is not feasible, then the site must be inspected by a biologist prior to clearing, to check for the presence of nests.
- 40.** The Site Specific EMP must demonstrate procedures for avoiding disturbance/harm to wildlife.
- 41.** If recommended by a qualified person and approved by PCA, exclusion zones or "no go" areas will be established to protect areas with known residences (e.g., hibernacula, dens, nests).
- 42.** If recommended by a qualified person and approved by PCA, conduct "Pre-stressing" activities within a few days prior to the onset of site preparation (vegetation clearing and grubbing) to encourage wildlife to move away from a site.
- 43.** On a daily basis, an inspection or "sweep" of the work area shall be performed prior to commencement of project works and activities to ensure wildlife are not present in the work area (include in site checklist).
- 44.** Field information regarding incidental encounters with wildlife (non-SAR wildlife) shall be compiled and reported on a daily basis.
- 45.** For incidental encounters, the following information should be recorded in the field:
 - a. Locations, dates and time of day where the species were encountered;
 - b. Names of species encountered;





- c. Photographs of the species, if taken;
 - d. Condition of animal.
46. If injured/dead wildlife are encountered report to PCA immediately. PCA may require retrieval and storage on ice of carcass for laboratory testing
 47. All vehicles and equipment used by project personnel will follow any construction zone speed limits to reduce the risk of hitting wildlife, as enforced by the site supervisor.
 48. Work areas will be kept clean and free of potential hazards to wildlife such as wire, cable, tubing, plastic, antifreeze or other materials that wildlife may eat or become entangled in.
 49. Waste will be stored, handled, and transported in accordance with the Waste Management Plan, including storage of all solid waste in sealed, bear-proof containers.
 50. Feeding of wildlife is prohibited.

Species at Risk

51. The EMP must detail procedures (e.g. exclusion fencing) for preventing turtle entry/nesting within disturbed project gravels/soils during all stages of project activity.
52. Species at risk training shall be provided to all employees before they begin work on site (materials can be part of the Environmental Protection Plan). Employees must be able to identify potential species at risk and know the proper procedures to follow when they encounter a species at risk. Special emphasis will be made on Blanding's Turtle sightings.
53. Should any suspected species at risk turtles and/or eggs be encountered during construction - project staging, implementation or demobilization - work would halt immediately and Parks Environmental Assessment Staff would be notified. The species must not be harmed or harassed. Stand back and allow the animal to leave the site. If the species does not leave or cannot leave the site, the contractor must immediately stop the works and contact the Departmental Representative and PCA's Environmental Assessment Officer (705-761-2390) immediately. Additional measures to avoid impacts may be required before work can restart.
54. Temporary reptile fencing, such as polythene/ woven geotextile secured with timber stakes, or material of a similar nature/function, should be installed completely around gravel stockpiles to prevent turtle nesting in the project area. For guidance on how to plan and install exclusion fencing, refer to the document titled "*Ontario Ministry of Natural Resources and Forestry. April 2016. Best Management Practices for Mitigating the Effects of Roads on Amphibians and Reptile Species at Risk in Ontario.*"
55. Synthetic plastic Erosion Control Blankets/Mats should not be utilized, particularly during nesting season, as they pose as an entrapment hazard to turtles. Fibre-based bio-degradable Erosion Control Blankets/Mats are only to be utilized.
56. If a turtle is found within the limits of the fencing it should be left alone to leave the area if possible, or the animal should be gently placed outside of the construction site. Typically, animals should be released not more than 250m from the capture site. Release sites should be near water with vegetation cover for shelter.
57. If milkweed has grown by project initiation, then as a precautionary measure, plants should be pulled and moved to non-affected areas where milkweed is growing, if there is the potential for Monarch butterfly larvae and eggs to be present on the affected plants.





- 58. If barn swallow nesting occurs after project start-up, Parks Canada shall be notified. Parks Canada will assess potential impact to the species; additional mitigation measures may be required.

Fish /Water Quality

- 59. All in-water work should be started after June 30th and completed before March 15th. Should in-water work be required beyond this date, additional mitigation measures may be required based on site specific characteristics. Work beyond March 15th must be approved by the Departmental Representative and PCA prior to work occurring, and may not be granted if conditions do not allow it. Inwater work covered by DFO letter of advice may commence after May 15, if workplan is accepted by PCA.
- 60. Canadian Council of Ministers of the Environment (CCME) Canadian Water Quality Guidelines for the Protection of Aquatic Life will form the baseline for water and streambed quality (see <http://cegg-rcqe.ccme.ca/en/index.html#void>).
- 61. Ontario Drinking Water Quality Guidelines cannot be exceeded (beyond parameters that currently exist) due to project activities.
- 62. Activities causing turbidity or release of sediment will comply with the CCME Guidelines on Total Particulate Matter (see <http://cegg-rcqe.ccme.ca/download/en/217>).
- 63. Dewatering, demolition and construction is staged such that clean is pumped back to the system and turbid water is managed through a waste water system.
- 64. All work should be completed in the dry. A de-watering Plan shall be submitted, as part of an EMP, to Parks Canada for review and acceptance prior to any dewatering.
- 65. Design and construct coffer dams to minimize sediment inputs to the water course; it is preferred that coffer dams not be composed of loose aggregate/granular material. If proposed must be accepted by PCA. Only clean material free of fine particulate matter shall be placed in or near water where it has been previously planned and authorized.
- 66. All debris on bed (including unused aggregate/concrete rubble) shall be completely removed and area restored to original state upon completion of work.
- 67. Sediment/turbidity curtains shall be deployed in a manner - e.g. moved in a direction from close to shore/structures outward - that prevent entrapment of fish inside the curtain.
- 68. Ensure that there is a fish screen that complies with DFO Freshwater Intake End-of-Pipe Fish Screen Guideline when pumping in fish-bearing water to prevent impingement or entrainment of fish.
- 69. Fish shall be removed from the work area prior to complete dewatering and released alive downstream into the river.
 - Parks Canada's shall be advised 24 hours prior to fish rescue.
 - Minimize the length of time fish are out of the water.
 - Use appropriate equipment to remove any stranded fish in the dewatered area. As water levels drop in the work area monitor the deeper pool areas where fish are congregating. If safe to do so, Seine nets or Dip nets can be operated by field staff to remove the fish.
 - Contact PCA EA staff should there be any issues with fish removal.





- Any fish found within the dewatered coffer dam areas will be documented by species, counted and removed and placed downstream if found in the downstream coffer dam and upstream if found upstream.
- Round gobies or other invasive species found during dewatering activities shall be euthanized and not returned to the water system; this shall be reported to Parks Canada.

Concrete

- 70.** Concrete leachate is alkaline and highly toxic to fish and aquatic life. Measures must be taken to prevent any incidence of concrete or concrete leachate from entering the watercourse. Maintain complete isolation of all cast-in-place concrete and grouting from fish-bearing waters for a minimum of 48 hours if ambient air temperature is above 0°C and for a minimum of 72 hours if ambient air temperature is below 0°C or until significantly cured to allow the pH to reach neutral levels.
- 71.** At the discharge point into the watercourse, pH will be maintained between 6.5 and 9.0. Water with pH > 9 cannot be released directly back into the watercourse, but must be treated prior to release. Water with a pH ≥ 12.5 is considered toxic and treated as a hazardous waste under Ontario Regulation 347 of the Environmental Protection Act and wastewater in this condition must be removed from the site.
- 72.** Ensure that all works involving the use of concrete will not deposit, directly or indirectly, sediments, debris, concrete, concrete fines, wash or contact water into or about any watercourse;
- 73.** Wash equipment away from water and provide containment facilities for the wash-down water from concrete delivery trucks, concrete pumping equipment, and other tools and equipment;
- 74.** In the event of a release of concrete or grout into a water course, Parks Canada and the Ontario Spill Action Centre (1-800-268-6060) shall be notified; remediation will be conducted immediately contain and clean up in accordance with provincial regulatory requirements AND to the satisfaction of Parks Canada; documentation of remediation, testing and results will be provided to Parks Canada.
- 75.** Additional Environmental Mitigation Measures For Placement of Tremie Concrete:
- Ensure concrete forms are tight and no flow is occurring.
 - Isolate area with curtain or impermeable material specified for concrete particulates; ensure fish exclusion is followed.
 - Isolated area should be the minimum size required to complete task.
 - For tremie pours or where water comes into contact with the forms, CO₂ system must be installed and operating along the entire length of the isolated area; the tank shall be used to release carbon dioxide gas into an affected area to neutralize pH levels. Ensure sufficiently sized tanks for the concrete volumes used amount of water to be treated.
 - Workers shall be trained in the use of the system.
 - Use of neutralizing acids is not permitted unless the system is designed and implemented by a qualified professional.
 - pH monitoring shall be conducted inside and outside the containment area.

Erosion and Sediment Control

- 76.** An Erosion and Sediment Control Plan, as part of the Environmental Management Plan, should be prepared by a qualified professional and submitted to the Departmental Representative and
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accepted by Parks Canada. The plan should focus on separating offsite and infiltrating water into the construction site from construction activities and sediment sources.

77. The document shall specify:

- A focus on erosion control primarily and sediment control secondary;
- Erosion and sediment controls will be tailored to the type of sediment found onsite (e.g. if clay is present, additional controls are necessary).
- The area to be controlled. In addition to the construction site, it is necessary to identify adjacent areas that could be negatively impacted by construction activities;
- Drainage areas and patterns based on pre-construction topography and construction design;
- How clean storm run-on will be diverted around the site and away from exposed areas;
- How sediment-laden run-off will be directed to detention or retention facilities on-site. Large drainage areas can produce a significant amount of run-off, resulting in a need for large detention or retention structures;
- Channels that are designed and constructed to the necessary design discharge;
- Temporary and permanent erosion control needs for all drainage channels;
- Consideration of project schedule in selecting, designing and laying out environmental controls;
- Consideration of seasonal requirements (for longer-term projects); select and design controls and practices for controlling erosion and sedimentation including shutdown periods.

78. The size of particles present in the sediment is a key consideration for selecting the appropriate sediment treatment option(s):

- If the sediment consists primarily of gravel or sand, which are relatively large particles, a single treatment using a more basic technology, such as a sediment trap or sediment bag, may be adequate.
- If the sediment consists of silt and/or clay or concrete fines, which are relatively small particles, the effluent will most likely need a more advanced technology, such as a filter press or chemical treatment with anionic flocculent and a filtration method.
- If the sediment consists of a large spectrum of particle sizes, the water may need primary treatment to remove larger particles, followed by secondary treatment to remove finer particles.

79. All erosion and sediment control measures shall be inspected daily to ensure they are functioning properly and are maintained and/or upgraded as required to prevent entry of sediment into the water.

80. If erosion and sediment control measures are not functioning properly, no further work shall occur until the sediment and/or erosion problem is addressed to the satisfaction of Parks Canada.

81. All disturbed areas of the work site shall be stabilized immediately and re-vegetated as soon as conditions allow. All exposed areas should be covered with erosion control blankets or other measures to keep the soil in place and prevent erosion until vegetated in the spring. Erosion and

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sediment control measures shall be left in place until all areas of the work site have been stabilized.

- 82.** Avoid activities that could lead to erosion during excessively wet weather conditions; monitor forecasts for heavy rainfall watches & warnings. Environmental protection measures shall be checked after each extreme weather event.
- 83.** Upon completion of the work all debris shall be completely removed and the area restored to its original state or better. Repair all damages to property due to project activities.
- 84.** Sediment control measures and exclusion fencing must be removed in a way that prevents the escape or re-suspension of sediments.
- 85.** A turbidity curtain (US Dot Type II) will be maintained in the water around all working areas during construction to contain and control the suspension of fines. Curtains should be as close to the work area as possible. If water levels/conditions do not permit the flotation of a turbidity curtain, other measures as approved will be implemented.
- 86.** Turbidity curtains should not be used as a settling area for dewatering activities. Supplementary sediment and erosion control measures should be installed prior to construction activities and should be added upon/reinforced as necessary.
- 87.** The contractor will provide a marine grade turbidity curtain across all areas where sediments can enter the watercourse. Turbidity curtains are to be anchored or weighted down along its length to form a continuous seal on the river bed with adequate flotation at water surface to prevent over spills of turbid water.
- 88.** Flow dissipaters and/or filter bags, or equivalent, shall be placed at water discharge points to prevent erosion and sediment release.
- 89.** Fine materials such as limestone-based aggregates, unwashed rocks or materials that have the possibility of being suspended or transported downstream should not be used.
- 90.** No acid-generating rock (containing sulphides) will be used.
- 91.** In the event of a significant silting or debris caused by construction activities, the contractor will take appropriate measures to contain and mitigate the problem including the installation of additional downstream turbidity curtains.

Cultural Resources and Archaeology

- 92.** Before any on-site mobilisation/construction work commences, PCA staff will clearly delineate any archaeologically sensitive areas and photo-document this activity for PCA records. These areas will be deemed no-go zones for staging, vehicular traffic and machinery
- 93.** Main vehicular access routes and staging areas will be restricted to roadways and parking lots. If this is not possible, the use of protective covering such as geotextile protective mats with a wood chip lift or granular “A” gravel is required. All protective covering must be removed following construction and the area restored to pre-construction state. Excavation is not permitted during installation or removal of protective covering.
- 94.** If archaeological, cultural resources, or character-defining elements (e.g. structural features or artifact concentrations) are encountered or damaged during construction activities , work will cease in the immediate area, the findings photographed, and the Parks Canada Project Manager informed; contact the TSW, Peterborough Office at 705-750-4900. The Project Manager should





then contact Parks Canada's Terrestrial Archaeology section for advice and assessment of significance, which will in turn determine what will be required to mitigate the find. Ensure that all exposed underwater cultural materials are kept submerged and/or wet while waiting for direction.

Air Quality and Noise

- 95. Minimize the noise levels from construction activities by using proper muffling devices, in addition to appropriate timing and location of these activities to reduce or minimize the effect of noise on nearby residents, recreational users, and wildlife.
- 96. Comply with any Municipality of Trent Hills Noise By-Law 2005-36.
- 97. The Departmental Representative or a Parks Canada Environmental Assessment Officer may stop a vehicle if they believe the vehicle is emitting excessive exhaust smoke or suspect that emission control equipment has been tampered with or removed.
- 98. Monitor and mitigate public complaints by keeping a record of complaints and addressing any issues raised by the public.
- 99. Use well-maintained heavy equipment and machinery, preferably fitted with fully functional emission control systems/muffler/exhaust baffles, engine covers, etc.; machines shall not be left to unnecessarily idle in order to avoid emissions.
- 100. Keep idling of construction equipment to a minimum.

Waste Disposal

- 101. Recyclable material and waste shall be removed from the site, in accordance with provincial and municipal regulations, to disposal facilities licensed to receive them.

Human Health

- 102. As identified in CANAL SEDIMENT INVESTIGATION REPORT – COBOCONK DAM AND TRENTON DAM #1 AND LOCK #1, 2017, the risks identified Coboconk do not appear to be significant. It is expected CANAL SEDIMENT INVESTIGATION REPORT – COBOCONK DAM AND TRENTON DAM #1 AND LOCK #1, 2017 that general health and safety measures undertaken for the construction project will be sufficient to mitigate risks to the construction workers. The following mitigation measures should be prepared and included as part of the specification for the infrastructure upgrades:

- Fencing and gates around construction zones should be employed to restrict access to the public.
- Health and Safety Plan for construction workers should be prepared which identify appropriate personal protective equipment (PPE) to minimize exposure to sediment. HASPs should consider both provincial (Ontario Occupational Health and Safety Act) and federal (Canada Labour Code) regulations and other departmental policies as appropriate.

Appropriate PPE should include:

- Gloves
- Boots
- Long sleeve shirts
- Long pants





- Decontamination procedures for staff, equipment and tools should be employed including but not limited to:
 - o Establishing a decontamination zone with containment and disposal of wash water
 - o Cleaning or disposal of PPE
 - o Removal of bulk sediment and washing of tools and equipment
 - o Containment and management of waste residues (see below)

- Sediment control measures similar to those described in:
 - Ontario MTO (2015) Environmental Guidelines for Erosion and Sediment Control During Construction and Highway Projects.
 - OPSS 805 (Nov 2015) Construction Specification for Temporary Erosion and Sediment Control Measures.
 - CCME CWQG for the Protection of Aquatic Life for water quality monitoring (eg Turbidity, suspended solids, etc).

- Residue Management and Waste Management Plan that conforms to applicable regulations for excess or residual sediment.
 - o Ontario Regulation 347 - Waste Management
 - o Soil management and stockpile sampling as described in CCME 2016 Guidance Manual for Environmental Site Characterization in Support of Environmental and Human Health Risk Assessment Volume 1 and Ontario Regulation 153/04 as amended.
 - o Leachate Testing (TCLP) of the dried stockpiled "soil"

9. PUBLIC/STAKEHOLDER ENGAGEMENT & ABORIGINAL CONSULTATION

- 9 a)** Indicate whether public/stakeholder engagement was undertaken in relation to potential adverse effects of the proposed project:
- No
- Yes (describe the process to involve relevant parties and indicate how comments were taken into consideration).

Communication activities

- 2015 & 2016 - Funding announcements, news release
- Fall 2016 - visit to individual property to inspect for shoreline and project impact old mill property immediately downstream on south/west side
- November 2016 - personal letters to residents on either side of easement access on north/east side of dam
- December 2016 - Community bulletin released to: media, municipal stakeholders, cottage association, interest groups, delivered door-to-door proximate to dam
- January 2018 - e-mail update to stakeholders





- Information on Parks Canada website
- Ongoing - Development of opt-in email list of individuals who would like push notifications about construction; personal communication with numerous residents local to the community

Public concerns regarding project throughout planning and construction include:

- a municipal event that is held from the dam - has now been cancelled twice because we have said construction would be overlapping.
- proximity and potential impact of construction to downstream south/west properties, and impact of redirected water flow on old mill property immediately downstream on south/west side
- impact on cottage rentals of nearby properties - project delay has now meant impact for two seasons, without moving forward with construction
- vibration damage of homes and impact on wells in the vicinity (not on municipal water source) - have indicated that there will be pre-condition well and home surveys
- impact of trucking and staging in a busy cottaging community and major highway
- concern from one landowner of downstream spawning

All concerns have been assessed and mitigation applied where appropriate.

9 b) Indicate whether Aboriginal consultation was undertaken in relation to potential adverse effects of the proposed project:

- No
- Yes (describe the process to involve relevant parties and how the results were taken into consideration).

On 3 April 2016, a letter was sent to the 7 Williams Treaties First Nations Chiefs advising them of the TSW Federal Infrastructure Projects and their status. To date, the Williams Treaties First Nations consultation officers have identified that consultation is not required as the proposed project activities do not appear to impact Aboriginal or Treaty Rights. However, the project scope was shared with community members to ensure all potential impacts have been assessed. Continued information, engagement and monitoring of project activities will occur to ensure the accuracy of proposed mitigation measures and to ensure that no impacts occur to the communities Aboriginal or Treaty Rights. Should such an impact arise, formal consultation to address the impact would be undertaken.

As part of the agreed to process, the community consultation representatives receive updates through the construction phase. As is Ontario Waterway practice, community consultation representatives have been and will be offered the opportunity for a site visit and will be accompanied by senior project staff should they make that request. In the event of an accident on site, contamination due to construction, or discovery of archaeological material, stop work order provisions in the contract will allow work to be temporarily halted around the impacted area and the community consultation representatives will be notified and if needed be invited to participate in any monitoring of the site.

10. SIGNIFICANCE OF RESIDUAL ADVERSE EFFECTS

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Given the nature and scope of with and with the proper implementation of mitigation measures, no significant adverse effects are anticipated. Residual effects are well understood, will be short-term in nature and are reversible. Appropriate mitigation will be employed.

11. SURVEILLANCE

- Surveillance is not required
- Surveillance is required (provide details such as the proposed schedule and the focus of inspections)

Surveillance and BMP monitoring will be conducted on all FII projects to ensure that environmental compliance is being maintained.

12. FOLLOW-UP MONITORING

Follow-up monitoring is:

- not required
- legally required (e.g. under the *Species at Risk Act* or *Fisheries Act*)
- required in accordance with the *Parks Canada Cultural Resource Management Policy*

13. SARA NOTIFICATION

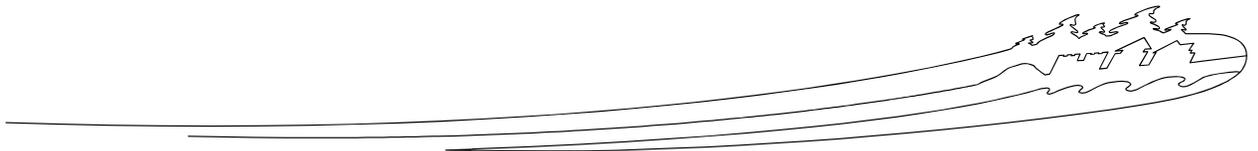
Notification is:

- not required
- required under the *Species at Risk Act* (outline the nature of and response to any notification).

14. EXPERTS CONSULTED

Include Parks Canada experts. Add as many entries as necessary for the project.

Department/Agency/Institution: OMNRF	Date of Request: 2016-08-15
Expert's Name & Contact Information: Colin Higgins	Title: Wildlife Biologist
Expertise Requested: Fisheries information and permit requirements	
Response: Telephone conversation regarding timing windows. Walleye spawning to dam in the town of Coboconk. This project should follow the cool water restrictions to protect the downstream walleye. No permit required. Spawning surveys provided.	
Department/Agency/Institution: Fisheries and Oceans Canada	Date of Request: May 19, 2016
Expert's Name & Contact Information: Richard Janusz	Senior biologist
DFO letter of advice received	





Department/Agency/Institution: Parks Canada,		Date of Request: March 22, 2016
Expert's Name & Contact Information: Natalie Desrosiers		Title: Federal Infrastructure CRM officer
Expertise Requested: CRM assessment of the Drag Lake Dams area		
Awaiting CRIA for the project. Will be incorporated into the BIA when available		
Department/Agency/Institution: Archeology	Date of Request: March 22, 2016	Date of Request: March 22, 2016
Expert's Name & Contact Information: Natalie Desrosiers/Filippo Ronca	Title: Officer	Date of Request: March 22, 2016
Expert's Name & Contact Information: Natalie Desrosiers	Federal Infrastructure CRM officer	
AOA and underwater archaeology reports provided	officer	





15. DECISION

Taking into account implementation of mitigation measures outlined in the analysis, the project is:

- not likely to cause significant adverse environmental effects.
- likely to cause significant adverse environmental effects.

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

16. RECOMMENDATION AND APPROVAL

(Add additional blocks as required)

Prepared by: EIA author (name & position): Christopher Strand, EA Officer	Date: 2018-05-31 
Recommended by: Functional manager of the project (name): Valerie Minelga	Date: 2018-05-28 
Approved by: Name & position: <i>(Field Unit Superintendent, Director of a Waterway)</i> : Jewel Cunningham	Date: June 4/18 
Signature: 	

17. ATTACHMENTS

Appendix A: Assessment Matrix

Appendix B: Photo documentation

Appendix C: Niblet Fisheries and habitat assessment

18. NATIONAL IMPACT ASSESSMENT TRACKING SYSTEM

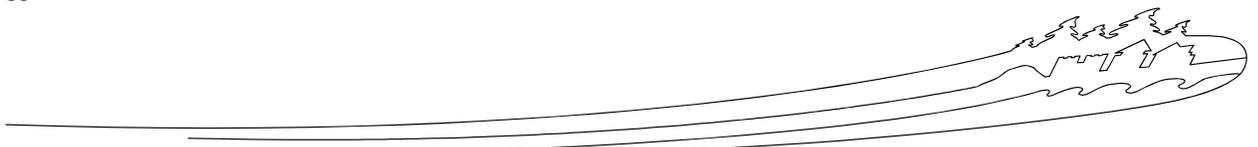
- Project registered in tracking system
- Not yet registered *(CEAA 2012 requires PCA submit a report to Parliament annually. EIAs must be entered in the tracking system by the end of April to enable reporting.*

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





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

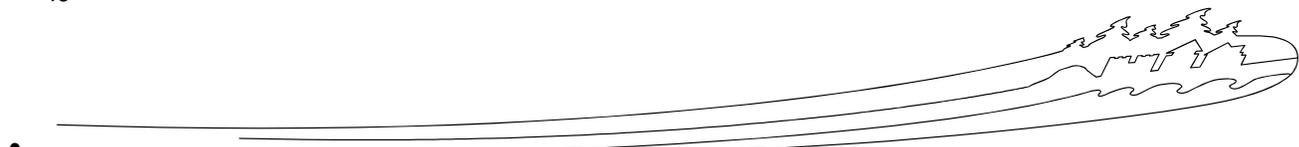




Appendix A: Environmental Impact Analysis Tools: Effects Identification Matrix

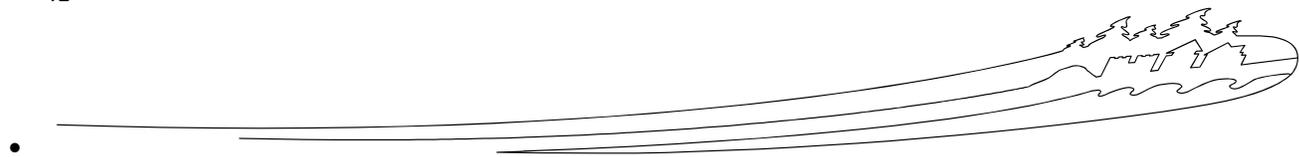
A. Direct Effects									
		Valued components potentially directly affected by the proposed project							
		Natural Resources					Cultural Resources		
		Air	Soil & landforms	Water (surface, ground, crossings, etc.)	Flora (specify, including SAR)	Fauna (specify, including SAR)	Insert heritage values	Insert heritage values	
Phase	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 checked="" type="checkbox"/>	<input type="checkbox"/>	<input 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 type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Demolition	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Disposal of waste	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input 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 type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Drainage	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Excavation	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Grading	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input 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 type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Transport of materials/ equipment	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Building of fire breaks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
		Use of Chemicals	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Set up of temporary facilities	<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"/>		
Other...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

A. Direct effects continued		
		Valued components potentially affected by the proposed project
		Natural Resources





		Air	Soil & landforms	Water (surface, ground, crossings, etc.)	Flora (specify, including SAR)	Fauna (specify, including SAR)	Insert heritage values	Insert heritage values
Phase	Examples of Associated Activities							
Project Components Preparation / Construction / Operation / Decommissioning	Waste disposal	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Wastewater disposal	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Maintenance	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Use	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Use/Removal of temporary facilities	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Use of Chemicals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Active fire stage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Prescribed burn cleanup	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Planting	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Culling	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Vehicle Traffic	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	Other...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>





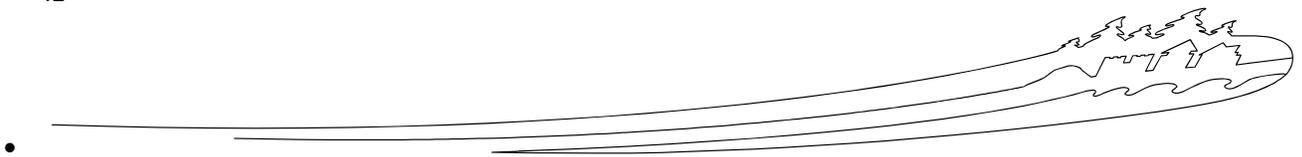
Appendix B: Photo Documentation



Photo 1 & 2: Photo showing right bank/shoreline upstream of Coboconk Dam, photo facing northeast (Photo Date: June 29th 2016).



Photo 3 & 4: Photo showing substrate along right bank/shoreline upstream of Coboconk Dam, photo facing northeast (Photo Date: June 29th 2016).



June 2015

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Photo 5 & 6: Photo showing left bank/shoreline upstream of Coboconk Dam, photo facing northwest (Photo Date: June 29th 2016).

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Photo 7 (left): Photo showing right bank/shoreline downstream of Coboconk Dam, photo facing southeast (Photo Date: June 29th 2016). Photo 8 (right): Photo showing right bank/shoreline downstream of Coboconk Dam, photo facing northwest (Photo Date: June 29th 2016).





Photo 9: Photo showing substrate along left bank/shoreline downstream of Coboconk Dam (Photo Date: June 29th 2016).





1. Gull River Watershed Fish Species List (upstream and downstream of dam) from OMNRF Minden & Bancroft, DFO and Carlton University Fish Sampling Records (Department of Fisheries and Oceans and Carlton University, 2010).

Fish Species Common (Scientific Name)	Spawning Habitat Preferences		General Habitat Preferences	Potential Fish Habitat within the Vicinity of the Dam	
	Time of Spawning	Spawning/Nesting Description		Habitat Potential on Site	Likelihood of Occurrence near the Site
Largemouth Bass (<i>Micropterus salmoides</i>)	May-June, water temperature 16.7-18.3°C.	Pit nest amongst macrophytes 0.6-0.91m in diameter in low velocity lake and stream habitats.	Shallow areas with macrophyte growth and soft mud, gravel, sand substrate amongst exposed macrophyte roots.	Habitat present for centrarchid sp. upstream and downstream of dam.	High likelihood of occurrence directly upstream of site due to suitable habitat. Potential spawning, nursery and feeding habitat downstream of dam.
Smallmouth Bass (<i>Micropterus dolomieu</i>)	May-June, water temperature 12.8°C-20.0°C.	Pit nest with a diameter twice the length of the male in low velocity lake and stream habitats.	Cool and clear mid-order streams >10.5 m wide with gravel and rock substrate.	Habitat present for centrarchid sp. upstream and downstream of dam	High likelihood of occurrence directly upstream of site due to suitable habitat. Potential spawning, nursery and feeding habitat downstream of dam.
Walleye (<i>Sander vitreus</i>)	Spring or early summer when water temperatures are between 5.6°C to 11.1°C.	Do not construct nests but rely on the interstitial space between substrate particles in lake and whitewater habitats to provide protection for developing eggs. Walleye require some form of water movement (e.g. current, wave action) to maintain dissolved oxygen levels suitable for egg development. Walleye do not provide any form of parental care for the eggs or fry post-spawn.	Below unpassable barriers in streams and lake shoals with sufficient wave action with rock, coarse gravel and boulder substrate.	Habitat present upstream and downstream of dam.	High likelihood of occurrence directly upstream and downstream of dam due to suitable habitat.
Mimic Shiner (<i>Notropis volucellus</i>)	June-August, water temperature data unknown.	Eggs are broadcast over aquatic vegetation at depths of 4-6m during the evening.	Lacustrine macrophyte littoral habitat.	Habitat absent both upstream and downstream of dam within the habitat assessment area.	Low likelihood of occurrence within the habitat assessment area due to the lack of suitable habitat upstream and downstream of dam.
White Sucker (<i>Catostomus commersonii</i>)	April-June, water temperature 10.0°C-20.0°C.	No nest, broadcasts eggs over gravel substrate in riffles and rapids.	Warm shallows of lakes and large lakes with water depths of 6-9m, pools and riffles of creeks.	Potential habitat upstream and downstream of dam.	Moderate likelihood for occurrence upstream and downstream of dam.
Lake Herring (<i>Coregonus artedii</i>)	November-December, water temperature 1°C-5°C.	Spawning occurs in small inland lakes, approximately 1-2m of water where there is no vegetation in or out of the water. The eggs are somewhat adhesive so they will stick to rocks, debris, etc. Spawning occurs during the night when water temperatures decline.	Shallow inland lakes with depths of 1-3m. Coldwater species preferred temperature range is 7°C -10°C.	Very little potential for habitat upstream and downstream of dam due water temperature (see site habitat description and surface water quality results).	Very little likelihood for occurrence within the site.



Coboconk Lake Dam

Muskellunge (<i>Esox masquinongy</i>)	May-June, water temperature 16.7°C - 18.3°C.	No nest constructed, eggs and milt are broadcasted over flooded areas in pools and lakes.	heavily vegetated flooded areas of shallow bays that are 0.3-0.5m deep.	Potential habitat upstream and downstream of dam along the shoreline/banks where vegetation is present.	Moderate likelihood for occurrence upstream and downstream of dam.
Pumpkinseed (<i>Lepomis gibbosus</i>)	May-August, water temperature 17°C -26°C.	Pit nest 0.10-0.40m in diameter are excavated by males in pools and lakes.	Shallow water (0.15-0.31m deep) of lakes, ponds or low velocity stream with substrate that consists of clay, sand, gravel and rock.	Habitat present upstream and downstream of dam.	High likelihood of occurrence directly upstream of site due to suitable habitat. Potential spawning, nursery and feeding habitat downstream of dam.
Bluegill (<i>Lepomis macrochirus</i>)	June-August, water temperature 19°C -26°C.	A shallow depression 0.05-0.15 m deep and 0.30 m in diameter is excavated by a male in pools and lakes	Shallow weedy bays of larger lakes, vegetated small lakes, ponds and pools of creeks and small to large rivers. Substrate typically consists of sand, gravel, cobble and silt.	Habitat present upstream and downstream of dam.	High likelihood of occurrence directly upstream of site due to suitable habitat. Potential spawning, nursery and feeding habitat downstream of dam.
Rock Bass (<i>Ambloplites rupestris</i>)	May-June, water temperature 15.6°C-21.1°C.	Male excavates shallow pit nest up to 0.6m in diameter in pools and lakes.	Vegetated or rocky shallows of lakes and pools of creeks and small to medium sized rivers.	Habitat present upstream and downstream of dam.	High likelihood of occurrence directly upstream of site due to suitable habitat. Potential spawning, nursery and feeding habitat downstream of dam.
Black Crappie (<i>Pomoxis nigromaculatus</i>)	May-June, water temperature 14°C-22°C.	Male excavates pit nest approximately 0.20-0.23 m in diameter. Eggs are deposited in depression, some may adhere to macrophytes in pools and lakes	Large clear ponds, small lakes, bays and shallow areas of larger lakes and areas of low velocity in large rivers. Substrate consists of abundant vegetation, mud or sand.	Habitat present upstream and downstream of dam.	High likelihood of occurrence directly upstream of site due to suitable habitat. Potential spawning, nursery and feeding habitat downstream of dam.
Golden Shiner (<i>Notemigonus crysoleucas</i>)	June-August, water temperature 20°C-27°C.	Spawning occurs in lacustrine habitats.	Clear large lakes with aquatic vegetation, ponds, reservoirs, and pools of rivers with substrate consisting of mud.	Habitat present upstream and downstream of dam.	High likelihood of occurrence directly upstream of site due to suitable habitat. Potential spawning, nursery and feeding habitat downstream of dam.
Spottail Shiner (<i>Notropis hudsonius</i>)	May-June, water temperature 15°C-22°C.	Spawning occurs in lacustrine and river habitats.	Lakes, river and streams with moderate velocity and sand, gravel silt or mud substrate.	Habitat present upstream and downstream of dam.	High likelihood of occurrence directly upstream of site due to suitable habitat. Potential spawning, nursery and feeding habitat downstream of dam.
Rainbow Smelt (<i>Osmerus mordax</i>)	March-May, water temperature 4.5°C -11°C	No nest constructed, eggs and milt are broadcast over substrate in rivers and lakes	Mesopelagic region of lakes. Coldwater species preferred temperature range is 7°C -16°C.	Very little potential for habitat upstream and downstream of dam due water temperature (see site habitat description and surface water quality results).	Very little likelihood for occurrence within the site.
Logperch (<i>Percina caprodes</i>)	May-June, water temperature 10°C -18°C	Spawning occurs in lacustrine and river habitats near shore/shoals in 0.10-0.2m of water in runs or riffles.	Sand, gravel and rocky beaches in lakes and creek and rivers with similar habitat.	Habitat present upstream and downstream of dam.	High likelihood of occurrence directly upstream and downstream of dam due to suitable habitat.

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Coboconk Lake Dam

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2.



Ministry of Transportation Section 4: Field Investigations
Environmental Guide for Fish and Fish Habitat Appendix 4.A: Watercourse Field Record Form

GENERAL INFORMATION									
PROJECT #: SP300-15-5862		PROJECT DESCRIPTION: Fish Habitat Assoc. most		DAY: 29	MONTH: June	YEAR: 2016			
Is STREAM REALIGNMENT required for this section: <input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Unknown									
COLLECTORS: A. Smith/S. Zuijers		WEATHER CONDITIONS: 15% cloud cover, SS2, w/precip, no precip		TIME STARTED: 7:00/10:15		TIME FINISHED: 9:25/10:46			
AIR TEMP: 19.5°C @ 9:23		WATER TEMP: 23.2°C @ 9:21		CONDUCTIVITY (µS/cm): 52.4 @ 9:21					
PHOTO NUMBERS AND DESCRIPTIONS: Start = 2670/2712 End = 2691/2783									
LOCATION									
NAME OF WATERBODY: Gull River		DRAINAGE SYSTEM: Gull Watershed		CROSSING #: n/a		STATION #: n/a			
LOCATION OF CROSSING: upstream of Cobocank Dam									
GPS COORDINATES: 674627.61E 4947483.26N				MTO CHAINAGE: n/a					
TOWNSHIP: Municipality City of Kawartha Lakes				MNR DISTRICT: Bancroft					
LAND USE AND POLLUTION									
SURROUNDING LAND USE: - cottages/houses, docks directly in the vicinity of dam. Dam off major highway. In town (bus stop), finishing pressure					SOURCES OF POLLUTION: - litter on site from cottages/houses/public boating (oil, fuel, etc.) - sandy/silt from road				
EXISTING STRUCTURE TYPE									
Bridge <input type="radio"/>		Box Culvert <input type="radio"/>		Open Foot Culvert <input type="radio"/>		CSP <input type="radio"/>		N/A <input type="radio"/>	
Other <input checked="" type="radio"/> Describe: Cobocank Dam						Size (w x h) m ² : n/a			
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER: n/a				SECTION LOCATION: (include on habitat map) u/s detailed					
TYPE:	Stream / river <input checked="" type="radio"/>	Channelized <input type="radio"/>	Permanent <input type="radio"/>	Intermittent <input type="radio"/>	Ephemeral <input type="radio"/>	ASSOCIATED WETLAND: n/a			
TOTAL SECTION LENGTH (m): 20				CURRENT VELOCITY (m/s): 0.56 (average)					
SUB-SECTION(S)	Run <input type="radio"/>	Pool <input type="radio"/>	Riffle <input type="radio"/>	Flats <input checked="" type="radio"/>	Inside culvert <input type="radio"/>	Other <input type="radio"/> Dam			
Percentage of area	n/a	n/a	n/a	95%	n/a	5%			
Mean depth wetted (m)				3-5		>5m			
Mean width wetted (m)				~87		76			
Mean bankfull width (m)				n/a		n/a			
Mean bankfull depth (m)				n/a		n/a			
Substrate				30.6% Gravel, 30% Co, 28% Silt		Concrete 100%			
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

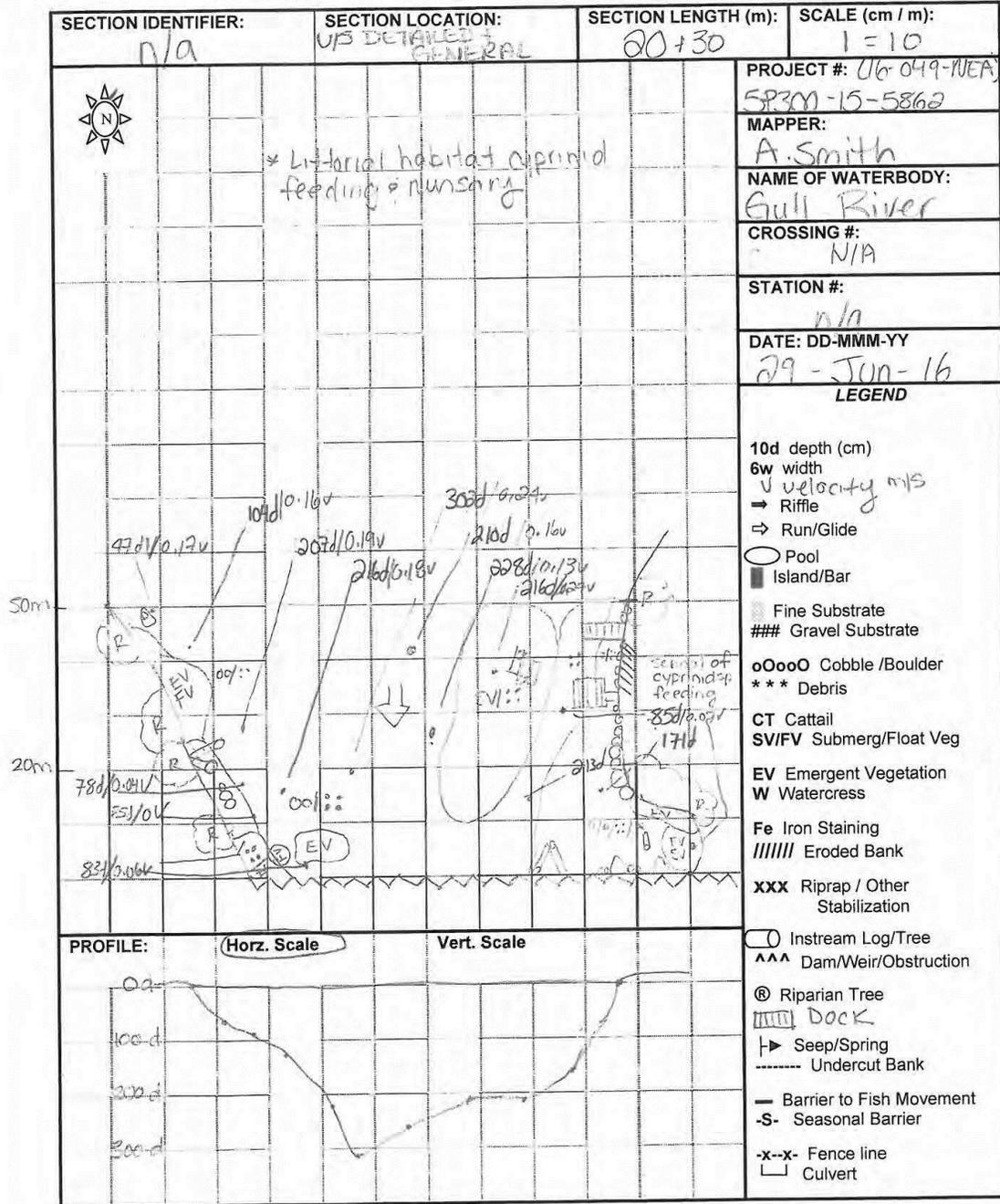
BANK STABILITY							
	Stable	Slightly Unstable	Moderately Unstable	Unstable			
Left Upstream Bank	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>			
Right Upstream Bank	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>			
HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Woody Debris	Organic debris	Vascular Macrophytes	None
	5%	5%	20%	Instream 5% Overhanging 2%	20%	Instream 5% Overhanging 0	
SHORE COVER (% stream shaded):	100 - 90 %	90 - 60%	60 - 30%	30 - 1%	None		
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>		
VEGETATION TYPE (%):	Submergent		Floating		Emergent		None
	5%		0		5%		
Predominant Species	Pondweed sp.				Fragmitis & white water lily		
MIGRATORY OBSTRUCTIONS:	None		Seasonal none observed white on site		Permanent Dam		
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning None identified by OMARF		Evidence of Groundwater none observed white on site		Other spawning potential for Centrarchid sp.		
POTENTIAL ENHANCEMENT OPPORTUNITIES:							
N/A							
COMMENTS:							
Water Quality (GPS # 734) ↳ taken from dam (NW side) - Water Depth (m) = 1 - Sample depth (m) = 0.5 - D.O (mg/L) = 7.3 - T.O.S (mg/L) = 78.1 - Salinity (ppt) = 0.0 • Left Bank/shoreline - cobble lined w sandy area closer to dam.				• Right bank/shoreline - cobble lined. Fragmitis stand ~ 2m u/s of dam - ~10-20m u/s of dam severe bank erosion (see photo) - fry sp. observed along right bank ~ 0.5m u/s of dam • Both right & left bank/shoreline populated w docks/boats			
Additional Notes Appended? <input checked="" type="radio"/> No <input type="radio"/> Yes number of pages <u>1 (front & back)</u>							

1.



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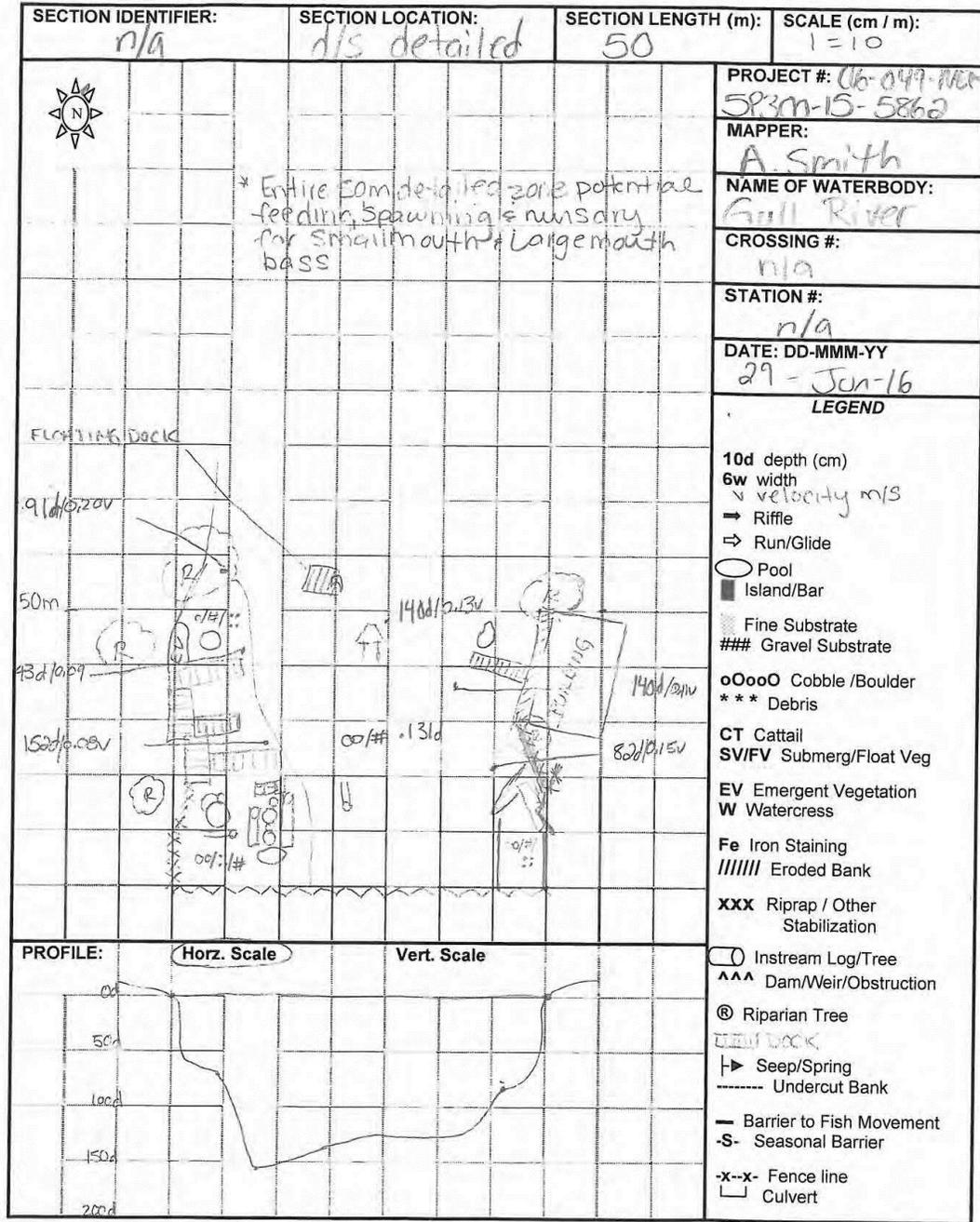


Ministry of Transportation
Environmental Guide for Fish and Fish Habitat

Section 4: Field Investigations
Appendix 4.A: Watercourse Field Record Form

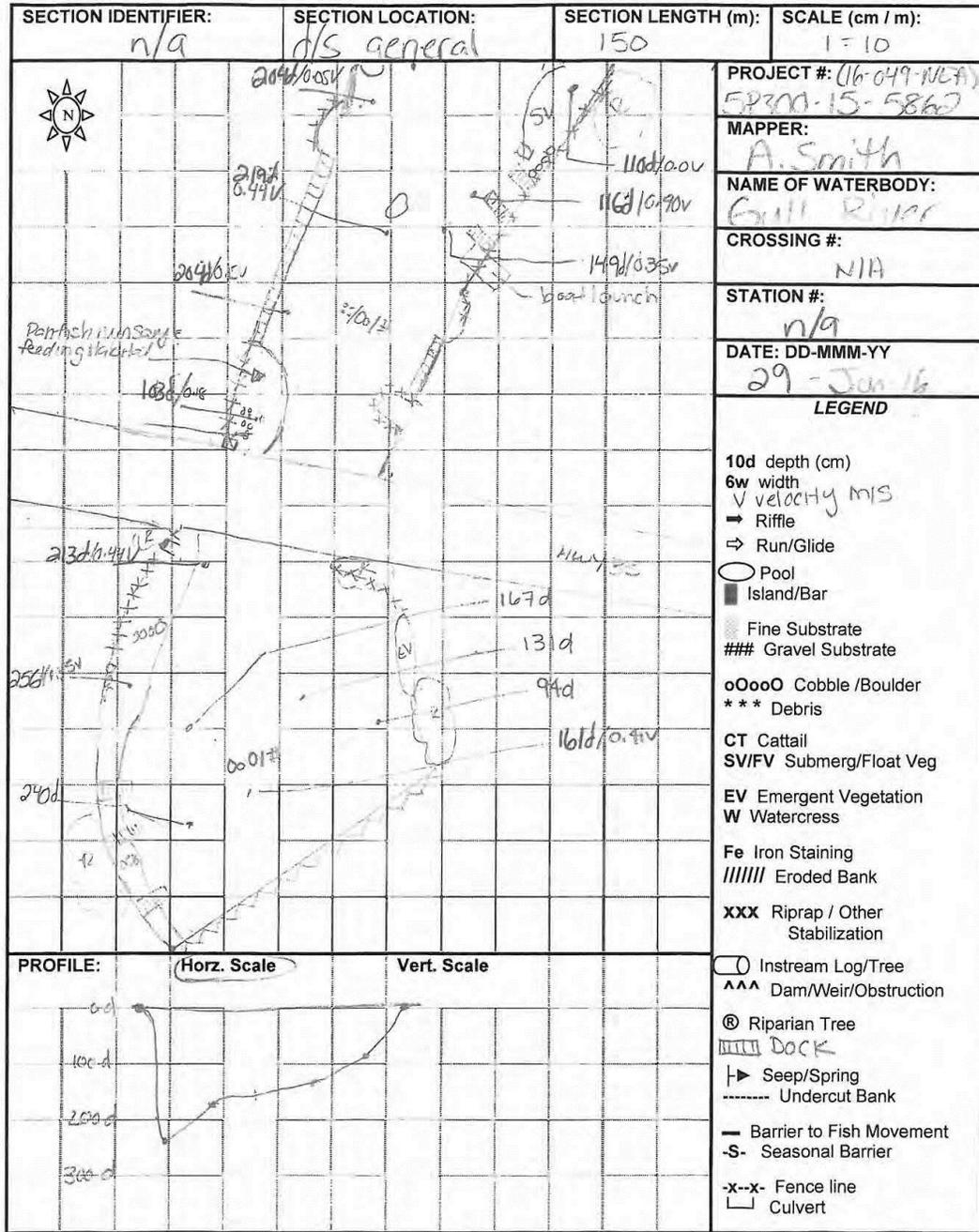
GENERAL INFORMATION									
PROJECT #: (16-099-NEA) SP3m-15-5862		PROJECT DESCRIPTION: Fish Habitat Assessment		DAY: 29	MONTH: June	YEAR: 2016			
Is STREAM REALIGNMENT required for this section: <input type="radio"/> Yes <input type="radio"/> No <input checked="" type="radio"/> Unknown									
COLLECTORS: A. Smith/S. Zuivert		WEATHER CONDITIONS: overcast, 50% precip		TIME STARTED: 9:26 / 10:50		TIME FINISHED: 10:00 / 11:20			
AIR TEMP: 20.5 °C @ 9:49		WATER TEMP: 23.1 °C @ 9:38		CONDUCTIVITY (µS/cm): 78.4 @ 9:38					
PHOTO NUMBERS AND DESCRIPTIONS: Start = 2682 / 2734 end: 2711 / 2765									
LOCATION									
NAME OF WATERBODY: Gull River		DRAINAGE SYSTEM: Gull Watershed		CROSSING #: n/a		STATION #: n/a			
LOCATION OF CROSSING: downstream of Colbrook Dam									
GPS COORDINATES: GPS 55 (w/ location)		674659.84 E 4947472.70 N		MTO CHAINAGE: n/a					
TOWNSHIP: Municipality City of Yellowknife		MNR DISTRICT: Boocraft							
LAND USE AND POLLUTION									
SURROUNDING LAND USE: cottages/houses, major highway, fishing pressure in town (businesses) indirect urban etc.					SOURCES OF POLLUTION: litter from houses/cottages in river, boating (oils, gas, etc) salt/sand from road				
EXISTING STRUCTURE TYPE									
Bridge <input type="radio"/>		Box Culvert <input type="radio"/>		Open Foot Culvert <input type="radio"/>		CSP <input type="radio"/>		N/A <input type="radio"/>	
Other <input checked="" type="radio"/> Describe: Colbrook Dam						Size (w x h) m ² : n/a			
SECTION TYPE AND MORPHOLOGY									
SECTION IDENTIFIER: n/a				SECTION LOCATION: (include on habitat map) d/s detailed					
TYPE:	Stream / river <input checked="" type="radio"/>	Channelized <input type="radio"/>	Permanent <input type="radio"/>	Intermittent <input type="radio"/>	Ephemeral <input type="radio"/>	ASSOCIATED WETLAND: n/a			
TOTAL SECTION LENGTH (m): 50				CURRENT VELOCITY (m/s): 0.12 (average)					
SUB-SECTION(S)	Run <input checked="" type="radio"/>	Pool <input type="radio"/>	Riffle <input type="radio"/>	Flats <input type="radio"/>	Inside culvert <input type="radio"/>	Other: Dam			
Percentage of area	5%	25%	n/a	65%	n/a	5%			
Mean depth wetted (m)	1-2	0.8		1.3		1-2			
Mean width wetted (m)	26	5		60		76			
Mean bankfull width (m)	n/a	n/a		n/a		n/a			
Mean bankfull depth (m)	n/a	n/a		n/a		n/a			
Substrate	Gr 10%, Gr20%, Co 40%, D 10%, Co 20%	Co 20%, Co 40%, 1% S%	Gr 20%, D 35%	Bo 20%, Sa 10%, Co 5%	Gr 20%, D 5%, Br 5%	concrete 100%			
Bedrock Br	Boulder Bo	Cobble Co	Gravel Gr	Sand Sa	Silt Si	Clay Cl	Muck Mu	Detritus D	

BANK STABILITY							
	Stable	Slightly Unstable	Moderately Unstable	Unstable			
Left Upstream Bank	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>			
Right Upstream Bank	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>			
HABITAT							
IN-STREAM COVER (% surface area):	Undercut banks	Boulders	Cobble	Woody Debris	Organic debris	Vascular Macrophytes	None
	2%	20%	0%	Instream 10% Overhanging 5%	15%	Instream Overhanging <input type="radio"/>	
SHORE COVER (% stream shaded):	100 - 90 %	90 - 60%	60 - 30%	30 - 1%	None		
	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>		
VEGETATION TYPE (%):	Submergent		Floating		Emergent		None
	<input checked="" type="radio"/>		<input checked="" type="radio"/>		<input checked="" type="radio"/>		<input type="radio"/>
Predominant Species							
MIGRATORY OBSTRUCTIONS:	None		Seasonal None observed while on site		Permanent Dam		
POTENTIAL CRITICAL HABITAT LIMITING:	Spawning none identified for OMRIF		Evidence of Groundwater none observed while on site		Other Potential for contact sp. wallop white sucker spawning		
POTENTIAL ENHANCEMENT OPPORTUNITIES:							
n/a							
COMMENTS:							
Water Quality (GPS # 735) - (at 1 km directly d/s of dam!) - Water depth (m) = 0.15 - Sample depth (m) = 0.15 - D.O (mg/L) = 7.0 - TDS (mg/L) = 53.0 - Salinity (ppt) = 0.0 - pH = 6.3 - Turbidity (at #4) = 0.67 NTU Both left & right banks adjacent docks - Dam very busy w/ public walking around - people fishing off docks.							
Additional Notes Appended? <input checked="" type="radio"/> No <input type="radio"/> Yes number of pages <u>1 (front & back)</u>							



Ministry of Transportation
Environmental Guide for Fish and Fish Habitat

Section 4: Field Investigations
Appendix 4.C: Fish Habitat Mapping



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Square	Species	Breeding Evidence			Atlasser Name
		Max BE	Categ	#Sq	
17PK74	Canada Goose	FY	CONF	1	Steven D. Price
17PK74	Trumpeter Swan	H	POSS	1	
17PK74	Wood Duck	FY	CONF	1	Louise Horne
17PK74	Mallard	FY	CONF	1	Steven D. Price
17PK74	Blue-winged Teal	FY	CONF	1	Louise Horne
17PK74	Hooded Merganser	NE	CONF	1	
17PK74	Ring-necked Pheasant	S	POSS	1	Donald A Sutherland
17PK74	Ruffed Grouse	NE	CONF	1	
17PK74	Wild Turkey	FY	CONF	1	
17PK74	Common Loon	NE	CONF	1	
17PK74	Pied-billed Grebe	T	PROB	1	Louise Horne
17PK74	American Bittern	H	POSS	1	
17PK74	Green Heron	P	PROB	1	Steven D. Price
17PK74	Turkey Vulture	T	PROB	1	
17PK74	Osprey	NY	CONF	1	Burke Korol
17PK74	Northern Harrier	FY	CONF	1	
17PK74	Sharp-shinned Hawk	CF	CONF	1	William J Crins
17PK74	Cooper's Hawk	H	POSS	1	
17PK74	Northern Goshawk	NY	CONF	1	
17PK74	Red-shouldered Hawk	FY	CONF	1	Louise Horne
17PK74	Broad-winged Hawk	NY	CONF	1	Louise Horne
17PK74	Red-tailed Hawk	FY	CONF	1	Louise Horne
17PK74	American Kestrel	CF	CONF	1	
17PK74	Merlin	H	POSS	1	
17PK74	Virginia Rail	P	PROB	1	Steven D. Price
17PK74	Sora	T	PROB	1	
17PK74	Common Gallinule	A	PROB	1	
17PK74	Killdeer	NE	CONF	1	
17PK74	Rock Pigeon	FY	CONF	1	
17PK74	Spotted Sandpiper	P	PROB	1	
17PK74	Upland Sandpiper	FY	CONF	1	Louise Horne
17PK74	Common Snipe	T	PROB	1	Louise Horne
17PK74	American Woodcock	T	PROB	1	
17PK74	Herring Gull	H	POSS	1	

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17PK74	Mourning Dove	FY	CONF	1	
17PK74	Black-billed Cuckoo	NE	CONF	1	
17PK74	Eastern Screech-Owl	S	POSS	1	
17PK74	Barred Owl	S	POSS	1	
17PK74	Northern Saw-whet Owl	S	POSS	1	
17PK74	Common Nighthawk	NY	CONF	1	
17PK74	Whip-poor-will	T	PROB	1	
17PK74	Chimney Swift	H	POSS	1	
17PK74	Ruby-throated Hummingbird	FY	CONF	1	
17PK74	Belted Kingfisher	CF	CONF	1	
17PK74	Red-headed Woodpecker	H	POSS	1	
17PK74	Red-bellied Woodpecker	FY	CONF	1	Louise Horne
17PK74	Yellow-bellied Sapsucker	CF	CONF	1	
17PK74	Downy Woodpecker	FY	CONF	1	William J Crins
17PK74	Hairy Woodpecker	FY	CONF	1	William J Crins
17PK74	Northern Flicker	FY	CONF	1	
17PK74	Pileated Woodpecker	NY	CONF	1	
17PK74	Eastern Wood-Pewee	T	PROB	1	Steven D. Price
17PK74	Alder Flycatcher	T	PROB	1	Steven D. Price
17PK74	Willow Flycatcher	S	POSS	1	
17PK74	Least Flycatcher	AE	CONF	1	
17PK74	Eastern Phoebe	NY	CONF	1	
17PK74	Great Crested Flycatcher	FY	CONF	1	
17PK74	Eastern Kingbird	NY	CONF	1	
17PK74	Loggerhead Shrike	FY	CONF	1	
17PK74	Blue-headed Vireo	S	POSS	1	Louise Horne
17PK74	Warbling Vireo	FY	CONF	1	
17PK74	Philadelphia Vireo	H	POSS	1	
17PK74	Red-eyed Vireo	FY	CONF	1	
17PK74	Gray Jay	T	PROB	1	
17PK74	Blue Jay	FY	CONF	1	William J Crins
17PK74	American Crow	FY	CONF	1	
17PK74	Common Raven	NY	CONF	1	
17PK74	Purple Martin	NY	CONF	1	
17PK74	Tree Swallow	NY	CONF	1	
17PK74	Northern Rough-winged Swallow	CF	CONF	1	
17PK74	Bank Swallow	CF	CONF	1	
17PK74	Cliff Swallow	NY	CONF	1	

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17PK74	Barn Swallow	FY	CONF	1	William J Crins
17PK74	Black-capped Chickadee	AE	CONF	1	Steven D. Price
17PK74	Red-breasted Nuthatch	FY	CONF	1	William J Crins
17PK74	White-breasted Nuthatch	FY	CONF	1	
17PK74	Brown Creeper	FY	CONF	1	Louise Horne
17PK74	House Wren	NY	CONF	1	
17PK74	Winter Wren	A	PROB	1	
17PK74	Marsh Wren	A	PROB	1	Louise Horne
17PK74	Golden-crowned Kinglet	T	PROB	1	Steven D. Price
17PK74	Eastern Bluebird	NY	CONF	1	
17PK74	Veery	T	PROB	1	Steven D. Price
17PK74	Swainson's Thrush	T	PROB	1	
17PK74	Hermit Thrush	T	PROB	1	Steven D. Price
17PK74	Wood Thrush	NE	CONF	1	
17PK74	American Robin	NY	CONF	1	
17PK74	Gray Catbird	FY	CONF	1	
17PK74	Northern Mockingbird	S	POSS	1	Louise Horne
17PK74	Brown Thrasher	NY	CONF	1	Louise Horne
17PK74	European Starling	CF	CONF	1	
17PK74	Cedar Waxwing	CF	CONF	1	
17PK74	Golden-winged Warbler	CF	CONF	1	Louise Horne
17PK74	Nashville Warbler	CF	CONF	1	William J Crins
17PK74	Yellow Warbler	CF	CONF	1	
17PK74	Chestnut-sided Warbler	FY	CONF	1	
17PK74	Magnolia Warbler	T	PROB	1	Louise Horne
17PK74	Black-throated Blue Warbler	T	PROB	1	
17PK74	Yellow-rumped Warbler	FY	CONF	1	
17PK74	Black-throated Green Warbler	FY	CONF	1	Louise Horne
17PK74	Blackburnian Warbler	T	PROB	1	Louise Horne
17PK74	Pine Warbler	T	PROB	1	
17PK74	Black-and-white Warbler	A	PROB	1	Steven D. Price
17PK74	American Redstart	AE	CONF	1	
17PK74	Ovenbird	D	PROB	1	
17PK74	Northern Waterthrush	T	PROB	1	Steven D. Price
17PK74	Mourning Warbler	T	PROB	1	
17PK74	Common Yellowthroat	FY	CONF	1	
17PK74	Canada Warbler	A	PROB	1	

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17PK74	Eastern Towhee	FY	CONF	1	
17PK74	Chipping Sparrow	AE	CONF	1	
17PK74	Clay-colored Sparrow	D	PROB	1	
17PK74	Field Sparrow	CF	CONF	1	
17PK74	Vesper Sparrow	NE	CONF	1	
17PK74	Savannah Sparrow	CF	CONF	1	
17PK74	Song Sparrow	CF	CONF	1	
17PK74	Swamp Sparrow	A	PROB	1	
17PK74	White-throated Sparrow	A	PROB	1	
17PK74	Scarlet Tanager	FY	CONF	1	
17PK74	Northern Cardinal	AE	CONF	1	
17PK74	Rose-breasted Grosbeak	FY	CONF	1	Donald Cuddy
17PK74	Indigo Bunting	FY	CONF	1	
17PK74	Bobolink	FY	CONF	1	
17PK74	Red-winged Blackbird	CF	CONF	1	William J Crins
17PK74	Eastern Meadowlark	FY	CONF	1	William J Crins
17PK74	Common Grackle	NY	CONF	1	
17PK74	Brown-headed Cowbird	FY	CONF	1	2 atlassers
17PK74	Baltimore Oriole	CF	CONF	1	
17PK74	Purple Finch	FY	CONF	1	
17PK74	House Finch	NE	CONF	1	Louise Horne
17PK74	Pine Siskin	FY	CONF	1	
17PK74	American Goldfinch	FY	CONF	1	
17PK74	House Sparrow	AE	CONF	1	

Herp Atlas summary for Coboconk Dam (17PK74))

Observation Id	Common Name	Number of Individuals	Year of Observation	Month of Observation	Calendar Day of Observation
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194394	American Bullfrog	1	1991	6	17
192006	American Bullfrog	1	1985	0	0
190635	American Toad	36	2012	7	13
193790	American Toad	1	1994	4	24
194275	American Toad	1	1993	8	21
192002	American Toad	1	1985	0	0
352368	Blanding's Turtle	1	2012	6	9
194593	Blanding's Turtle	1	1990	7	2
190890	Blue-spotted Salamander	1	2014	7	28
192654	Blue-spotted Salamander	1	1986	4	25
194089	Blue-spotted Salamander	1	1986	4	26
190636	Eastern Gartersnake	1	2012	7	13
193626	Eastern Gartersnake	1	2012	9	1
194184	Eastern Gartersnake	1	2010	7	28
194276	Eastern Gartersnake	1	1993	7	25
194391	Eastern Gartersnake	1	1991	6	2
194392	Eastern Gartersnake	1	1991	6	17
192005	Eastern Gartersnake	1	1985	0	0
192655	Eastern Gartersnake	1	1970	11	8
192053	Eastern Gartersnake	1	1968	4	20
192643	Eastern Gartersnake	1	1968	4	20
192652	Eastern Gartersnake	1	1933	0	0
192648	Eastern Gartersnake	1	1932	7	0
192651	Eastern Gartersnake	1	1931	9	27
193417	Eastern Hog-nosed Snake	1	1990	9	2
192009	Eastern Newt	1	1993	0	0
194090	Eastern Newt	1	1986	4	26
194103	Eastern Newt	1	1968	4	20
191165	Gray Treefrog	1	1988	6	25
194092	Gray Treefrog	1	1988	5	20
194389	Green Frog	1	1991	8	31
190892	Green Frog	1	1984	7	28
194432	Jefferson/Blue-spotted Salamander Complex	1	1988	8	7
194088	Jefferson/Blue-spotted Salamander Hybrid	1	1986	4	26
193812	Midland Painted Turtle	1	2012	7	30
194594	Midland Painted Turtle	1	1990	7	2
194431	Midland Painted Turtle	1	1988	8	7
192003	Midland Painted Turtle	1	1985	0	0
192653	Midland Painted Turtle	1	1978	0	0
193833	Milksnake	1	2012	5	24
194279	Milksnake	1	1993	8	7

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192007	Milksnake	1	1984	0	0
193627	Northern Leopard Frog	1	2012	9	1
194388	Northern Leopard Frog	1	1991	6	17
194384	Northern Leopard Frog	1	1990	6	21
194087	Northern Leopard Frog	1	1986	4	26
192004	Northern Leopard Frog	1	1985	0	0
192661	Northern Leopard Frog	1	1984	4	16
	Northern Two-lined Salamander				
192642	Northern Two-lined Salamander	1	1933	7	17
	Northern Two-lined Salamander				
192638	Northern Two-lined Salamander	1	1932	7	17
194280	Northern Watersnake	1	1993	8	21
193791	Northern Watersnake	1	1991	5	28
194390	Northern Watersnake	1	1991	6	17
192054	Northern Watersnake	1	1968	4	20
192644	Northern Watersnake	1	1968	5	20
194393	Red-bellied Snake	1	1991	8	31
194385	Red-bellied Snake	1	1990	8	7
192649	Red-bellied Snake	1	1932	7	17
192650	Red-bellied Snake	1	1931	4	29
192647	Red-bellied Snake	1	1909	5	22
194433	Smooth Greensnake	1	1988	7	31
192008	Smooth Greensnake	1	1984	0	0
192656	Smooth Greensnake	1	1933	7	0
192640	Smooth Greensnake	1	1932	7	0
358617	Snapping Turtle	1	2016	4	23
190826	Snapping Turtle	1	2013	5	20
352354	Snapping Turtle	1	2013	5	7
352355	Snapping Turtle	1	2012	5	14
352376	Snapping Turtle	1	2012	5	19
352371	Snapping Turtle	1	2011	6	26
352457	Snapping Turtle	1	2011	6	24
194185	Snapping Turtle	1	2010	6	12
192135	Snapping Turtle	1	1994	6	15
190893	Snapping Turtle	1	1993	6	22
194595	Snapping Turtle	1	1990	7	2
194278	Spotted Salamander	1	1993	8	20
193789	Spring Peeper	1	1994	4	24
194091	Spring Peeper	1	1988	5	20
192055	Western Chorus Frog	1	1968	4	20
190939	Wood Frog	1	2010	6	10
194277	Wood Frog	1	1993	8	21
192001	Wood Frog	1	1985	0	0

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APPENDIX B
GEOTECHNICAL REPORT (2012)



TECHNICAL MEMORANDUM

Date: June 5, 2012
To: Shawn Fillion, P.Eng. - PWGSC
Copies: Harvey Walsh, P.Eng. - GENIVAR
From: Steve Ash, P.Eng.
Project No.: 111-26271-00
Subject: Concrete Coring Results – Coboconk Dam – DRAFT No. 2

GENIVAR Inc. (GENIVAR) was retained by Public Works and Government Services Canada to perform a concrete coring investigation of the Coboconk Dam, to assess the general quality of the concrete as input to a Dam Safety Review (DSR). The site location is shown on Figure 1, attached. The coring program was undertaken between March 6 and 8, 2012 and advanced eight (8) vertical core holes designated as CH-1 through CH-8 to depths of up to 6 m (22 ft) below the deck surface. Core hole locations are indicated on Figure 2.

Coring was completed using a 3-speed Hilti DD 200 Diamond Coring Tool, operated by G. Buteau Core Drilling, from Dowling, Ontario, under the supervision of a GENIVAR technician. The core holes were advanced using a 100 mm outside diameter (OD) diamond impregnated coring bit, and various lengths of AW (44 mm) diameter aluminum rods, with river water used for drilling lubrication. Sampling intervals were continuous from the deck surface of the dam to termination depth. Concrete core samples were logged in the field, core run recovery was measured, and core samples were placed into labelled boxes for transport, review and temporary storage. Samples will be stored at our facility for up to 6 months, after which they will be disposed.

Concrete slurry and spoils from the coring operation were contained and vacuumed up using an industrial vacuum. Drilling slurry was transferred into 45 gal barrels; once the barrels were full, the material was removed by Shepherd Environmental Services of Coboconk and transported to a registered waste facility.

Upon completion of drilling, the core holes were backfilled using non-shrink grout. A plug was used to seal off the bottom of the core holes to prevent wet grout from migrating into voids or fractures within the dam structure, and into the watercourse.

The concrete core samples were inspected, and selected core zones were submitted for laboratory tests, including: compressive strength, absorption, density and percent voids. Compressive strength tests were completed at GENIVAR's Peterborough laboratory; the other tests were completed at Golder Associates laboratory in Mississauga. Results are summarized below.

RESULTS

Photographic logs of the core samples are appended, and a cross section is included as Figure 3. Laboratory test results are summarized in Table 1 as follows.

Table 1: Concrete Core Test Results

Core Hole No. (Figure 2) and Sample No.	Sample Depth (m)	Compressive Strength (MPa)	Density (kg/m ³)	Absorption After Immersion (%)	Volume of Voids (%)
CH-1-1	0.22-0.42	30.3	2407	--	-
CH-2-1	0.00-0.22	34.4	2343	5.4	13.5
CH-2-2	0.92-1.12	35.6	2366	--	--
CH-2-3	3.00-3.25	29.0	2291	--	--
CH-3-1	0.30-0.51	29.4	2312	6.7	15.5
CH-3-2	1.83-2.04	36.6	2383	--	--
CH-4-1	0.00-0.22	28.7	2292	--	--
CH-5-1	0.08-0.28	33.1	2317	6.2	14.8
CH-7-1	0.92-1.12	45.4	2429	6.3	14.8
CH-7-2	5.18-5.39	35.4	2373	--	-
CH-8-1	0.00-0.23	43.8	2383	--	--

In summary, based on the inspections and tests, concrete within the dam appears to have good compressive strength, with an average of 34.0 MPa at the sampled locations. Occasional 19 mm diameter smooth rebar was observed in some of holes at various depths shown in the photos, and large cobble aggregate was observed in some of the deeper intervals (see CH-2 photo). Efflorescence was observed on the face of the dam and occasionally along fractures within the core samples. Overall, internal concrete degradation for this dam appears to be minor.

Core hole CH-7 encountered the pier/apron interface at 4.78 m depth, and limestone bedrock at a depth of 5.56 m. A small void was encountered between the concrete and the bedrock, which may be a result of erosion or possibly a construction gap. The bedrock was core sampled for a length of 0.46 m after which the borehole was terminated. The limestone was slightly weathered and sound.

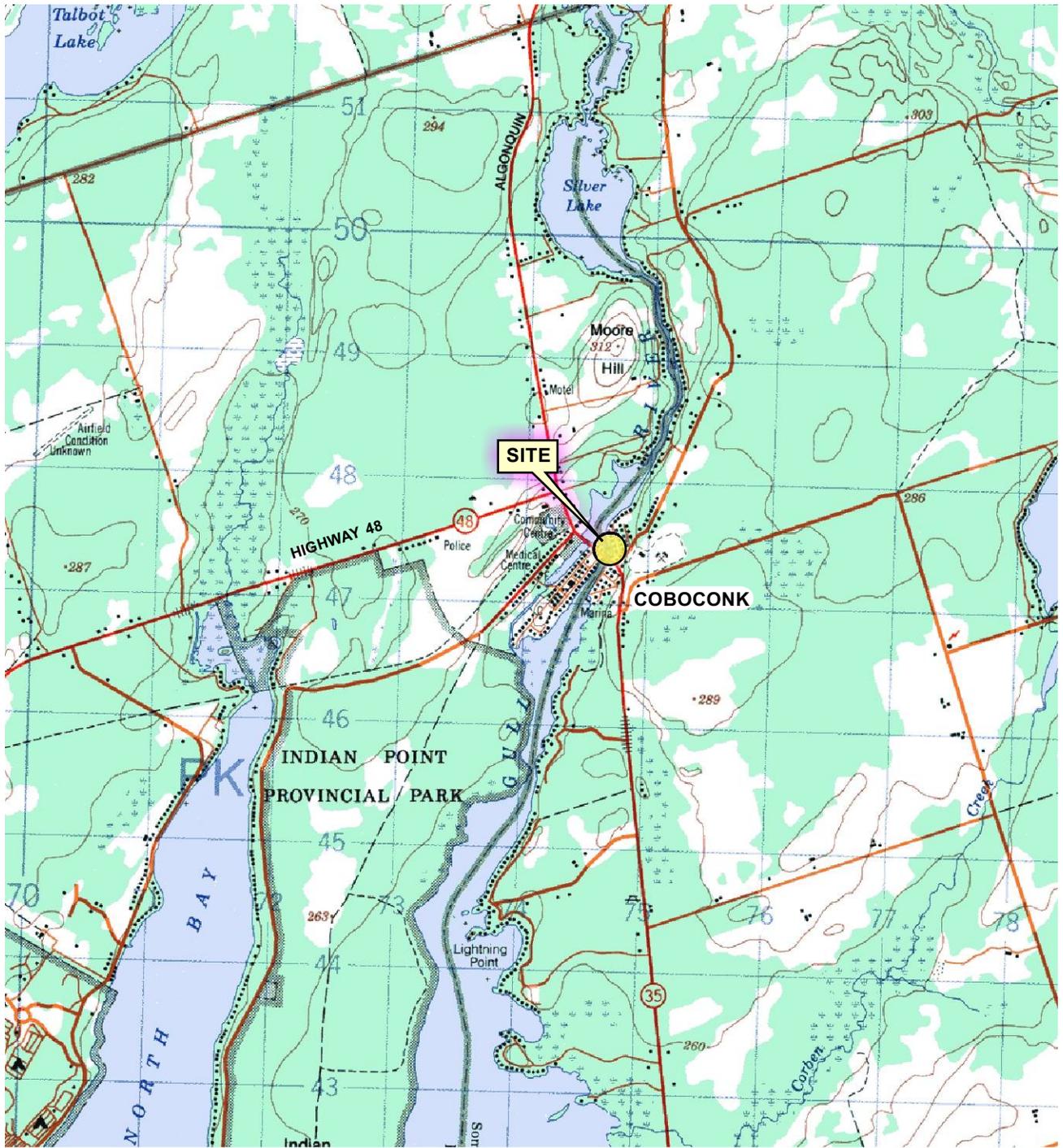
Please call us if you have any questions about this information.

Figures

Figure 1 – Location Map

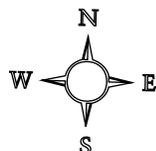
Figure 2 – Core Hole Locations

Figure 3 – Cross Section



LEGEND

-  LOCATION OF STUDY AREA



MAP SOURCE:
NTS 1:50000 SHEET 31D/10, FENELON FALLS.

LOCATION MAP

GEOTECHNICAL INVESTIGATION
GULL RIVER BUNDLE DAM SAFETY REVIEW
COBOCONK DAM
For Public Works & Government Services Canada

DATE: MARCH 2012

SCALE: 1:50000

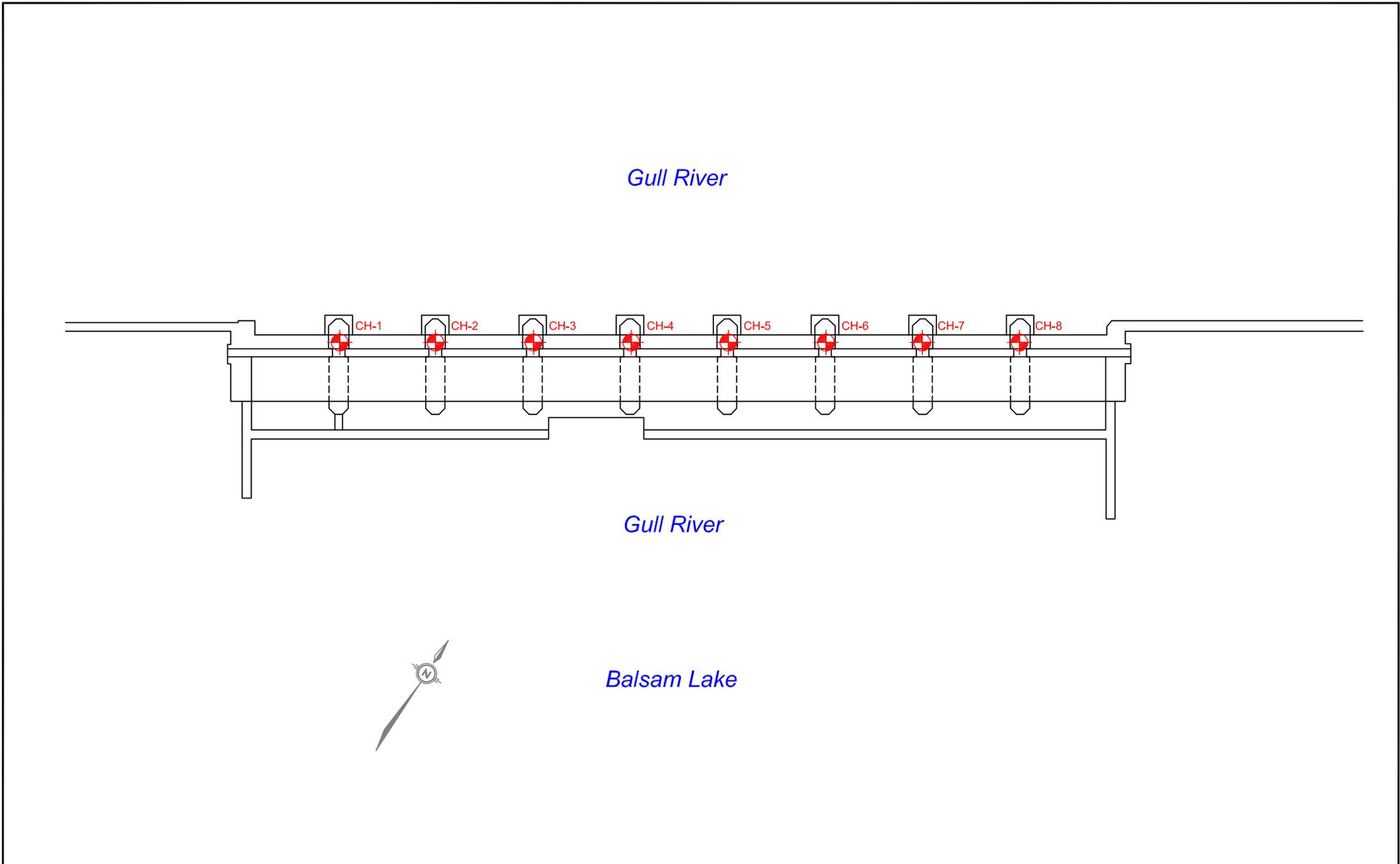
PROJECT: 111-26271-00

REF. NO.: 111-26271-00-F1-LM Cob



FIGURE

1



LEGEND

 CORE HOLE LOCATION AND DESIGNATION

SCALE: NTS

REF. NO.: 111-26271-00-F2-SP Cob

DATE: MARCH 2012

PROJECT: 111-26271-00

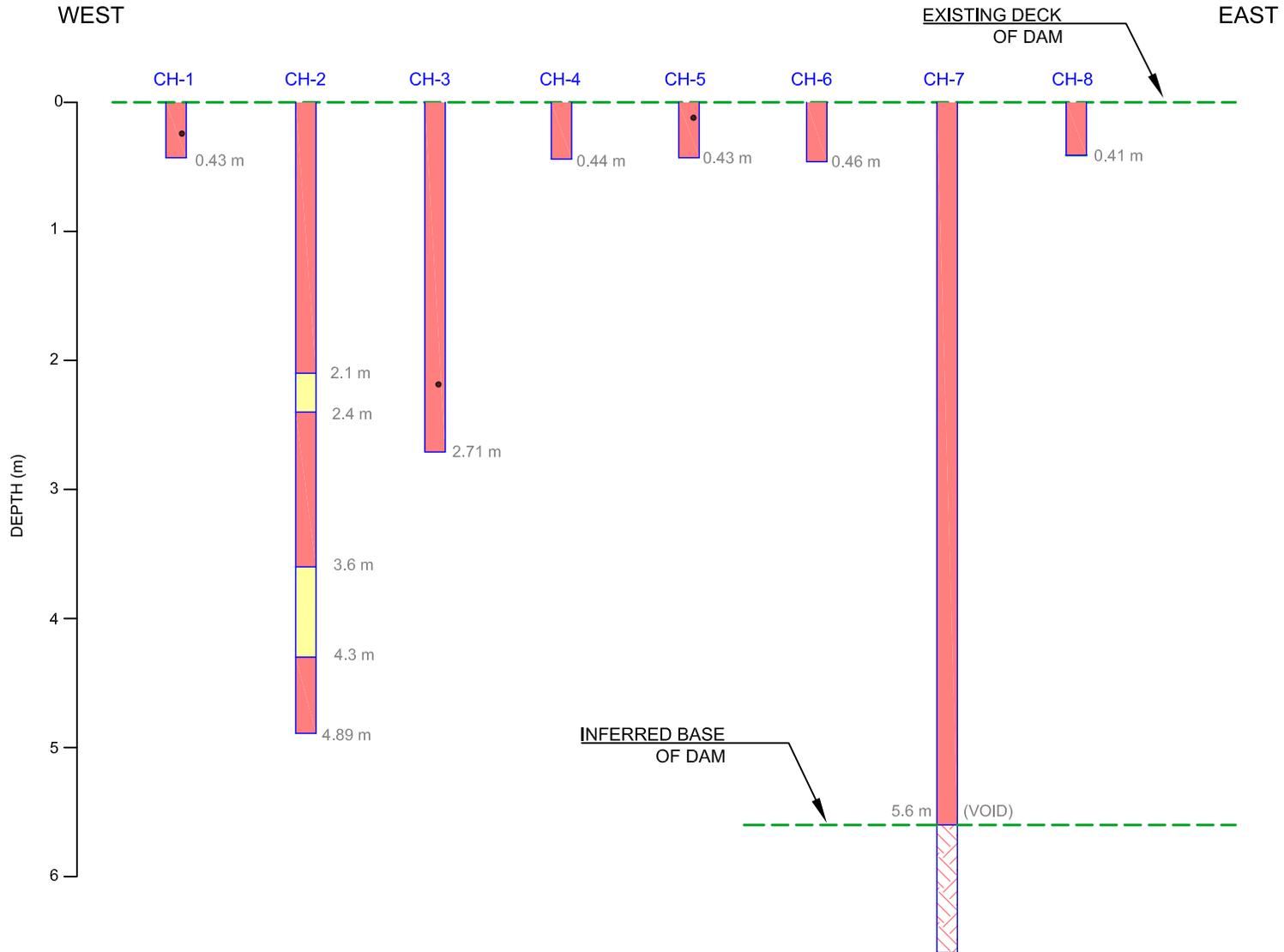


CORE HOLE LOCATIONS

GEOTECHNICAL INVESTIGATION
 GULL RIVER BUNDLE DAM SAFETY REVIEW
 COBOCONK DAM
 For Public Works & Government Services Canada

FIGURE

2



LEGEND

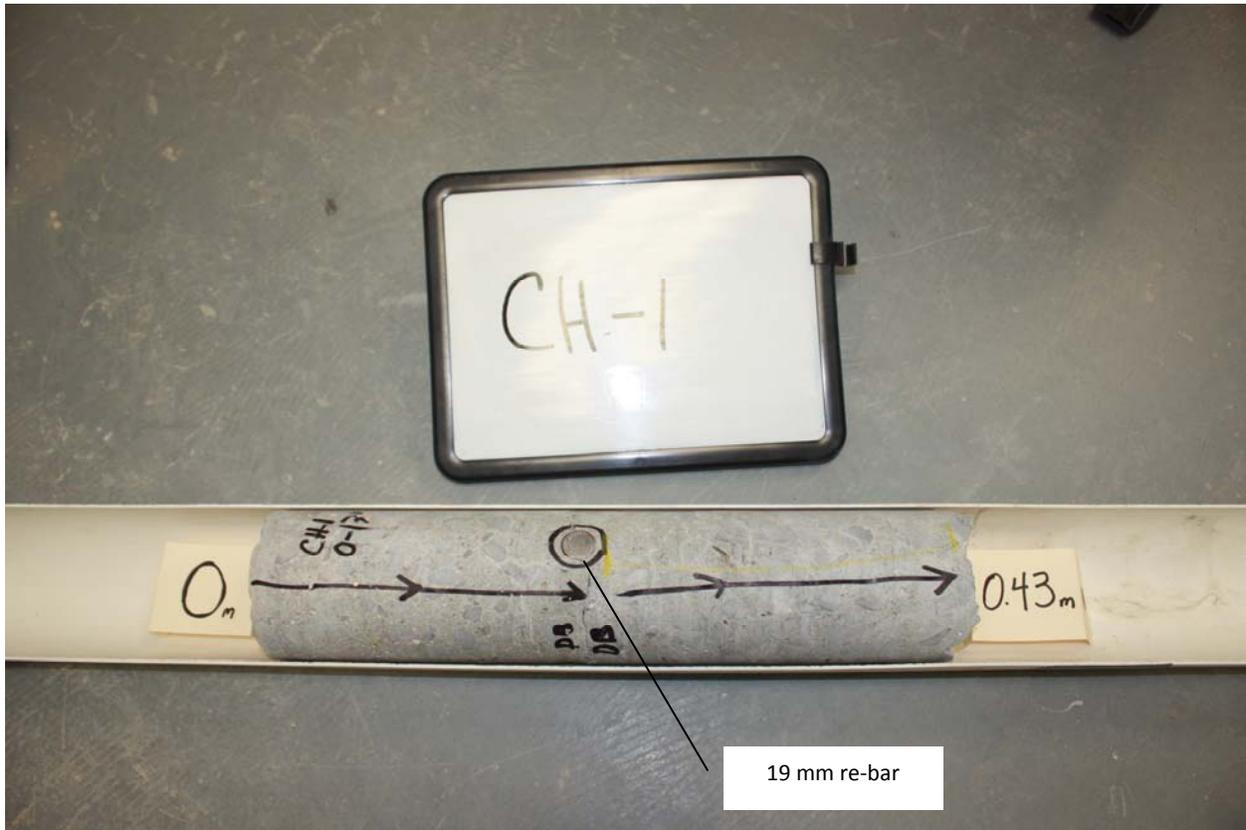
- CH-1 CORE HOLE DESIGNATION
- REBAR
- CONCRETE
- COBBLE AND AGGREGATE
- BEDROCK (LIMESTONE)

SCALES: AS SHOWN	CROSS SECTION	
REF. NO.: 111-26271-00-F3-CR	CONCRETE CORING RESULTS GULL RIVER BUNDLE DAM SAFETY REVIEW COBOCONK DAM For Public Works & Government Services Canada	
DATE: JUNE 2012		
PROJECT: 111-26271-00		
GENIVAR	FIGURE	3

Appendix A

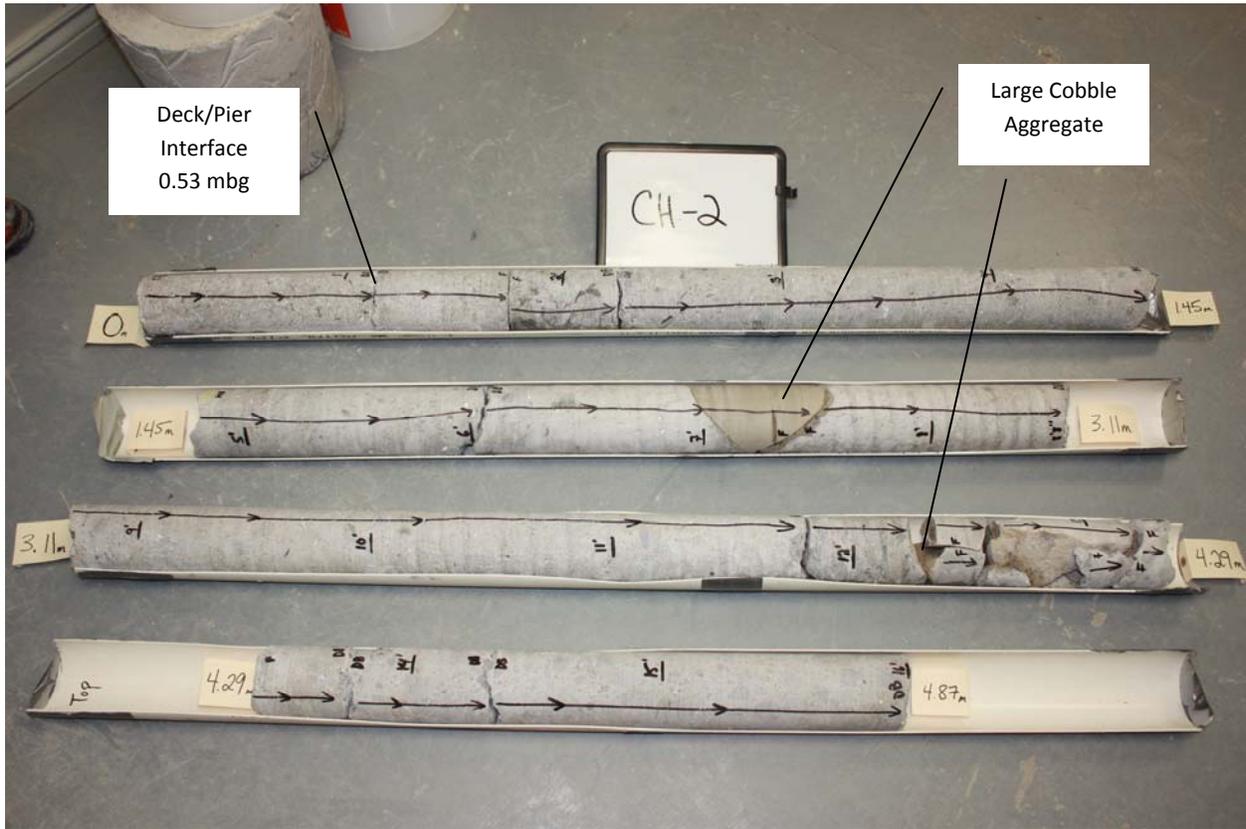
Core Photographs

Coboconk Dam Coring Investigation



Photograph 1: Core Sample CH-1

Coboconk Dam Coring Investigation



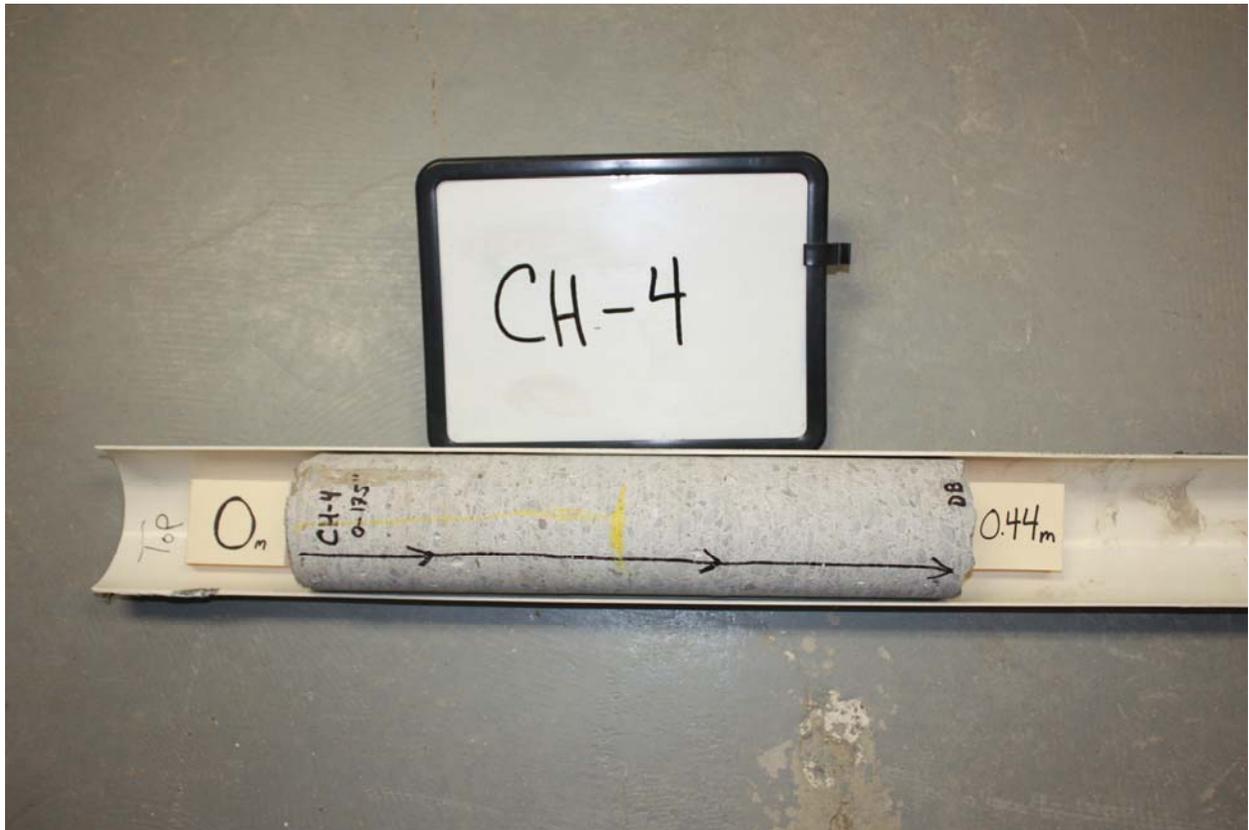
Photograph 2: Core Sample CH-2

Coboconk Dam Coring Investigation



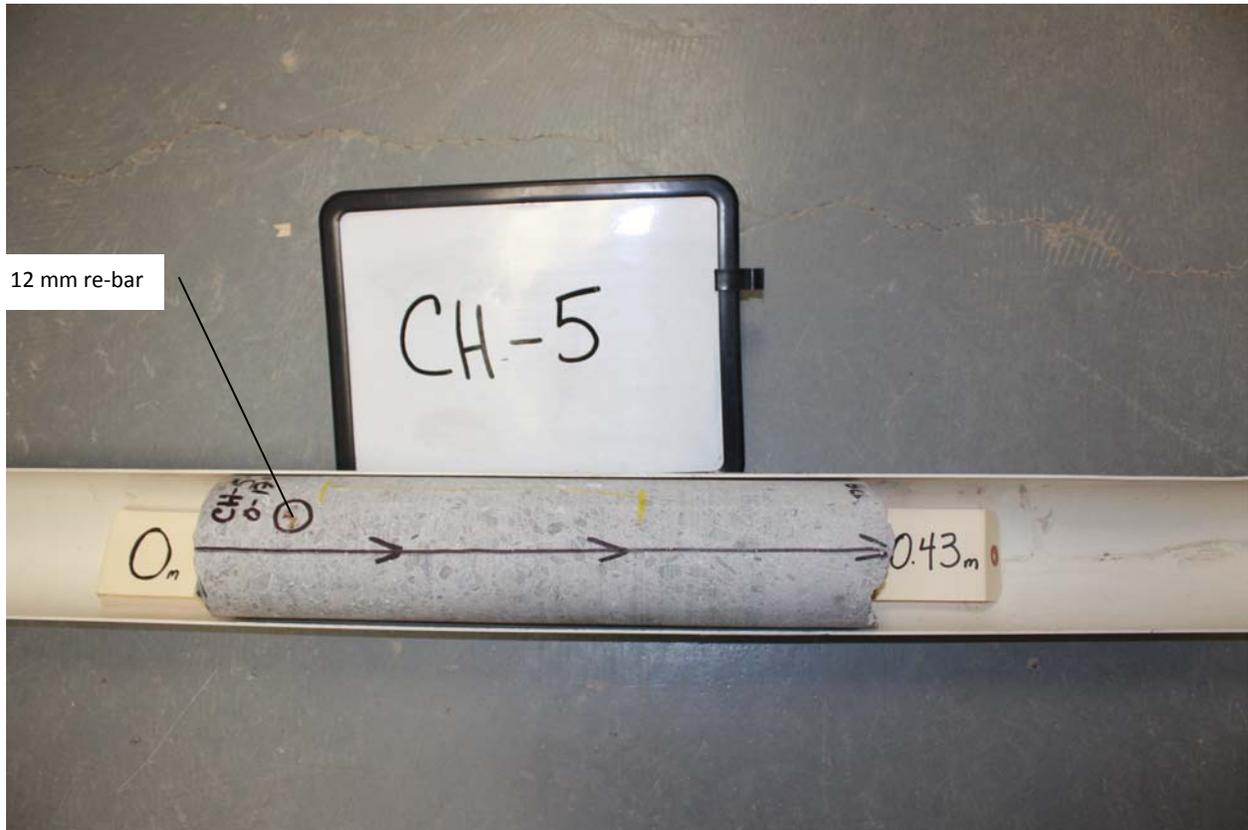
Figure 3: Coboconk Dam CH-3

Coboconk Dam Coring Investigation



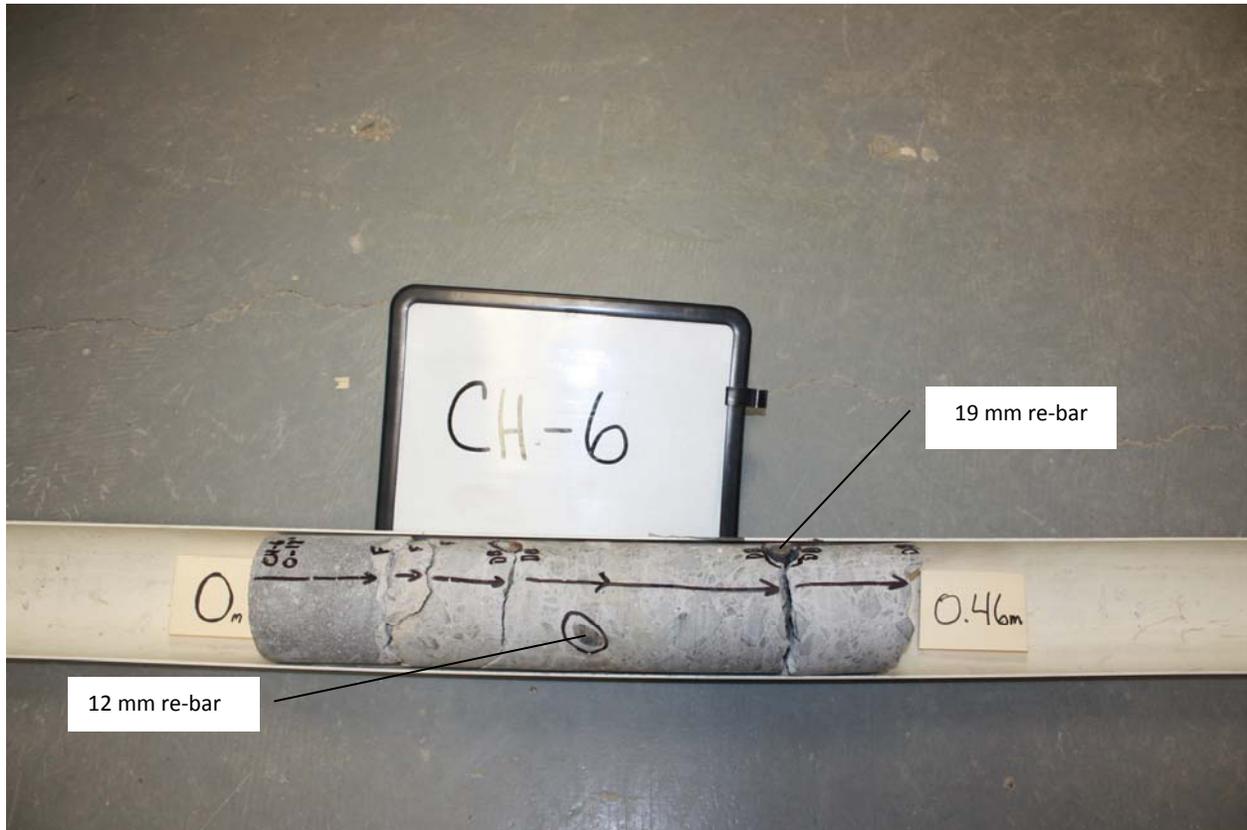
Photograph 4: Core Sample CH-4

Coboconk Dam Coring Investigation



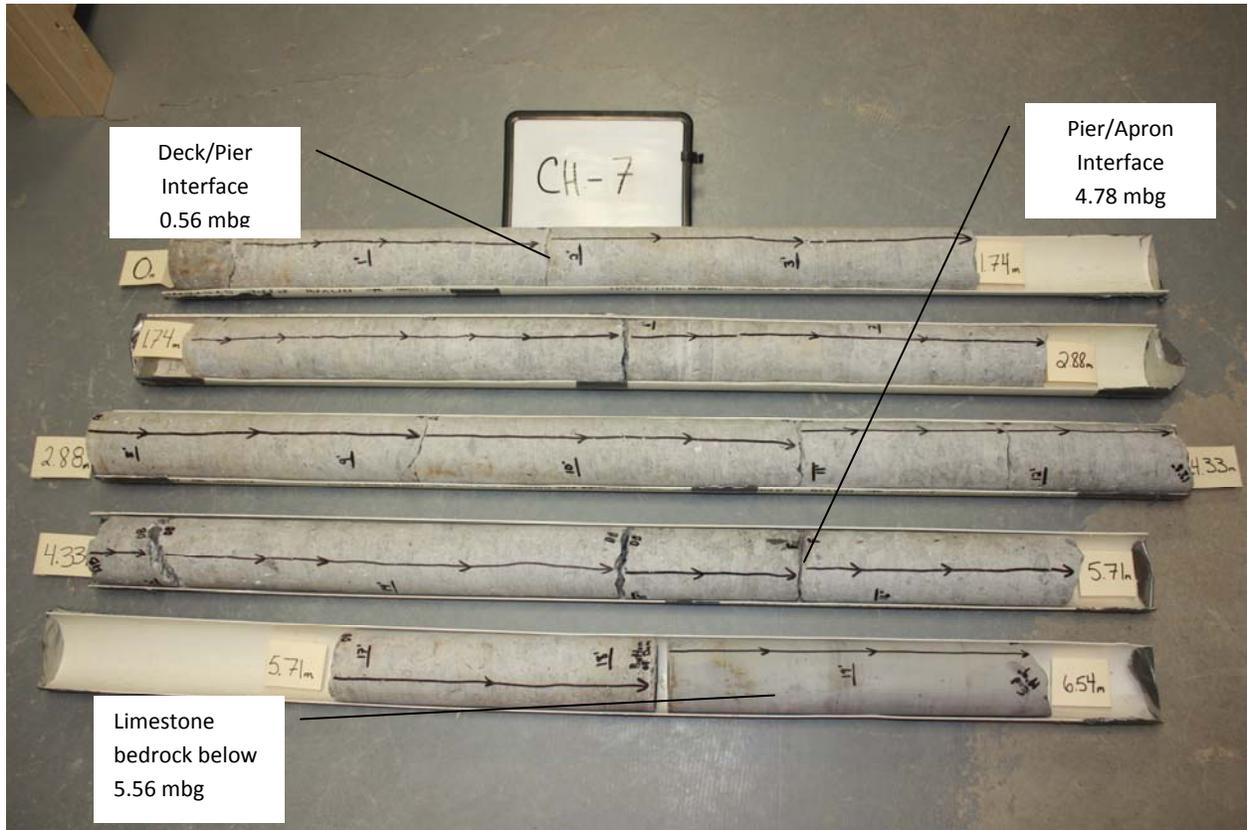
Photograph 5: Core Sample CH-5

Coboconk Dam Coring Investigation



Photograph 6: Coboconk Dam CH-6

Coboconk Dam Coring Investigation



Photograph 7: Core Sample CH-7

Coboconk Dam Coring Investigation



Photograph 8: Core Sample CH-8

APPENDIX C
HISTORICAL WATER LEVELS

Water Level Readings, Coboconk Dam

YEAR	HIGHEST LEVEL	LOWEST LEVEL
1988	257.794	257.285
1989	257.794	257.285
1990	257.818	257.483
1991	257.745	257.343
1992	257.711	257.431
1993	257.711	257.346
1994	257.730	257.030
1995	257.850	257.250
1997	257.730	256.400
2005	257.795	257.160
2006	257.877	257.180
2007	257.890	257.422
2008	257.912	257.350
2009	258.050	257.145
2010	257.799	256.966
2012	257.774	257.311
2013	257.757	256.632
2014	257.804	256.997
2015	257.757	257.000

Water Level Readings, Coboconk Dam

Coboconk Level
Average Daily Water Levels (m) 1988-2016

Trent-Severn Waterway

Date	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept	Oct.	Nov.	Dec.
1		257.650	257.582	257.603	257.470	257.607	257.661	257.658	257.614	257.620	257.573	257.577
2	257.655	256.789	257.580	257.571	257.510	257.619	257.626	257.629	257.606	257.627	257.564	257.593
3	257.649	257.619	257.571	257.602	257.513	257.599	257.613	257.623	257.606	257.616	257.589	257.625
4	257.650	257.598	257.582	257.646	257.475	257.602	257.594	257.618	257.600	257.618	257.561	257.570
5	257.654	257.592	257.564	257.625	257.480	257.602	257.633	257.638	257.611	257.605	257.576	257.598
6	257.674	257.593	257.610	257.616	257.459	257.599	257.631	257.638	257.622	257.605	257.567	257.602
7	257.651	257.609	257.592	257.611	257.488	257.597	257.641	257.639	257.616	257.610	257.593	257.605
8	257.661	257.590	257.594	257.609	257.473	257.594	257.634	257.638	257.608	257.598	257.594	257.616
9	257.639	257.604	257.593	257.622	257.504	257.598	257.631	257.632	257.618	257.609	257.592	257.588
10	257.649	257.605	257.612	257.609	257.526	257.597	257.633	257.630	257.610	257.596	257.600	257.595
11	257.632	257.607	257.618	257.605	257.502	257.580	257.636	257.624	257.610	257.599	257.599	257.578
12	257.633	257.603	257.613	257.572	257.486	257.609	257.638	257.637	257.608	257.597	257.614	257.580
13	257.637	257.596	257.623	257.566	257.455	257.600	257.619	257.630	257.595	257.584	257.638	257.602
14	257.638	257.591	257.637	257.566	257.495	257.607	257.617	257.632	257.609	257.586	257.623	257.606
15	257.648	257.590	257.628	257.558	257.502	257.613	257.626	257.624	257.612	257.596	257.636	257.579
16	257.643	257.593	257.603	257.544	257.471	257.626	257.634	257.617	257.614	257.603	257.628	257.584
17	257.635	257.586	257.622	257.562	257.498	257.613	257.636	257.615	257.610	257.598	257.626	257.580
18	257.623	257.613	257.599	257.559	257.515	257.598	257.645	257.620	257.619	257.589	257.582	257.594
19	257.629	257.621	257.617	257.538	257.490	257.588	257.651	257.610	257.611	257.582	257.600	257.585
20	257.641	257.614	257.607	257.550	257.485	257.584	257.655	257.609	257.595	257.566	257.583	257.579
21	257.631	257.623	257.589	257.508	257.530	257.593	257.243	257.609	257.585	257.565	257.584	257.616
22	257.627	257.610	257.594	257.555	257.549	257.598	257.274	257.611	257.607	257.574	257.584	257.603
23	257.611	257.592	257.589	257.552	257.540	257.590	257.661	257.608	257.606	257.570	257.007	257.597
24	257.619	257.619	257.593	257.561	257.533	257.600	257.652	257.620	257.597	257.562	257.600	257.634
25	257.607	257.593	257.584	257.512	257.535	257.616	257.660	257.626	257.611	257.563	257.586	257.626
26	257.576	257.584	257.612	257.486	257.537	257.618	257.664	257.626	257.606	257.568	257.601	257.620
27	257.604	257.538	257.617	257.480	257.540	257.605	257.648	257.609	257.614	257.562	257.579	257.620
28	257.589	257.459	257.667	257.440	257.563	257.611	257.632	257.625	257.593	257.565	257.598	257.610
29	257.605	257.636	257.586	257.490	257.542	257.659	257.639	257.611	257.637	257.599	257.588	257.623
30	257.590		257.576	257.499	257.543	257.648	257.646	257.584	257.641	257.590	257.588	257.615
31	257.582		257.541		257.583		257.627	257.613		257.571		257.605

Water Level Readings, Coboconk Dam

**Coboconk Level
Maximum Water Levels (m) 1988-2016**

Trent-Severn Waterway

Date	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept	Oct.	Nov.	Dec.
1		257.757	257.628	257.886	257.717	257.784	257.673	257.755	257.843	257.675	257.730	257.684
2	257.841	257.750	257.624	257.919	257.905	257.768	257.671	257.743	257.820	257.680	257.735	257.689
3	257.844	257.744	257.630	257.951	257.898	257.752	257.712	257.740	257.798	257.680	257.740	257.693
4	257.847	257.737	257.672	257.984	257.670	257.729	257.705	257.747	257.775	257.680	257.730	257.697
5	257.900	257.731	257.677	258.017	257.700	257.698	257.700	257.754	257.753	257.680	257.773	257.853
6	257.895	257.810	257.723	258.050	257.654	257.672	257.710	257.757	257.731	257.680	257.710	257.850
7	257.889	257.805	257.733	257.926	257.774	257.657	257.743	257.759	257.708	257.678	257.752	257.846
8	257.884	257.801	257.744	257.863	257.637	257.690	257.747	257.762	257.686	257.668	257.757	257.843
9	257.878	257.796	257.754	257.890	257.720	257.696	257.766	257.765	257.680	257.665	257.780	257.839
10	257.912	257.791	257.764	257.880	257.626	257.725	257.753	257.767	257.674	257.656	257.803	257.836
11	257.867	257.786	257.774	257.870	257.616	257.754	257.741	257.770	257.668	257.650	257.827	257.832
12	257.862	257.782	257.785	257.851	257.611	257.785	257.758	257.762	257.661	257.658	257.850	257.838
13	257.855	257.777	257.795	257.861	257.607	257.745	257.761	257.754	257.659	257.676	257.850	257.845
14	257.855	257.779	257.792	257.870	257.602	257.704	257.775	257.727	257.664	257.694	257.850	257.851
15	257.854	257.781	257.788	257.880	257.626	257.740	257.768	257.700	257.670	257.738	257.850	257.858
16	257.849	257.783	257.773	257.890	257.638	257.768	257.760	257.678	257.675	257.730	257.850	257.864
17	257.843	257.786	257.777	257.848	257.654	257.795	257.753	257.679	257.680	257.718	257.790	257.871
18	257.838	257.788	257.780	257.806	257.738	257.721	257.746	257.689	257.685	257.705	257.790	257.877
19	257.833	257.790	257.784	257.764	257.720	257.648	257.739	257.681	257.690	257.711	257.798	257.876
20	257.828	257.792	257.787	257.723	257.716	257.650	257.770	257.707	257.663	257.680	257.806	257.875
21	257.822	257.789	257.791	257.703	257.712	257.667	257.771	257.739	257.646	257.687	257.805	257.875
22	257.817	257.786	257.794	257.722	257.708	257.692	257.773	257.771	257.678	257.734	257.804	257.874
23	257.811	257.783	257.798	257.741	257.704	257.700	257.774	257.804	257.682	257.700	257.802	257.873
24	257.805	257.818	257.801	257.760	257.700	257.716	257.776	257.836	257.672	257.706	257.801	257.872
25	257.799	257.776	257.804	257.718	257.707	257.733	257.777	257.840	257.700	257.712	257.800	257.872
26	257.794	257.773	257.807	257.660	257.725	257.723	257.779	257.844	257.696	257.718	257.799	257.871
27	257.788	257.770	257.811	257.705	257.745	257.713	257.780	257.848	257.692	257.725	257.797	257.870
28	257.787	257.634	257.814	257.620	257.729	257.777	257.769	257.853	257.687	257.731	257.796	257.654
29	257.791	257.646	257.817	257.640	257.736	257.799	257.759	257.857	257.683	257.737	257.674	257.663
30	257.794		257.820	257.714	257.743	257.683	257.753	257.861	257.675	257.743	257.684	257.681
31	257.763		257.853		257.750		257.757	257.865		257.749		257.699

Water Level Readings, Coboconk Dam

**Coboconk Level
Minimum Water Levels (m) 1988-2016**

Trent-Severn Waterway

Date	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept	Oct.	Nov.	Dec.
1		257.571	257.492	257.400	256.858	257.498	257.639	257.550	257.484	257.501	257.491	257.452
2	257.570	250.850	257.512	257.367	256.779	257.511	257.526	257.541	257.462	257.492	257.491	257.445
3	257.563	257.470	257.400	257.360	256.747	257.298	257.492	257.529	257.507	257.483	257.491	257.526
4	257.555	257.433	257.385	257.394	256.731	257.284	257.160	257.500	257.473	257.474	257.425	257.440
5	257.548	257.361	257.370	257.407	256.728	257.527	257.492	257.574	257.455	257.465	257.346	257.435
6	257.540	257.360	257.530	257.421	256.714	257.521	257.520	257.580	257.486	257.453	257.385	257.430
7	257.526	257.343	257.321	257.434	256.652	257.515	257.580	257.578	257.476	257.442	257.425	257.425
8	257.509	257.311	257.442	257.468	256.632	257.509	257.550	257.566	257.460	257.431	257.465	257.419
9	257.490	257.310	257.330	257.483	257.052	257.504	257.531	257.554	257.488	257.550	257.446	257.317
10	257.477	257.348	257.490	257.425	257.262	257.498	257.575	257.542	257.499	257.540	257.428	257.361
11	257.471	257.385	257.473	257.360	257.086	257.166	257.561	257.476	257.510	257.538	257.410	257.390
12	257.466	257.423	257.457	257.313	257.030	257.430	257.546	257.530	257.511	257.524	257.487	257.380
13	257.461	257.440	257.440	257.267	256.997	257.490	257.532	257.489	257.416	257.442	257.501	257.363
14	257.455	257.423	257.458	257.220	257.221	257.495	257.490	257.528	257.513	257.477	257.489	257.347
15	257.469	257.405	257.475	257.300	257.279	257.499	257.549	257.526	257.516	257.465	257.498	257.330
16	257.463	257.388	257.211	257.352	257.050	257.504	257.548	257.524	257.489	257.527	257.492	257.313
17	257.450	257.370	257.510	257.418	256.888	257.508	257.546	257.522	257.530	257.519	257.495	257.297
18	257.400	257.490	257.220	257.403	256.725	257.513	257.566	257.520	257.571	257.519	257.468	257.280
19	257.446	257.522	257.483	257.382	256.563	257.517	257.590	257.520	257.538	257.510	257.468	257.265
20	257.440	257.470	257.470	257.349	256.400	257.484	257.570	257.530	257.443	257.500	257.459	257.250
21	257.447	257.522	257.399	257.182	257.150	257.449	251.397	257.540	257.371	257.490	257.451	257.477
22	257.454	257.490	257.445	257.279	257.195	257.415	251.480	257.550	257.504	257.497	257.442	257.483
23	257.461	257.362	257.432	257.239	257.178	257.380	257.510	257.476	257.504	257.489	250.650	257.489
24	257.469	257.510	257.420	257.198	257.162	257.412	257.507	257.562	257.510	257.480	257.434	257.501
25	257.470	257.480	257.250	256.817	257.145	257.455	257.575	257.556	257.509	257.477	257.452	257.493
26	257.420	257.330	257.453	256.815	257.236	257.498	257.570	257.530	257.507	257.473	257.471	257.477
27	257.428	257.180	257.420	256.831	257.328	257.505	257.565	257.392	257.506	257.470	257.450	257.460
28	257.395	257.030	257.510	256.818	257.367	257.495	257.542	257.410	257.366	257.466	257.485	257.550
29	257.363	257.631	256.966	256.808	257.317	257.574	257.545	257.350	257.580	257.463	257.481	257.562
30	257.330		257.010	256.831	257.312	257.584	257.496	257.367	257.624	257.459	257.477	257.552
31	257.320		257.000		257.307		257.480	257.439		257.456		257.510

APPENDIX D

USPEA STORMWATER BEST MANAGEMENT PRACTICE CONCRETE WASHOUT

Minimum Measure

Construction Site Stormwater Runoff Control

Subcategory

Good Housekeeping/Materials Management

Description of Concrete Washout at Construction Sites

Concrete and its ingredients

Concrete is a mixture of cement, water, and aggregate material. Portland cement is made by heating a mixture of limestone and clay containing oxides of calcium, aluminum, silicon and other metals in a kiln and then pulverizing the resulting clinker. The fine aggregate particles are usually sand. Coarse aggregate is generally gravel or crushed stone. When cement is mixed with water, a chemical reaction called hydration occurs, which produces glue that binds the aggregates together to make concrete.

Concrete washout

After concrete is poured at a construction site, the chutes of ready mixed concrete trucks and hoppers of concrete pump trucks must be washed out to remove the remaining concrete before it hardens. Equipment such as wheelbarrows and hand tools also need to be washed down. At the end of each work day, the drums of concrete trucks must be washed out. This is customarily done at the ready mixed batch plants, which are usually off-site facilities, however large or rural construction projects may have on-site batch plants. Cementitious (having the properties of cement) washwater and solids also come from using such construction materials as mortar, plaster, stucco, and grout.

Environmental and Human Health Impacts

Concrete washout water (or washwater) is a slurry containing toxic metals. It's also caustic and corrosive, having a pH near 12. In comparison, Drano liquid drain cleaner has a pH of 13.5. Caustic washwater can harm fish gills and eyes and interfere with reproduction. The safe pH ranges for aquatic life habitats are 6.5 – 9 for freshwater and 6.5 – 8.5 for saltwater.

Construction workers should handle wet concrete and washout water with care because it may cause skin irritation and eye damage. If the washwater is dumped on the ground (Fig. 1), it can run off the construction site to adjoining roads and enter roadside storm drains, which discharge to surface waters such as rivers, lakes, or estuaries. The red arrow in Figure 2 points to a ready mixed truck chute that's being washed out into a roll-off bin, which isn't watertight. Leaking washwater, shown in the foreground, will likely follow similar



Figure 1. Chute washwater being dumped on the ground



Figure 2. Chute washwater leaking from a roll-off bin being used as a washout container

paths to nearby surface waters. Rainfall may cause concrete washout containers that are uncovered to overflow and also transport the washwater to surface waters. Rainwater polluted with concrete washwater can percolate down through the soil and alter the soil chemistry, inhibit plant growth, and contaminate the groundwater. Its high pH can increase the toxicity of other substances in the surface waters and soils. Figures 1 and 2 illustrate the need for better washout management practices.

Best Management Practice Objectives

The best management practice objectives for concrete washout are to (a) collect and retain all the concrete washout water and solids in leak proof containers, so that this caustic material does not reach the soil surface and then migrate to surface waters or into the ground water, and (b) recycle 100 percent of the collected concrete washout water and solids. Another

Stormwater Best Management Practice: Concrete Washout

objective is to support the diversion of recyclable materials from landfills. Table 1 shows how concrete washout materials can be recycled and reused.

Table 1 – Recycling concrete washout materials

Uses of Recycled Materials	Concrete Washout Materials					
	Washwater	Cement fines ^a	Fine aggregate	Coarse aggregate	Hardened concrete	Unused wet concrete
Reused to washout additional mixer truck chutes or drums	x					
Reused as a ready mixed concrete ingredient	x	x ^b	x	x		
Reused as an ingredient of precast concrete products, e.g., highway barriers, retaining wall blocks, riprap	x	x	x	x		x
Reused as crushed concrete products, e.g., road base or fill		x	x	x	x	
Reused to pave the yards of ready mixed concrete plants						x
Returned back to a surface water, e.g., river, lake, or estuary	x ^c					

a. Fine particles of cementitious material (e.g., Portland cement, slag cement, fly ash, silica fume)

b. Recyclable, if allowed by the concrete quality specifications

c. Treated to reduce the pH and remove metals, so it can be delivered to a municipal wastewater treatment plant, where it is treated further and then returned to a natural surface water

Washwater recycling, treatment, disposal

Washwater from concrete truck chutes, hand mixers, or other equipment can be passed through a system of weirs or filters to remove solids and then be reused to wash down more chutes and equipment at the construction site or as an ingredient for making additional concrete. A three chamber washout filter is shown in Figure 3. The first stage collects the coarse aggregate. The middle stage filters out the small grit and sand. The third stage has an array of tablets that filter out fines and reduces the pH. The filtered washwater is then discharged through a filter sock. An alternative is to pump the washout water out of the washout container (Fig 4) and treat the washwater off site to remove metals and reduce its pH, so it can be delivered to a publicly owned treatment works (POTW), also known as a municipal wastewater treatment plant, which provides additional treatment allowing the washwater to be discharged to a surface water. The POTW should be



Figure 3. Concrete washout filter

contacted to inquire about any pretreatment requirements, i.e., the National Pretreatment Standards for Prohibited Dischargers (40CFR 403.5) before discharging the washwater to the POTW. The washwater can also be retained in the washout container and allowed to evaporate, leaving only the hardened cementitious solids to be recycled.

Solids recycling

The coarse aggregate materials that are washed off concrete truck chutes into a washout container can be either separated by a screen and placed in aggregate bins to be reused at the construction site or returned to the ready mixed plant and washed into a reclaimer (Fig. 5). When washed out into a reclaimer, the fine and coarse aggregates are separated out and placed in different piles or bins to be reused in making fresh concrete. Reclaimers with settling tanks separate cement fines from the washwater, and these fines can also be used in new concrete unless prohibited by the user's concrete quality specifications.



Figure 4. Vacuuming washwater out of a washout container for treatment and reuse



Figure 5. Ready mixed truck washing out into a reclaimer

Hardened concrete recycling

When the washwater in a construction site concrete washout container has been removed or allowed to evaporate, the hardened concrete that remains can be crushed (Fig. 6) and reused as a construction material. It makes an excellent aggregate for road base and can be used as fill at the



Figure 6. Crushed concrete stockpile and crusher

construction site or delivered to a recycler. Concrete recyclers can be found at municipal solid waste disposal facilities, private recycling plants, or large construction sites.

Wet concrete recycling

Builders often order a little more ready mixed concrete than they actually need, so it is common for concrete trucks to have wet concrete remaining in their drum after a delivery. This unused concrete can be returned to the ready mixed plant and either (1) used to pour precast concrete products (e.g., highway barriers, retaining wall blocks, riprap), (2) used to pave the ready mixed plant's yard, (3) washed into a reclaimer, or (4) dumped on an impervious surface and allowed to harden, so it can be crushed and recycled as aggregate. Unused wet concrete should not be dumped on bare ground to harden at construction sites because this can contribute to ground water and surface water contamination.

Washout Containers

Different types of washout containers are available for collecting, retaining, and recycling the washwater and solids from washing down mixed truck chutes and pump truck hoppers at construction sites.

Chute washout box

A chute washout box is mounted on the back of the ready mixed truck. If the truck has three chutes, the following procedure is used to perform the washout from the top down: (1) after the pour is completed, the driver attaches the extension chute to the washout box, (2) the driver then rotates the main chute over the extension chute (Fig. 7) and washes down the hopper first then the main chute, (3) finally the driver washes down the flop down chute and last the extension chute hanging on the box. All washwater and solids are captured in the box.



Figure 7. Chute washout box

Chute washout bucket and pump

After delivering ready mixed concrete and scraping the last of the customer's concrete down the chute, the driver hangs a washout bucket shown in Figure 8 (see red arrow) on the end of the truck's chute and secures the hose to insure no leaks. The

driver then washes down the chute into the bucket to remove any cementitious material before it hardens. After washing out the chute, the driver pumps (yellow arrow points to the pump) the washwater, sand, and other fine solids from the bucket up into the truck's drum to be returned to the ready mixed plant, where it can be washed into a reclaimer. A removable screen at the bottom of the washout bucket prevents course aggregate from entering the pump. This course aggregate can also be returned to the plant and added to the coarse aggregate pile to be reused. All the materials are recycled.



Figure 8. Chute washout bucket and pump

Hay bale and plastic washout pit

A washout pit made with hay bales and a plastic lining is shown in Figure 9. Such pits can be dug into the ground or built above grade. The plastic lining should be free of tears or holes that would allow the washwater to escape (Fig. 10). After the pit is used to wash down the chutes of multiple ready mixed trucks and the washwater has evaporated or has been vacuumed off, the remaining hardened solids can be broken up and removed from the pit. This process may damage the hay bales and plastic lining. If damage occurs, the pit will need to be repaired and relined with new plastic. When the hardened solids are removed, they may be bound up with the plastic lining and have to be sent to a landfill, rather than recycled. Recyclers usually accept only unmixed material. If the pit is going to be emptied and repaired more than a few times, the hay bales and plastic will be generating additional solid waste. Ready mixed concrete



Figure 9. Hay bale and plastic washout pit



Figure 10. Leaking washout pit that has not been well maintained

Stormwater Best Management Practice: Concrete Washout

trucks can use hay bale washout pits, but concrete pump trucks have a low hanging hopper in the back that may prevent their being washed out into bale-lined pits.

Vinyl washout container



Figure 11. Vinyl washout pit with filter bag

The vinyl washout container (Fig. 11) is portable, reusable, and easier to install than a hay bale washout pit. The biodegradable filter bag (Fig. 12) assists in extracting the concrete solids and prolongs the life of the vinyl container. When the bag is lifted, the water is filtered out and the remaining concrete solids and the bag can be disposed of together in a landfill, or the hardened concrete can be delivered to a recycler. After the solids have been removed several times and the container is full of washwater, the washwater can be allowed to evaporate, so the container can be reused. The washwater can be removed more quickly by placing another filter bag in the container and spreading water gelling granules evenly across the water. In about five minutes, the water in the filter bag will turn into a gel that can be removed with the bag. Then the gel and filter bag can be disposed of together.



Figure 12. Extracting the concrete solids or gelled washwater

Metal washout container

The metal roll-off bin (Fig. 13) is designed to securely contain concrete washwater and solids and is portable and reusable. It also has a ramp that allows concrete pump trucks to wash out their hoppers (Fig. 14). Roll-off providers offer recycling services, such as, picking up the roll-off bins after the washwater has evaporated and the solids have hardened, replacing them with empty washout bins, and delivering the hardened concrete to a recycler (Fig. 15), rather than a landfill. Some providers will vacuum off the washwater, treat it to remove metals and reduce the pH, deliver it to a wastewater treatment plant for additional treatment and



Figure 13. Mixer truck being washed out into a roll-off bin

subsequent discharge to a surface water. Everything is recycled or treated sufficiently to be returned to a natural surface water.



Figure 14. Pump truck using the ramp to wash out into a roll-off bin



Figure 15. Delivering hardened Concrete to a recycler

Another metal, portable, washout container, which has a rain cover to prevent overflowing, is shown in Figure 16. It is accompanied by an onsite washwater treatment unit, which reduces the pH and uses a forced weir tank system to remove the coarse aggregate, fine aggregate, and cement fines. The washwater can then be reused at the construction site to wash out other mixer truck chutes and equipment. The solids are allowed to harden together and can be taken to a concrete recycler (Fig. 17) to be crushed and used as road base or aggregate for making precast products, such as retaining wall blocks. All materials are recycled.



Figure 16. Washout container with a rain cover and onsite washwater treatment



Figure 17. Delivering hardened concrete to a recycler

Siting Washout Facilities

Concrete washout facilities, such as washout pits and vinyl or metal washout containers, should be placed in locations that provide convenient access to concrete trucks, preferably near the area where concrete is being poured. However they

should not be placed within 50 feet of storm drains, open ditches, or waterbodies. Appropriate gravel or rock should cover approaches to concrete washout facilities when they are located on undeveloped property. On large sites with extensive concrete work, washouts should be placed at multiple locations for ease of use by ready mixed truck drivers. If the washout facility is not within view from the pour location, signage will be needed to direct the truck drivers.

Operating and Inspecting Washout Facilities

Concrete washout facilities should be inspected daily and after heavy rains to check for leaks, identify any plastic linings and sidewalls have been damaged by construction activities, and determine whether they have been filled to over 75 percent capacity. When the washout container is filled to over 75 percent of its capacity, the washwater should be vacuumed off or allowed to evaporate to avoid overflows. Then when the remaining cementitious solids have hardened, they should be removed and recycled. Damages to the container should be repaired promptly. Before heavy rains, the washout container's liquid level should be lowered or the container should be covered to avoid an overflow during the rain storm.

Educating Concrete Subcontractors

The construction site superintendent should make ready mixed truck drivers aware of washout facility locations and be watchful for improper dumping of cementitious material. In addition, concrete washout requirements should be included in contracts with concrete delivery companies.

Reference

NRMCA 2009. Environmental Management in the Ready Mixed Concrete Industry, 2PEMRM, 1st edition. By Gary M. Mullins. Silver Springs, MD: National Ready Mixed Concrete Association.

Websites and Videos

Construction Materials Recycling Association
www.concreterecycling.org

National Ready Mixed Concrete Association
www.nrmca.org

National Ready Mixed Concrete Research and Education Foundation
www.rmc-foundation.org

Additional information and videos on concrete washout containers and systems can be found by a web search for "concrete washout."

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APPENDIX E

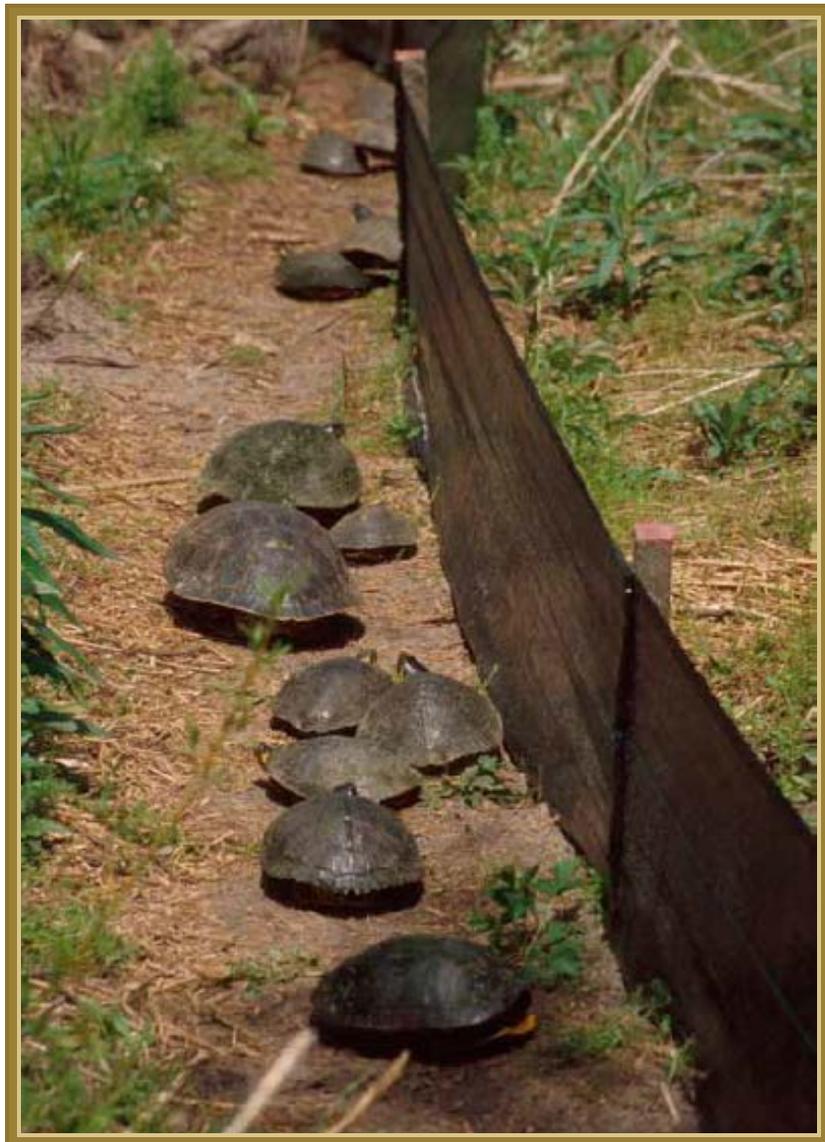
REPTILE AND AMPHIBIAN EXCLUSION FENCING

SPECIES AT RISK BRANCH BEST PRACTICES TECHNICAL NOTE

REPTILE AND AMPHIBIAN EXCLUSION FENCING

Version 1.1

July 2013



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Ontario Ministry of Natural Resources
Species at Risk Branch

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Document History

Revision Number	Revision Date	Summary of Changes	Originated	Reviewed	Authorized
1.1	June, 2013	Pre-publishing edits	June, 2013	June, 2013	June, 2013

REPTILE AND AMPHIBIAN EXCLUSION FENCING - BEST PRACTICES -

The purpose of this guidance document is to provide an overview of proven design and installation techniques for reptile and amphibian exclusion fencing. Though this document points to site and species-specific design requirements, it is important to recognize that every situation is different. This guidance is not meant to replace site-specific advice obtained from local MNR staff or experienced exclusion fencing contractors. Moreover, exclusion fences are only effective when well planned, properly constructed, and maintained.

Exclusion fencing seeks to eliminate access to specific areas where activities that could harm animals are occurring (e.g. active aggregate operations, construction sites, and roads). The selection and installation of exclusion fencing can present some challenges, particularly if multiple species are being excluded. For example, some reptiles and amphibians are able to dig under fencing while others can climb over. Some may also take advantage of burrows dug by other animals. To maintain effectiveness, the bottom of the fence should be buried or secured firmly to the ground and minimum height recommendations (Table 1) are considered.

Exclusion fence design should consider the target species as well as those that might be unintentionally impacted. Fencing material should not pose a risk of entanglement or permit individuals to pass underneath or between openings. Landscape features such as topography and substrate need to be considered as they may constrain fencing design.

Including plans for fencing in advance of a project can increase efficiency and fence

effectiveness. For example, long-term road projects that will include a permanent sound barrier could design the sound barrier such that it also meets the specifications of the required exclusion fence.

EFFECTIVE FENCE CHARACTERISTICS

The fence burial and height recommendations listed in Table 1 below have been compiled from scientific literature, established management practices, and practitioner best advice. These are general recommendations and at times other specifications may be more appropriate. For instance, in areas where the substrate does not permit fence burial, weighing down the fence with heavy items (e.g. sand bags) or backfilling may be acceptable. Where needed, speak with your local MNR staff or experienced exclusion fencing contractor to develop site-specific plans.

If multiple species are being excluded from the same area, and the species-specific fencing specifications differ, the uppermost minimum height and greatest depth recommendation should be used (Table 1). If you are excluding both Blanding's Turtle and Gray Ratsnake, for example, the exclusion fence should be a minimum of 2 m tall (see Gray Ratsnake section below for additional details).

Exclusion fences should be installed prior to emergence from hibernation. A survey of the enclosed/secluded area should be conducted immediately following fence installation to ensure that no individuals have been trapped on the wrong side of the fence.

Table 1. Recommended burial depth and height requirements of exclusion fencing for reptiles and amphibians. Recommended height is the height of the fence after it has been installed including the buried components and any installed overhangs or extended lips.

SPECIES	RECOMMENDED DEPTH OF FENCE BURIED (cm) *	RECOMMENDED HEIGHT OF FENCE (cm) **
Turtles – general	10 – 20	60
Eastern Musk Turtle, Wood Turtle	10 – 20	50
Massasauga, Eastern Hog-nosed Snake, Butler’s Gartersnake, Queensnake	10 – 20	60
Gray Ratsnake & Eastern Foxsnake	10 – 20	200
Fowler’s Toad	10 – 20	50
Snakes - general	10 – 20	100
Common Five-lined Skink	10 – 20	unknown
Salamanders	10 – 20	30

* does not include the 10 cm horizontal lip that should extend outward an additional 10 – 20 cm (see Figure 2)

** the height of fencing has been provided as an approximate. Fencing materials may in fact not be available in proportions that would allow for these precise measurements. It is most effective, if the height and burial depth recommendations are met.

DURATION OF ACTIVITIES & DEGREE OF ANTICIPATED DISTURBANCE

The type of disturbance, the proximity to disturbance, and the planned fence longevity are factors that influence which type of exclusion fence is most effective. For short-term activities (i.e. 1 to 6 months) such as minor road repairs, a light-duty geotextile fence is appropriate. Longer term or permanent fencing projects, however, require more durable materials such as – heavy-duty geotextile, wood, concrete, woven-wire, sheet metal, vinyl panels, or galvanized mesh.

GEOTEXTILE FENCES

Geotextile fences (e.g. silt fences) come in many types and qualities. They can be very effective for the temporary exclusion of reptiles and amphibians. For the purposes of this document, temporary use ranges from a few months up to 2-3 years. Winter

weather is generally damaging to geotextile materials and the cost of maintenance over the long-term should be considered during the planning phase. Depending upon the quality, geotextile can be resistant to UV degradation and the bio-chemical soil environment.

Light-duty Geotextile Fencing:

Light-duty geotextile fencing is made of nylon material and is typically purchased with wooden stakes pre-attached at 2 m to 3 m intervals (Plate 1). It can also come without pre-attached stakes. Light-duty geotextiles are largely intended for projects with shorter durations of only a few months in duration and up to one season.

Geotextile fencing with nylon mesh lining should be avoided due to the risk of entanglement by snakes.

To use light-duty geotextile fencing:

- Fencing fabric is effective if attached to wooden, heavy plastic or metal stakes using heavy-duty wire staples or tie-wire (Figure 2).
- Secure the fence on posts that are placed at 2 m to 3 m apart. If using the greater recommended distance between posts, additional maintenance may be required to maintain effectiveness.
- Securely drive the stakes into the ground to a recommended depth of 30 cm. The fencing fabric should be buried to the recommended specifications in Table 1 and back-filled with soil.
- For snakes, supporting posts should be staked on the activity side (e.g. on the side facing the aggregate stock pile or the road - Figure 2).
- Light-duty geotextile fences are not effective where rocks or other hard surfaces prevent proper anchoring of fence posts and burial of the fence fabric.
- Light-duty geotextile fences are not effective where a large amount of concentrated run-off is likely or to cross streams, ditches or waterways without specific modifications.
- Contact your local MNR staff or experienced exclusion fencing contractor for advice and recommendations.
- See general best practices section below for additional details.

Generally, light-duty geotextile fences are not effective if they exceed 1 metre in height unless purposely manufactured for greater height (e.g. stakes placed at closer intervals or cross braces). If greater height is required consider using heavy duty geotextile, hardware cloth or other fencing materials.

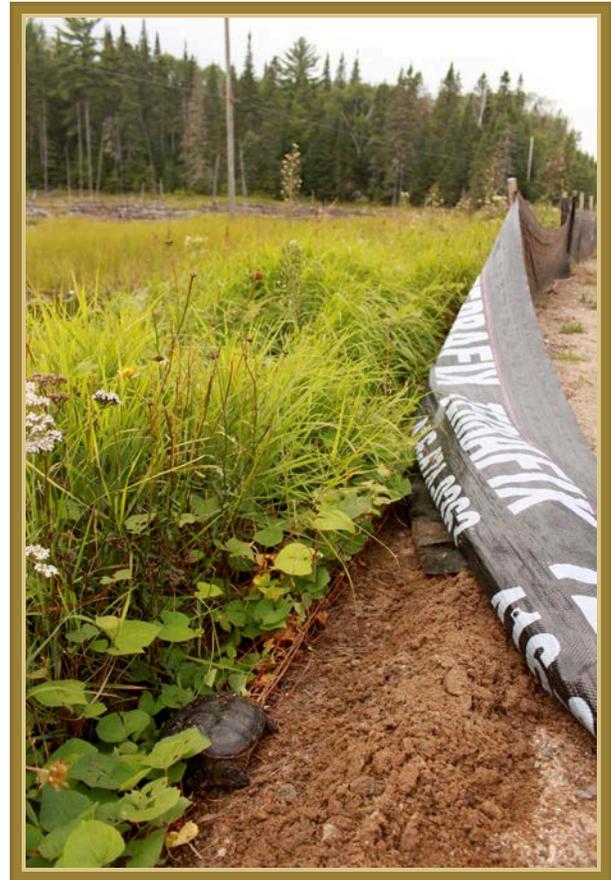


Plate 1. Light-duty geotextile fencing with pre-attached wooden stakes used to exclude turtles from a road as seen on a regular maintenance check (photo credit: Brad Steinberg).

Heavy-duty Geotextile Fencing:

Heavy-duty geotextile fencing is typically constructed of a thick felt-like fabric. It may also be called 'double row' or 'trenched' fencing. For support, this fencing uses a woven wire fence (e.g. chain link) or some other structure (Plate 2). It is recommended that a minimum density of 270R or equivalent woven geotextile fabric is used.

Heavy-duty geotextile material can be effective for up to 2 or 3 years with proper maintenance. This type of fencing can be damaged by small mammals chewing through or torn by heavy debris (e.g. tree branches). Therefore, it may be best suited to turtles, which are less likely to take advantage of holes or tears in the fabric. If

used to exclude snakes or other animals, more maintenance may be required.

Heavy-duty geotextile fencing:

- The wire fence should be installed on the activity side to prevent animals from leveraging and climbing into the exclusion area while allowing the animal to escape if they find themselves on the wrong side (Figure 2).
- Geotextile fences across streams, ditches or waterways should have case-specific modifications.
- Contact your local MNR staff or experienced exclusion fencing contractor for advice.
- See light-duty geotextile section above and general best practices below for additional details.



Plate 2. Example of a heavy-duty geotextile fencing used to exclude snake species (photo credit: Jeremy Rouse).

HARDWARE CLOTH FENCES

Hardware cloth (also known as galvanized mesh or Birdscreen) is durable, cost effective and useful for excluding reptiles and amphibians. The fence should be made of heavy galvanized hardware cloth with a ¼ inch mesh. For fences intended to exclude small snakes, a ⅛ inch mesh may be more effective. In contrast, fencing intended to exclude turtle species can have a larger mesh size (e.g. ½ inch). Larger mesh may have a longer lifespan as it is constructed from a thicker material compared to smaller mesh sizes.

To use hardware cloth fencing:

- Secure the fence on posts placed a recommended 2.5 m apart with the stakes on the activity side (Figure 2).
- Pull the mesh taut and staple or secure with screws and a metal stripping to prevent the mesh from being ripped when pressure is applied.
- Installing a top rail or folding the mesh over a taut smooth wire reduces tearing (Plates 3 and 4).
- An outward facing lip installed on the species side ensures that snakes and amphibians are unable to climb or jump over the fence (Figure 2; Plate 4)
- Tears can be mended with 18-gauge galvanized wire.
- See general best practices section below for additional details.



Plate 3. Example of a galvanized mesh fencing used for the long-term exclusion of snakes and turtles from the adjacent highway (photo credit: Megan Bonenfant).



Plate 4. Long-term to permanent exclusion fencing using galvanized mesh with over-hanging lip to prevent animals from climbing or jumping over (photo credit: Megan Bonenfant).

WOOD LATH SNOW FENCING

In certain circumstances, wood lath snow fencing can be effective at excluding turtles. This fencing is typically constructed from soft wood slats that have been woven together with 13-gauge wire and is then attached to steel fence posts which have been driven into the ground.

Wood lath fencing is cost effective and can easily be laid down during the winter to prevent damage. The durability of the material, however, is not meant for very long-term use (e.g. more than 3 years), unless regular maintenance occurs.

To use wood lath snow fencing:

- The fencing should be attached to heavy plastic or metal stakes using heavy-duty wire staples or tie-wire.
- The stakes are recommended to be placed at 2 to 3 m intervals and securely driven into the ground 30 cm or more.
- Wood lath snow fencing across streams, ditches or waterways should have case-specific modifications.
- Wood lath snow fencing lends itself well to being combined with other types of material to ensure complete exclusion.
- See general best practices section below for additional details.



Plate 5. Example of a wood lath snow fencing used to exclude turtles (photo credit: Karine Beriault).

EXCLUSION FENCING FOR GRAY RATSNAKE AND EASTERN FOXSNAKE

Gray Ratsnake and Eastern Foxsnake are the largest snakes in Ontario - reaching nearly 2 m in length. They are also excellent climbers. For this reason, fencing intended to exclude either of these species has additional recommended design specifications.

- The fence should be at least 2 m high.
- The material on the species side (Figure 2) should be smooth to prevent the snakes from climbing into the excluded area.
- Stakes should be on the activity side of the fence (Figure 2).
- Due to the increase in fence height, it is valuable to decrease the distance between posts or install diagonal braces.
- See general best practices section below for additional details.

CONCRETE, SHEET METAL & VINYL WALLS

Concrete, metal or vinyl walls can stand alone or be combined with woven wire or chain link fences. They are durable, require minimal maintenance and are effective in excluding target species from high risk areas and guiding them to crossing structures or other desired locations (Plates 6 and 7). This fence type is comprised of a continuous vertical face of concrete, metal or vinyl sheeting with no gaps. Concrete walls can be installed as either pre-cast sections or pour directly in place.



Plate 6. Stand-alone continuous concrete wall used to exclude salamander species installed as pre-cast forms (photo credit: Steven Roorda).



Plate 7. Pre-formed vinyl sheeting fence intended to exclude salamanders for a construction site (photo credit: Herpetosure Ltd.)

The wall height depends upon the target species, but they are usually between 45 and 60 cm tall and buried 25 cm. Concrete, metal or vinyl exclusion fencing is most appropriate for salamanders, skinks, small snakes, and small turtles. For large turtle species, a chain link fence can be installed directly on top of the concrete wall for complete exclusion.

HABITAT CONNECTIVITY

Habitat connectivity is the connectedness between patches of suitable habitat or the degree to which the landscape facilitates animal movement. Exclusion fencing installed along roads or other large projects can effectively reduce or eliminate habitat connectivity for animals. In these scenarios, exclusion fencing should be considered with eco-passages in order to maintain connectivity. Fencing in isolation should be viewed as a temporary method to reduce mortality until species movement can be restored. Where eco-passages are not feasible they should be identified for consideration with any future road work or development to improve connectivity.

During the installation of fencing with an eco-passage, it is important that the fencing sits flush with the passage to ensure that

there are no gaps where animals can squeeze through.



Plate 7. A wood turtle travelling through a dry eco-passage. Ecopassages such as this help to ensure the long-term connectivity of seasonal habitat for this and other reptile and amphibian species (photo credit: Amy Mui).

GENERAL BEST PRACTICES:

- To deter digging, bury the fence 10 cm down with an additional 10 cm horizontal lip (Figure 2).
- Backfill and compact soil along the entire length on both sides of the fence (Figure 2).
- Once the fence is installed, a survey should be done to ensure that no individuals have been trapped inside (speak with MNR for survey advice).
- Exclusion fencing intended to exclude snakes should have the stakes installed on the activity side (opposite the normal requirement for sediment control fencing) to prevent snakes from using the stakes to maneuver over the fencing.
- For snakes and toads, the fence should have an overhanging lip on the species side (Figure 2).
- Fences should be inspected after spring thaw and at regular intervals throughout the active season, especially following heavy rain events. This is particularly important

for geotextile fences. Any damage that affects the integrity of the fence (e.g. tears, loose edges, collapses, etc.) should be fixed promptly.

- Tall or woody vegetation on the species side of the fence should be managed if there is a risk that it may enable the animals to climb over. This is most important during spring and fall. Proceed cautiously to not harm animals protected plant species during vegetation removal.
- When installing an eco-passage, fencing or exclusion walls should be used as a guiding system to direct animals to passage openings.
- Natural screens such as trees or shrubs can help to reduce road access and can be combined with fencing to provide protection of individuals from predation.
- Install fences with a turn-around at the ends furthest from the wetland habitat and at any access areas to assist in redirecting animals away from any fence openings (Figure 1).
- Curving the ends of the fencing inward (i.e. away from the road or construction site) may help to reduce access to these locations. The ends may also be tied off to natural features on the landscape such as trees or rock cuts.

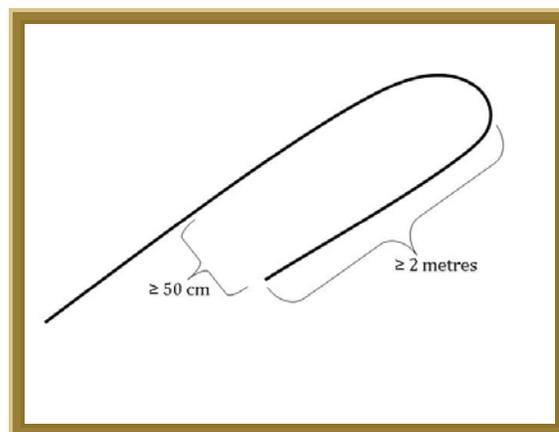


Figure 1. Diagram of the ends of the fence designed to curve inward in order to direct animals away from the area of exclusion.

WATER MOVEMENT & DRAINAGE

- In areas where surface water run-off may erode a soil-based backfill, consider using rocks or sand bags. Ensure these materials cannot be used by animals to climb over the fence.
- Where possible, minimize the number of water crossings: when necessary, it should occur where flow is minimal.
- Fence posts in waterways or areas prone to seasonal flooding should be driven rather than dug – unless following established best practices.
- Fencing should be placed above the high water mark anticipated for high water events such as spring freshet or periods of heavy or continuous rainfall.

TOPOGRAPHY:

- Fence posts should be closer together in undulating topography.
- Fences installed on slopes have a different effective height depending upon whether the animal will be approaching from the up or down slope. The fence height can be adjusted accordingly.

Improvements or questions regarding exclusion fencing can be brought to the local MNR Species at Risk Biologist or other MNR staff.

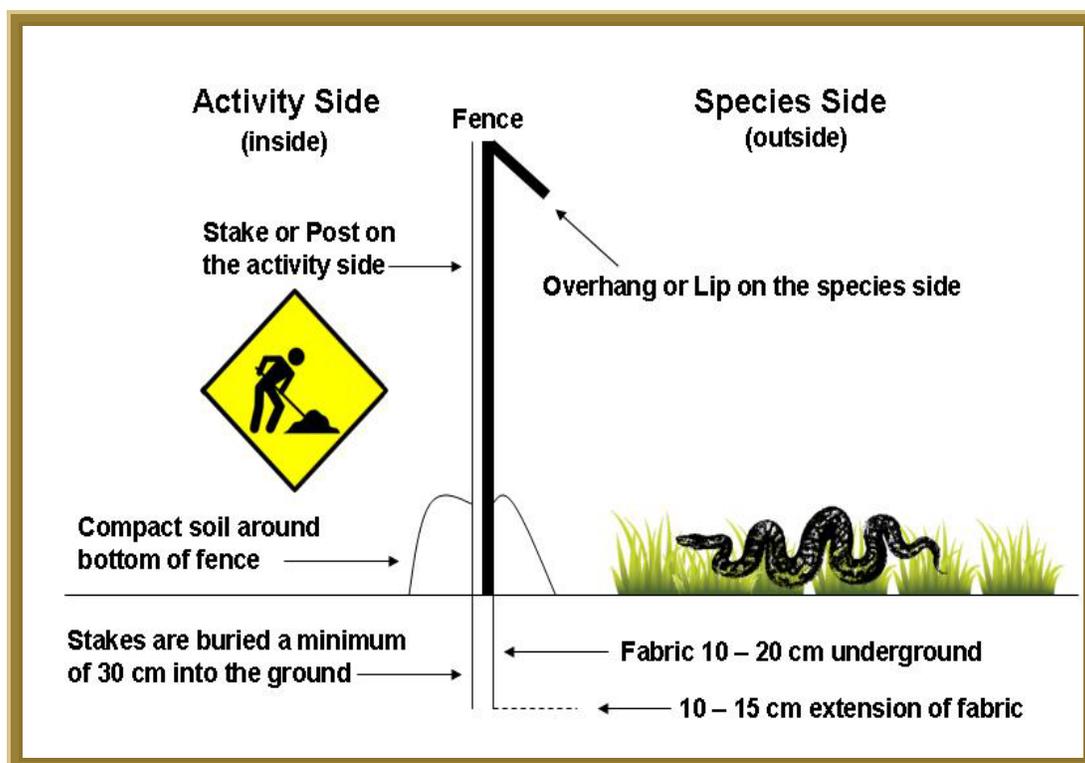


Figure 1. A side view of a basic exclusion fence including an overhang or flexible lip to deter animals from climbing or jumping over the fence. Placement of the stake on the Activity Side or on the inside of excluded area is also illustrated. This is particularly important for snake species which may use the stakes to maneuver over the fence.

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For additional information:

Visit the species at risk website at
ontario.ca/speciesatrisk
Contact your MNR district office
Contact the Natural Resources
Information Centre
1-800-667-1940
TTY 1-866-686-6072
mnr.nric.mnr@ontario.ca
ontario.ca/mnr

APPENDIX F
EROSION AND SEDIMENT CONTROL GUIDELINES



PART 2:

ENVIRONMENTAL STANDARDS AND GUIDELINES



Category	Environmental Standards and Guidelines	Identifier
Pre- Construction Works and Activities	Erosion Control	<u>ESG-1-Pre</u>
	Sediment Control	<u>ESG-2-Pre</u>
	Soil Stripping, Grubbing and Stockpiling	<u>ESG-3-Pre</u>
	Tree Protection and Hording	<u>ESG-4-Pre</u>
	Vegetation Clearing and Protection	<u>ESG-5-Pre</u>
Construction Works and Activities	Abrasive Blasting	<u>ESG-1-C</u>
	Blasting	<u>ESG-2-C</u>
	Borehole and Rock Drilling	<u>ESG-3-C</u>
	Chipping and Cutting	<u>ESG-4-C</u>
	Concrete Pour Operations and Grouting	<u>ESG-5-C</u>
	Dredging and Sediment Removal	<u>ESG-6-C</u>
	Fish Exclusion, Salvage and Relocation	<u>ESG-7-C</u>
	Fugitive Dust Control During Construction	<u>ESG-8-C</u>
	Grinding and Welding	<u>ESG-9-C</u>
	Installation and Removal of Cofferdams and Isolation Structure	<u>ESG-10-C</u>
	Invasive Species Management	<u>ESG-11-C</u>
	Pile Driving	<u>ESG-12-C</u>
	Refueling and Spill Management	<u>ESG-13-C</u>
	Treatment of Discharge Waters	<u>ESG-14-C</u>
	Use and Maintenance of Heavy Equipment	<u>ESG-15-C</u>
	Vehicle and Equipment Washing and Cleaning	<u>ESG-16-C</u>
	Wildlife and Species at Risk Protection During Construction	<u>ESG-17-C</u>
	Winter Weather Stabilization and Operations	<u>ESG-18-C</u>
Post-Construction Works and Activities	Revegetation	<u>ESG-1-Post</u>



Erosion Control (ESG-1-Pre)

Application to Ontario Waterways' Projects

Land based construction involving activities such as vegetation removal, topsoil stripping, excavation or soil stockpiling create the potential for soil erosion that can affect surface water quality or deposit fine sediment into adjacent wetlands and waterbodies. Protecting exposed soil from erosion and containing run-off to prevent off-site migration is a critical component of construction, maintenance and repair projects on Ontario Waterways. For this reason, industry accepted standard erosion control devices are extensively used on both major and small scale land based construction projects.

Description of Activity

Erosion controls for construction sites are intended to deal only with rainfall / snowmelt water within the site, and not for handling water from off the construction site. Construction site erosion control practices generally involve preserving existing vegetation, staged removal when possible, or stabilizing disturbed areas with exposed soils with temporary covers comprised of seeded vegetation or sod. Methods depend on the duration of soil exposure, the phase of the project, and/or the season in which the erosion control methods are being applied. The selection of appropriate erosion controls involves identifying the factors that influence the type and severity of potential erosion. Factors that influence the type of erosion control method to be used include climate, soil properties, soil cover, land management and topography.

- | | |
|-------------------------|--|
| Climate / Precipitation | <ul style="list-style-type: none">• Duration and intensity of rainfall, snowfall and snowmelt regulates the amount of soil detachment and subsequent loss from the land. The greater or more intense the rainfall, snowfall and subsequent snowmelt, the greater the potential for erosion. |
| Soil Properties | <ul style="list-style-type: none">• Soil texture (the proportion of clay, silt, and sand particles in a soil) influences infiltration of water as well as the ease of detachment. For example, sand and silt particles are most easily detached because they are small and do not easily form aggregates and are more easily eroded. In contrast, more calcareous soils tend to erode more easily on steep slopes, while clay soils have low potential to erode on steep slopes. However, sandy soils will tend to settle in water more quickly than silts and clays. For this reason, erosion controls are geared towards managing the finer sized particles that have the greatest potential to result in turbid waters. |
| Soil Cover | <ul style="list-style-type: none">• Bare soil is exposed to the full erosive power of rain, snow and runoff / snowmelt water. Vegetative canopy helps stabilize soil and controls runoff. The vegetative canopy intercepts rain and reduces its erosive energy. Dense canopies that cover much of the soil surface intercept a large proportion of the rainfall. Soil covers comprised of seeded vegetation or sod also minimize the contact of runoff / snowmelt water with soil. Here, the roots of vegetation, such as grass, bind soil particles together to resist erosion. |
| Land Management | <ul style="list-style-type: none">• Clearing, grading, and other activities disturb the soil surface, remove existing vegetation, and alter topography, thereby increasing erosion risk. Massive land clearing done by large construction equipment pulverizes the soil and clears all vegetation. This mechanical disturbance exposes the soil directly to the impact of rainfall energy. Highly disturbed soils have also lost much of the organic matter that glues them together. Also, the rate of water infiltration is usually decreased and water that does not soak into the soil runs off carrying sediment. |



Topography /
Slope Length

- The degree of steepness (percent slope), as well as the slope length, is important. Steep slopes have high runoff water velocity. This increases its erosive energy (i.e., the erosive energy of runoff is a function of runoff velocity and volume). When the slope is longer (length), surface area for water collection also increases and therefore increases the run-off volume.

Erosion controls require proper selection, installation and regular inspection and maintenance. Along with non-structural methods such as minimizing the amount of exposed soil at a site, erosion controls generally either dissipate energy or divert surface run-off.

Environmental Standards and Guidelines

Site-specific erosion controls (as part of an overall Surface Water Management, Erosion and Sediment Control Plan, shall be developed by a Qualified Professional(s) and included in the Contractor's EMP for review and acceptance by PCA. Timing and scheduling, staging, minimizing the amount of exposed soil, surface stabilization and directing surface water runoff away from exposed soil and managing water within the work zone must be considered in developing site-specific plans.

Timing and Scheduling

Developing a schedule and planning the project are the very first steps in developing an effective soil erosion control program. Erosion control strategies shall be undertaken and specific erosion control devices shall be installed prior to the undertaking of any ground disturbing activities and prior to winter operations.

Staging and Sequencing

Construction staging and sequencing shall be planned to minimize the duration of time that soils are disturbed and exposed to erosive forces prior to and following construction. The best form of erosion control is not to disturb soils unless absolutely required and only immediately prior to the required work. Project staging must be described in the Construction Plan of the site-specific EMP. Best practices in construction staging (VOI, 2005) are:

- Dividing the overall project site into a series of smaller work areas and implement construction progressively rather than simultaneously in all work areas. The erosion potential within each work area should be determined (see below) to assist in selecting appropriate erosion controls;
- Erecting barriers to restrict construction activities to within the identified work boundaries; and
- Maintaining existing vegetation or providing temporary vegetative cover in areas that are inactive.

Minimize Disturbance and Buffer Strip

The primary objective of buffer strips is to protect the riparian zone along wetlands and waterbodies, which is critical to the maintenance of a healthy aquatic environment. Where practical, the retention of vegetated buffer strips should be planned for works adjacent to all waterbodies and wetlands.

Surface Stabilization

Surface stabilization techniques must be considered and, if appropriate, described in the site-specific EMP. Surface stabilization is a process that protects exposed surface soils from wind and water erosion. Techniques can vary from roughening the surface soil, benching and contour furrows, applying an organic layer or covering, applying a tackifier, seeding or using soil erosion control blankets. In some cases using



one or more of these techniques may be required. Techniques should be chosen based on duration of treatment (i.e., short term vs permanent).

Directing Surface Water Runoff Away From Exposed Soil

Surface water diversion techniques must be considered and, if appropriate, described in the site-specific EMP. Diversion structures redirect potentially erosive flow away from or around exposed soils and towards a well vegetated area for runoff deposition or into a treatment facility. Reducing the amount of water in the work zone will decrease effort in treating turbid and potentially contaminated water. These techniques include: slope drains, diversion berms, conveyance channels or diversion dykes. These techniques are often used in conjunction with surface stabilization on steep slopes and erosion prone soils.

Determining Erosion Potential

As discussed above, several factors can influence the erosion potential of soils within a work area. The risk of soil erosion is directly related to the slope and the soil properties within the work area. Runoff pathways, slope patterns and valley features will also influence the likelihood of runoff / snowmelt waters causing erosion. It is important to consider all potential sources of runoff, including snowmelt waters, groundwater seeps, etc.

- Steep slopes with a grade greater than 33% and consisting of sandy and light silty soils are at a very high risk of erosion.
- Moderate slopes with a grade between 17% and 33% with sandy and light silty soils or medium and calcareous soils have a high or moderate risk of erosion, respectively.
- Gentle slopes with a grade between 10% and 17% have a low to moderate risk of erosion for medium and calcareous soils; with clay till or heavy soils having a low risk of erosion on most slope.

As noted above, if the finer sediments such as clays and silts get into suspension in a waterbody, they do not settle out or deposit as quickly as more coarse materials such as sands. Suspension is when material made up of very fine particles such as clay and silt are lifted as the result of turbulence and transported by flowing water. The faster flowing and more turbulent the water, the more suspended the material becomes

Selecting Erosion Control Measures

The selection of erosion control measures shall considered a variety of factors, including: the size of the work area, its erosion potential (see above), the extent of vegetation cover, degree of soil compaction, and the duration of treatment.

Areas with higher risk of erosion typically require multiple and more robust control measures. More robust measures are those that require the construction of facilities and structures such as diversion dikes, channels, swales and slope drains. The following provides suggested erosion control measures/devices and associated best practices.

Slope Texturing and Surface Roughening

Slope texturing, surface roughening uses tracked equipment or agricultural implements to leave the ground surface in a rough textured condition to reduce soil erosion or to prepare a seed bed. The measure reduces runoff velocity and increase infiltration. Best practices and limitations (VOI, 2005) include:



- Leaving slopes in rough condition when building fills, excavating cuts or reapplying topsoil.
- All slope texturing practices must be applied on-contour (i.e., across the slope).
- Slope texturing and surface roughening are not practical on short slopes or slopes steeper than 2H:1V.
- Roughness elements should be randomly sized and spaced, between 50 mm to 100 mm in height.
- When using tracked equipment or agricultural implements to roughen surfaces, limit the activity to one or two passes to minimize soil compaction.
- Narrow, gently (~ 1%) in-sloping soil benches should have an elevation change of <8 m. Design of benches should be undertaken by a Qualified Professional(s).
- Seeding should occur immediately following slope texturing or roughening.

Mulching and Compost

Mulching is the application of a protective layer of organics such as straw, woody fibres or other suitable organic material to temporarily stabilize bare and disturbed soil. Mulch can be applied most times of the year. Trees and shrubs removed from the construction site during clearing activities can be shredded and used as mulch on newly exposed surfaces. The application of mulch results in protection of surface soil from raindrop impact, increased surface water infiltration, conservation of moisture, prevention of soil compaction or crusting, and decreased surface water runoff. Mulching also fosters growth of vegetation by protecting the seeds from predators, reducing evaporation, and insulating the soil.

Hydromulching is a soil stabilization technique where a fibre mulch is applied to disturbed and exposed soil surfaces and is primarily intended to protect the soil surface from raindrop impact erosion. The fibre which may be wood fibre, straw, or compost is applied to the soil surface hydraulically in a slurry consisting of the fibre, water and a binding agent. Hydromulch is applied using a mechanical hydro seeder and can also be used as a tackifier for straw mulch or in combination with seeding. When applied correctly and when using the proper mulches and tackifiers, the hydromulch can be effective against soil erosion for over a year.

A compost blanket is a layer of compost applied to surface soil to prevent erosion, especially rills and gullies used for temporary or permanent erosion control and slope stabilization and vegetation establishment. Compost erosion control blankets act similarly to mulch products but provide organic nutrients that promote vegetation growth, even in areas where germination, moisture management and irrigation could be challenging. For these reasons, a compost blanket can be more effective at vegetation establishment, weed suppression and erosion control than an Erosion Control Blanket or hydroseeding. Compost blankets are typically applied to slopes with pneumatic blower trucks which make them easy to apply to slopes or hard to reach areas.

Best practices and limitations (VOI, 2005) include:

- Organic mulches can be applied to a range of slope gradients up to 1.5H:1V and most soil types.
- Should not be used as a stand-alone or long term (>1 year) erosion control measure but should be combined with other erosion control measures for optimal performance.
- Some mulches can inhibit or prevent vegetative growth, while others promote vegetation growth and establishment.
- Straw, woodchips, woodfibre and compost materials are preferred. Use of recycled paper (cellulose) requires review and acceptance by PCA prior to application.
- Mulches must be applied as recommended (see below) to be effective as an erosion control measure:



- Straw
 - Straw is applied evenly in a 20 – 40 mm thick layer in *areas that will be seeded*, at a bulk application rate of 3,300 – 4,500 kg/ha over 80 – 90% of the soil surface. Straw should be anchored through crimping or tackifiers.
 - Straw is applied evenly in a 40 - 60 mm thick layer in *areas that will not be seeded*, at a bulk application rate of 4,500 – 6,700 kg/ha over more than 90% of the soil surface. Straw should be anchored through crimping or tackifiers.
- Woodchips
 - Locally generated woodchips are applied evenly in a 50 – 75 mm layer, at a rate of 13,500 kg/ha mixed in a 30% woodchip to 70% soil ratio.
- Woodfibre
 - Woodfibre is applied hydraulically at a rate of 1,200 - 1,500 kg/ha mixed in a 20 kg of wood fibre to 500 litres of water (or in accordance with manufacturer’s specifications)
 - Effective as a temporary erosion control measure on slopes less than 4H:1V.
- Compost
 - Compost is applied onto roughened or decompacted soils on slopes as steep as 1H:1V and 1 – 2 m back from slope crest
 - Compost blanket thickness varies with slope and anticipated rainfall over a 24 hour period.

Slope (H:V)	Recommended Compost Erosion Blanket Thickness (mm)		
	Rainfall = 16.5 mm	Rainfall = 50 mm	Rainfall = 100 mm
<4:1	12.5 to 50	25 to 50	50
4:1 to 3:1	12.5 to 50	25 to 50	50
3:1 to 2:1	25 to 50	25 to 50	25 to 50

Seeding, Hydroseeding and Sodding

Seeding is an important step in revegetating disturbed construction sites and will help reduce soil erosion issues. There are two approaches to seeding with the first being temporary seeding for short term exposed soils and long term seeding associated site revegetation. Seeding alone is not an erosion control method unless an erosion control blanket or Rolled Erosion Control Product is applied over top and secured in place.

Hydroseeding is the use of water as a medium to spray and spread seeds onto the seedbed. Hydroseeding is not an erosion control method unless a bonded fibre matrix is applied or an erosion control blanket or Rolled Erosion Control Product is applied over top and secured in place. Sodding offers a quick and relatively inexpensive method of establishing vegetation. Both of these techniques require frequent watering until roots become established. Best practices and limitations (VOI, 2005) include:

- Site soils must be prepared, decompacted (>300 mm) and amended for seeding and/or a suitable growth medium (see recommended topsoil thicknesses in Revegetation (ESG-1-Post)) be applied to support plant germination and growth. Soil pH should be >6.5. The type and amount of soil amendment (i.e., the fertilizer mix) shall be identified in the EMP.
- Dry seeding (i.e., by hand, rotary seeders, cyclone seeders, drill seeding) is preferred for small areas and/or longer term applications associated with site revegetation following construction.
- Hydroseeding is most appropriate for large areas where seedbed preparation is impractical and/or longer term applications associated with site revegetation following construction.



- Sodding is to be used for final landscaping purposes or for erosion control in very small areas (e.g., surrounding temporary buildings, along drainage ditches, etc.).
- Regular inspection and maintenance (once per week) is essential for successful seeding. Watering and multiple seeding / re-sodding operations may be required.
- Careful consideration must be given to timing, seed mixtures and application rates.
 - Timing
 - Seed areas immediately once the area is brought to final contour or would be left undisturbed for more than 30 days.
 - Seeding should occur on same day that the soil was prepared for seeding and preferably during spring or summer. Fall seeding is recommend for construction site winterization.
 - Seed Mixtures
 - Only seed mixtures native to Ontario, identified in the EMP and accepted by PCA shall be used.
 - Species will be appropriate for site conditions and habitat. Invasive species will not be used. A Qualified Professional(s) shall be consulted to assist with selection of seed mixture.
 - Application Rates
 - Apply seed mixes at recommended application rates (see Revegetation (ESG-1-Post)).
 - If hydroseeding is combined with hydraulic mulching in a single operation, seed application rates are increased by 25% – 30%.

Soil Binders / Tackifiers

Tackifiers are binding agents that act as a "glue" to hold soil particles together and are used to reduce soil erosion on loose dry soil. Tackifiers are also used to anchor straw mulch to the soil surface. Tackifiers can also protect seedbeds by holding the product to the soil surface and preventing movement. Tackifiers are available in both organic and synthetic varieties for specific applications. Commonly used organic products are guar, psyllium and starch. Synthetic products include various polymeric compounds and resins. Chloride compounds are primarily used for unpaved roadway stabilization. Best practices and limitations include:

- The purpose, type(s) and amount of tackifiers to be used shall be identified in the EMP and accepted by PCA.
- Petroleum based tackifiers are prohibited.
- Organic tackifiers are preferred to synthetic varieties. Application of soil stabilizer is intended to be conducted with conventional hydraulic seeding equipment. Soil stabilizer may also be placed by dry spreading. Application rates for common organic tackifiers are:
 - Guar is a non-toxic and biodegradable product that should be stored, mixed and applied according to manufacturer's specification, but typically between 45 kg/ha for flat areas and up to 80 kg/ha for 1H:1V slopes.
 - Psyllium is a biodegradable finely ground coating of plantago seeds, and is applied as a dry powder or in a wet slurry to the surface of the soil. It should be stored, mixed and applied according to manufacturer's specification, but typically between 90 to 225 kg/ha. Note that this product requires a 12 to 18 hour drying time prior to a precipitation event.
 - Starch is biodegradable, cold water soluble granular cornstarch mixed with water and typically applied at the rate of 168 kg/ha requiring a drying time of between 9 to 12 hours.



- Additional important considerations for soil binders and tackifiers include the following.
 - They are easily damaged by traffic and lose their effectiveness more rapidly than organic mulches.
 - They decompose with varying times, some within 60 to 90 days.
 - Material safety data sheets for all synthetic products should be provided to verify that products are free of toxics and to ensure proper handling.
 - When using soil binders and tackifiers, seed must be sown separately from the time when the soil binder or tackifier is applied.
 - When soil binders or tackifiers are used on permanent slopes, an approved mulch should be applied as well to protect and facilitate germination of new seed.

Rolled Erosion Control Products (RECP) and Fibre Rolls

Rolled Erosion Control Products (RECP) are soil stabilization devices consisting of prefabricate layers of material that is laid on the soil to protect disturbed surface soil from raindrop impact erosion. They are carpet-like mats, installed and anchored to properly prepared soil surfaces along slopes or to unvegetated conveyance systems. RECPs also protect seed sites and provide protection and cover for vegetation to become established.

Fibre rolls are long tubes that act as barriers to sediment, allowing water to flow through. Fibre rolls help control erosion by intercepting sheet flow and creating ponding of runoff water and promoting suspended sediment to settle out of runoff water. They are installed across slopes to slow or stop the flow of surface runoff and installed across shallow ditches and drains to reduce the velocity of flowing water.

Best practices and limitations (VOI, 2005) include:

- The type(s) and proposed application of RECPs and Fibre Rolls shall be identified in the EMP and accepted by PCA.
- RECPs and Fibre Rolls composed of plastics are prohibited (e.g., plastic netting).
- Only open weave, biodegradable products are to be used:
 - Erosion control blankets or organic fibre rolls composed of processed natural fibres (e.g., cereal, straw, coir or coconut husk, wood strands);
 - Open weave textile composed of natural fibres; and
 - Mulch control netting composed of natural fibres.
- Appropriate RECPs shall be used depending on application (i.e., slope, ditch/channel and soil conditions).
- Disturbed soils must be prepared and seeded prior to RECP installation. Do not seed or reseed over a RECP.
- RECPs shall be installed according to manufacturer's specifications and as illustrated in the Figures below (VOI, 2014). RECP fasteners such as wooden or biodegradable stakes are preferred to wire stakes, metal or plastic pins.
- RECPs shall be inspected weekly and following each rainfall or snowmelt event. Displaced or damaged RECPs shall be replaced. Rills that develop under the RECP must be filled with soil prior to replacement.



Temporary Diversion Ditches/Berms/Swales and Slope Drains

Diversion structures redirect potentially erosive flow away from or around exposed soils and towards a well vegetated area for runoff deposition. Diversion ditches, berms and swales are temporary barriers placed at the base of a slope or along the perimeter of construction areas to slow down the speed of runoff and reduce erosion potential. They are typically parabolic or trapezoidal in shape often constructed in association with dykes. Slope drains typically consist of flexible pipe that conveys water runoff down a hillside from one source toward a protected area or receiving waterbody. Temporary slope drains can also be constructed as open top drains or with plastic sheeting and geotextile fabric. These techniques are often used in conjunction with surface stabilization on steep slopes and erosion prone soils. Best practices and limitations (VOI, 2005) include:

- Diversion Ditches, Berms and Swales
 - The location and design of diversion ditches, berms and swales shall be identified in the EMP and accepted by PCA
 - Diversion ditches, berms and swales shall be designed by a Qualified Professional(s).
 - Temporary diversion ditches, berms and swales are not intended for diversion of a natural watercourse;
 - Individual structures are limited to small catchments of less than 2 ha.
 - Diversion ditches can be lined or armoured with a filter layer and rock. Berms and swales shall be stabilized immediately after construction.
 - Diversion ditches, berms and swales shall be installed as per design but generally as illustrated in the Figures below (VOI, 2014).

- Slope Drains
 - The location and design of slope drains shall be identified in the EMP and accepted by PCA.
 - Individual structures are limited to small catchments of less than 2 ha. A 2 ha catchment area would require a pipe diameter of approximately 760 mm. Smaller catchments require smaller sized pipes. If the catchment areas are greater than 2 ha, additional slope drains shall be installed.
 - Diversion ditches, berms and swales shall be installed as per design but generally as illustrated in the Figures below (VOI, 2014).

Inspection and Maintenance of Erosion Controls

- An inspection program (e.g., performance monitoring) that evaluates the integrity, functionality and effectiveness of erosion control methods shall be described in the EMP and accepted by PCA.
- Inspection of erosion controls within the construction area shall be undertaken weekly and following each rainfall or snowmelt event, and repaired as required. The inspections are intended to:
 - confirm erosion control methods and devices have been installed according to the contract plans and correctly according to installation standards;
 - confirm erosions control methods and devices are maintained and functioning as intended; and
 - identify deficiencies of selected measures based on observations of terrain, soils, or construction progress.



Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Sediment Control (ESG-2-Pre)
- Soil Stripping, Grubbing and Stockpiling (ESG-3-Pre)
- Vegetation Clearing and Protection (ESG-5-Pre)

Related EMP Component Plans

- Dust and Air Quality Management
- Blasting
- Demolition
- Site Dewatering and Wastewater Management
- Surface Water Management, Erosion and Sediment Control
- Dredging and Sediment Removal
- Vegetation Protection
- Wildlife Protection and Management
- Aquatic Resources Management
- Invasive Species Management
- Spills Prevention and Emergency Response
- Dam and/or Bypass Channel Commissioning
- Site Restoration

Other Design and Environmental Considerations

- Timing of works should avoid seasonally high rainfall and snowmelt periods.
- Timing windows for in-water works shall be respected.

References

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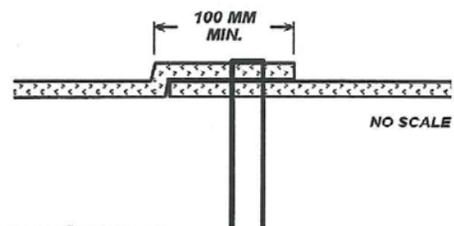
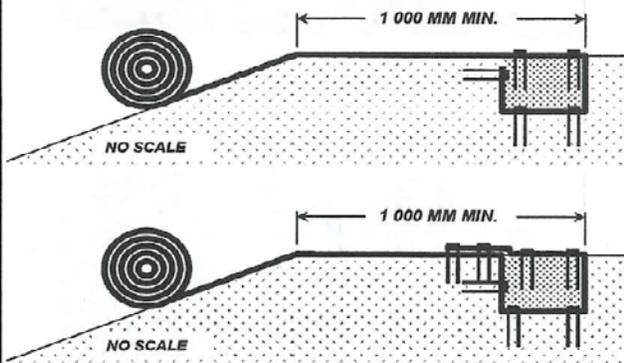
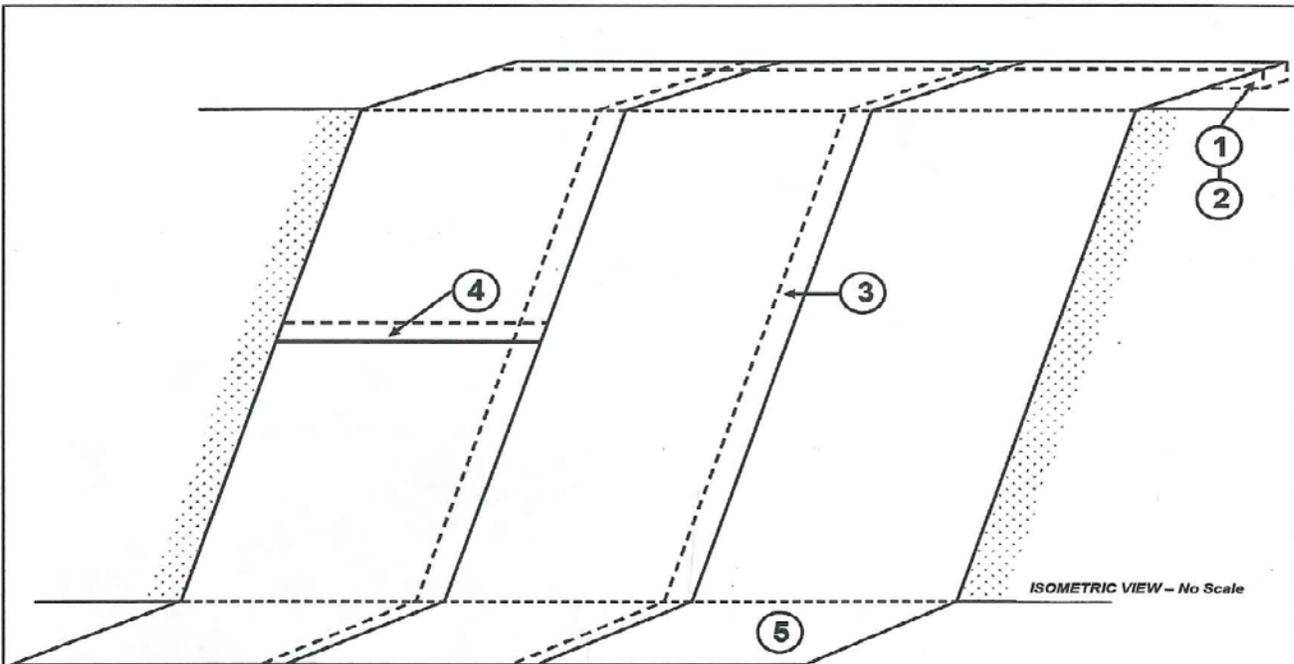
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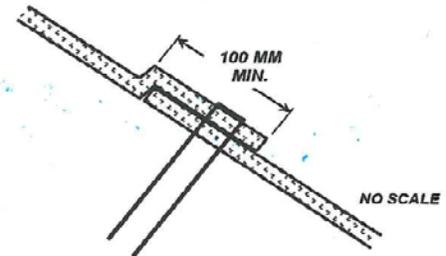
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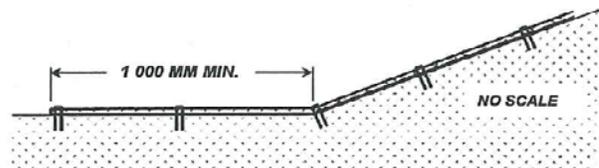
VOI Training Group, 2014. Environmental Field Procedures for Works in and About Water. Developed by Van Osch Innovations Ltd., 130 Columbia Street, Nanaimo, British Columbia, Canada.



- ③ SIDE SEAM OVERLAP**
1. ANCHOUR THROUGH BOTH RECPS
 2. ANCHOURS 150 MM O.C.



- ④ END ROLL OVERLAP**
1. ANCHOUR THROUGH BOTH RECPS
 2. ANCHOURS 150 MM O.C.



- ⑤ BOTTOM OF SLOPE TERMINATION**
1. ANCHOURS 150 MM O.C. AT TERMINAL END OF RECP
 2. ANCHOURS 150 MM O.C. AT SLOPE TRANSITION

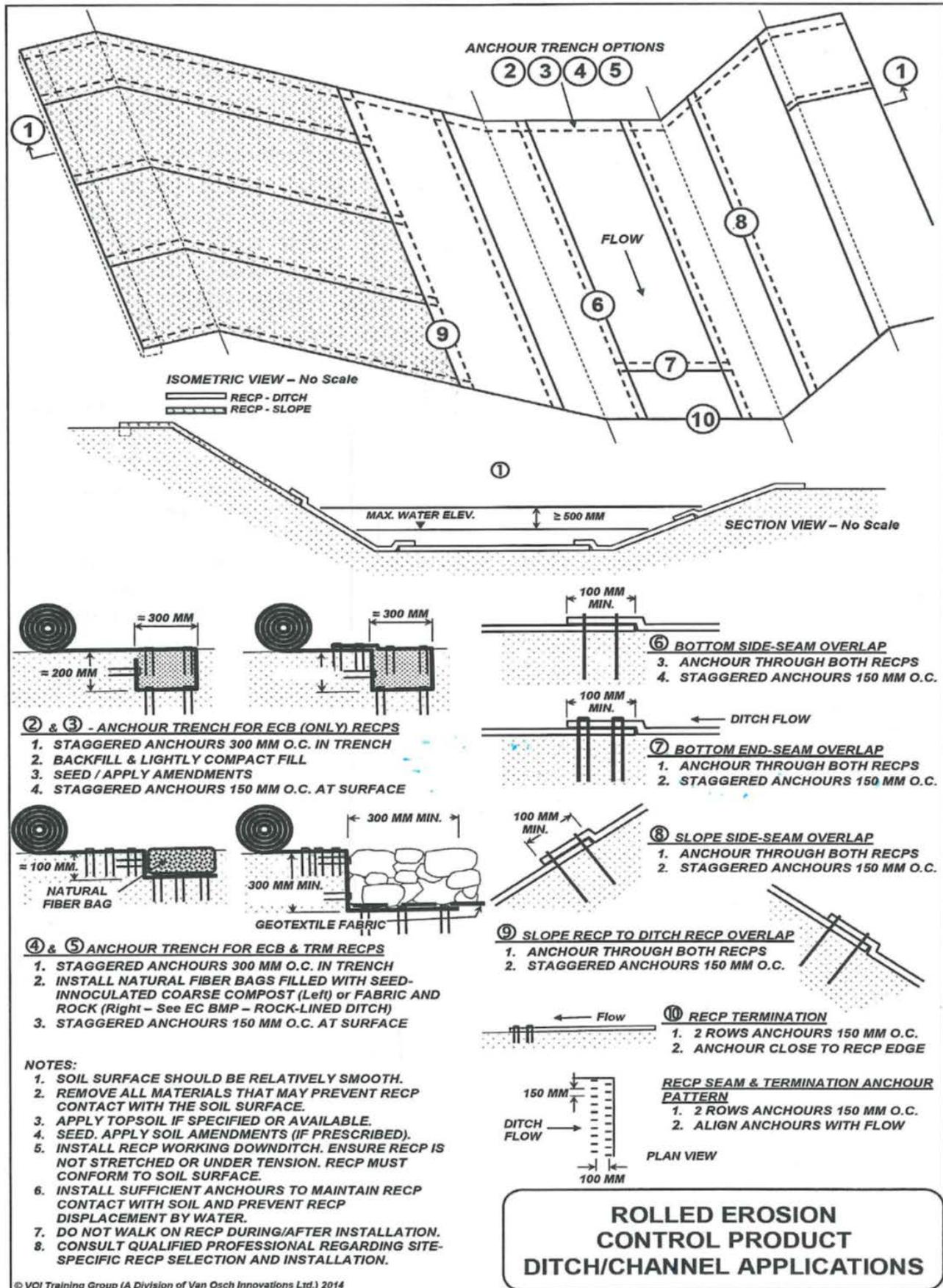
① & ② TOP SLOPE ANCHOUR TRENCH

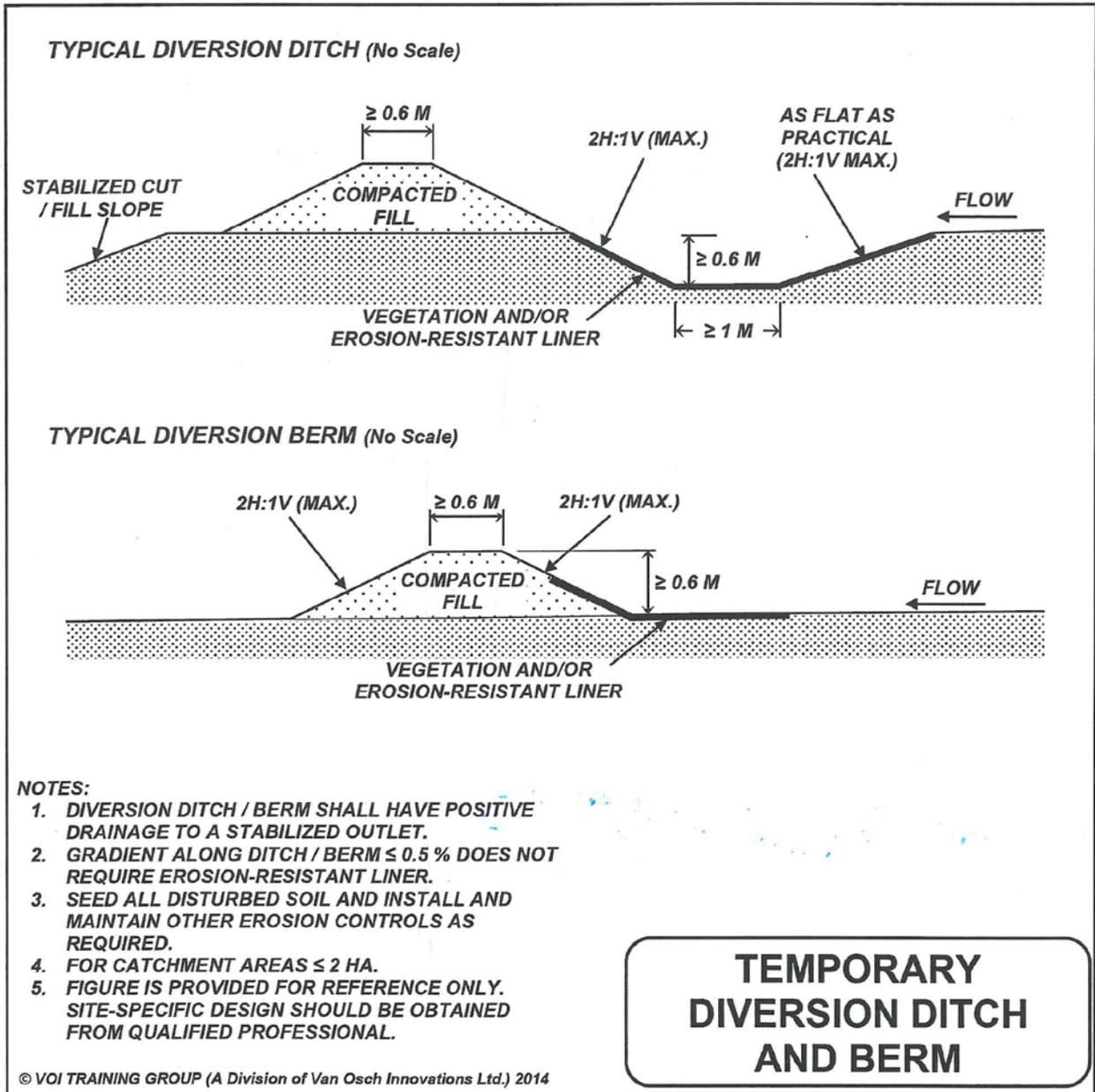
1. EXCAVATE 300 MM X 200 MM TRENCH
2. LAY RECP THROUGH TRENCH
3. STAGGERED ANCHOURS 300 MM O.C. IN TRENCH
4. BACKFILL & LIGHTLY COMPACT FILL
5. SEED / SOIL APPLY AMENDMENTS
6. STAGGERED ANCHOURS 300 MM O.C. AT SURFACE

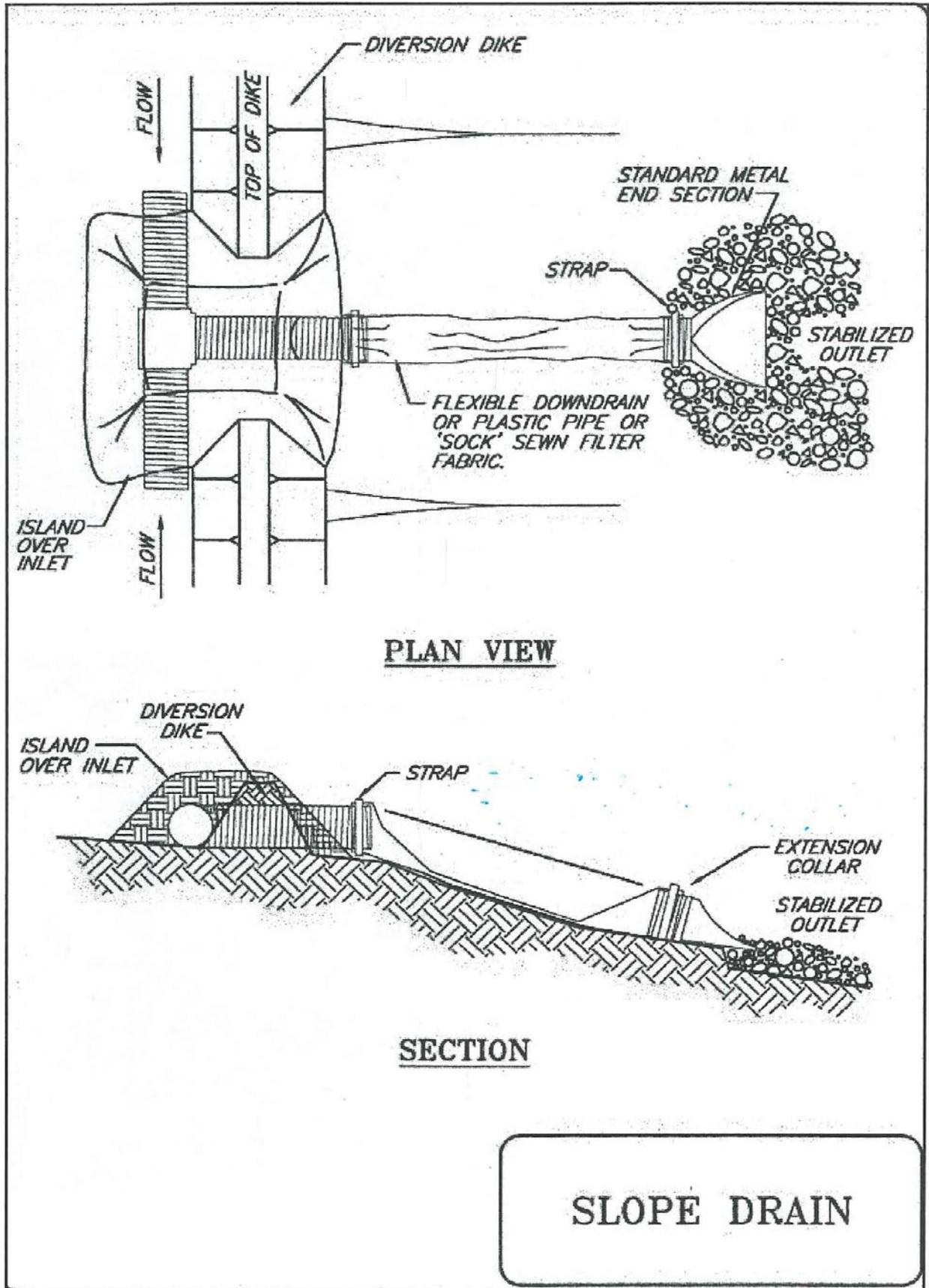
NOTES:

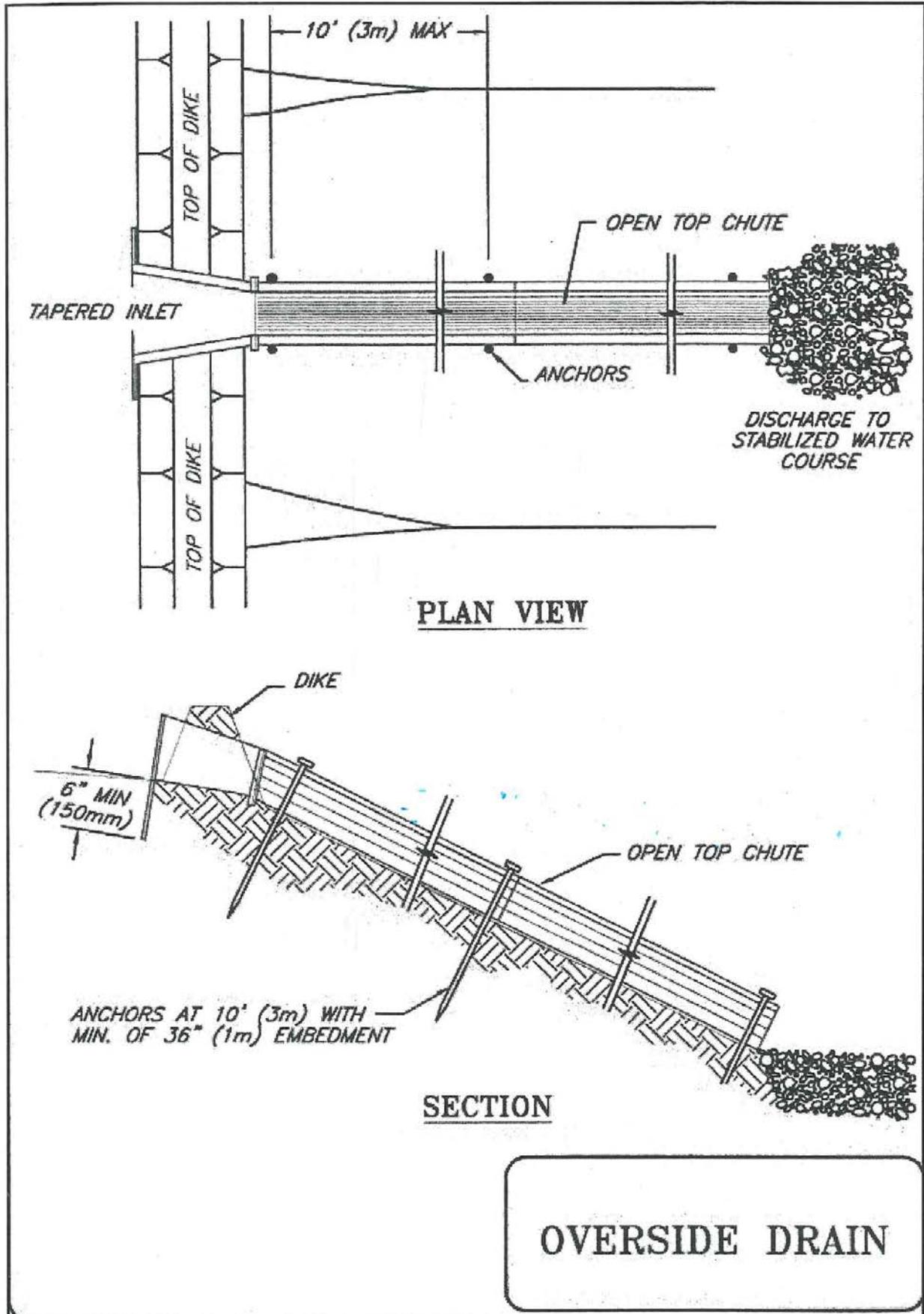
1. PREPARED SOIL SURFACE SHOULD BE RELATIVELY SMOOTH (NO SHARP DEPRESSIONS OR HUMMOCKS).
2. REMOVE ALL MATERIALS THAT MAY PREVENT RECP CONTACT WITH THE SOIL SURFACE.
3. APPLY TOPSOIL IF SPECIFIED OR AVAILABLE.
4. SEED AREA WITH SPECIFIED SEED MIXTURE AT SPECIFIED SEEDING RATE. APPLY SOIL AMENDMENTS, IF PRESCRIBED.
5. INSTALL RECP WORKING DOWNSLOPE. ENSURE RECP IS NOT STRETCHED OR UNDER TENSION. RECP MUST CONFORM TO SOIL SURFACE.
6. DO NOT WALK ON RECP DURING OR FOLLOWING INSTALLATION.
7. RECP SHOULD NOT BE INSTALLED ACROSS SLOPE.
8. INSTALL SUFFICIENT ANCHOURS TO MAINTAIN RECP CONTACT WITH SOIL AND PREVENT RECP DISPLACEMENT BY WATER / WIND.
9. ANCHOR DENSITY SHOULD BE DETERMINED BY SITE SPECIFIC CONDITIONS. CONSIDER GENERIC ANCHOR DENSITY / SPACING RECOMMENDATIONS TO BE MINIMUM ANCHOURING REQUIREMENT.
10. CONSULT QUALIFIED PROFESSIONAL REGARDING SITE-SPECIFIC RECP SELECTION AND INSTALLATION.

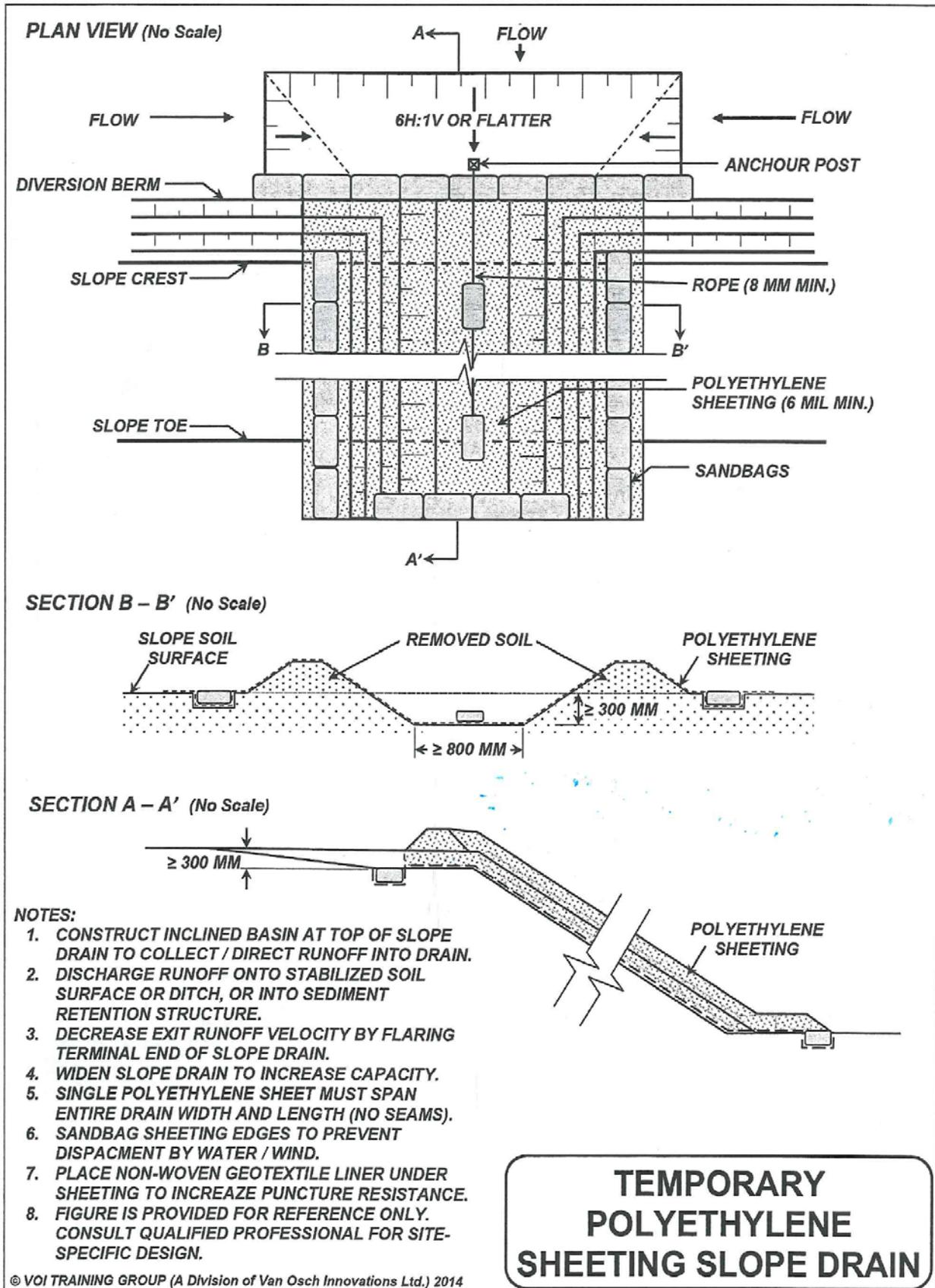
**ROLLED EROSION
CONTROL PRODUCT
OPEN SLOPE APPLICATIONS**













Sediment Control (ESG-2-Pre)

Application to Ontario Waterways' Projects

Land based construction involving activities such as vegetation removal, topsoil stripping, excavation or soil stockpiling create the potential for soil erosion and sedimentation that can affect surface water quality or deposit fine sediment into adjacent woodlands and wetlands. Protecting exposed soil from erosion and containing run-off to prevent off-site migration and deposition of fine sediment is a critical component of construction and maintenance projects. For this reason, the use of industry accepted standard erosion and sediment control devices are extensively used on both major and small scale land based construction projects on Ontario Waterways.

Description of Activity

Sediment control involves the installation of barriers on disturbed lands to minimize sediment laden runoff from leaving the work area. This is accomplished by introducing a barrier along a flow path to reduce velocities and dissipate energy together with providing opportunity for sediments to settle. These controls offer the second line of defence after erosion control against the offsite migration of sediment. The use of sediment controls involves properly installing the appropriate device or measure and regularly inspecting and maintaining them.

Environmental Standards and Guidelines

Temporary Barriers and Perimeter Controls

Temporary barriers and perimeter controls are used to protect adjacent undisturbed areas and waterbodies down gradient from the work area. They should not be considered as sediment control measure unless it meets the applicable standards and guidelines for installation. They may be used in some circumstances to divert sediment laden or clean water away from unprotected slopes and encroaching onto adjacent sensitive features such as waterbodies, wetlands and forest. In general:

- Uncontrolled sediment entering a waterbody will be considered a spill and must be reported to PCA and the Ontario Ministry of Environment and Climate Change Spills Action Centre (SAC).
- The use of stormwater drain sediment barriers is prohibited.
- The use of straw bale check dams is prohibited. Straw bales are only appropriate for structural support (e.g., sediment pond structural walls) or as straw mulch for erosion control.
- Perimeter earthen berms shall be considered for longer periods of perimeter control consider construction of earthen berms. See Erosion Control ([ESG-1-Pre](#)) for standards and guidelines.

Sediment fences (frequently referred to as silt fences) are temporary sediment barriers consisting of synthetic filter fabric entrenched into the soil with attached wooden or metal posts. A sediment fence does not filter run-off. It is intended create upstream ponding of sediment laden water, allowing the suspended sediment to fall out of suspension. A sediment fence is intended to address moderate sheet flow and is not suitable to treat concentrated flows. Best practices and limitations (VOI, 2005) include:

- The location(s) and type(s) of sediment fence shall be identified in the EMP and accepted by PCA.
- The locations and types of sediment fences shall be determined by a Qualified Professional(s).
- Sediment fences shall not be placed into drainage ditches or into a natural watercourse.
- Sediment fences constructed from woven geotextile fabric are preferred over non-woven fabrics.



- Maximum slope length above a sediment fence should be less than or equal to 30 m.
- Maximum gradient upslope of sediment fence should be less than or equal to 1.5H:1V.
- Maximum length of a single sediment fence from corner to corner should be less than or equal to 40 m.
- Sediment fences shall be installed as per design but generally as illustrated in the Figures below (VOI, 2014).

Stabilized Site Entrances

Vehicular Tracking Control and Mud Mats are devices placed at construction site access / exit points to stabilize site entrances by removing sediment (mud and debris) from construction vehicles leaving the site and entering adjacent established public roadways. Temporary tracking pads are constructed of clear stone underlain with geotextile material. Mud mats typically consist of high-strength fabric with high tensile reinforcing ribs confined within a sleeve which allows for easy deployment. Mats connect together to form custom sizes. Best practices and limitations (VOI, 2005) include:

- All construction site entrances from public roads shall be stabilized using temporary tracking pads or mud mats. Entrances with steep grades (>8%) shall be avoided.
- The location(s) and type(s) of vehicle tracking controls and mud mats shall be identified in the EMP and accepted by PCA.
- The design of stabilized site entrances, including vehicle tracking controls and mud mats, shall be determined by a Qualified Professional(s).
- Temporary gravel pads shall be constructed from 75 mm or coarser, clean open graded aggregate, with a pad thickness not less than 15 cm placed on non-woven geotextile fabric.
- The pad or mud mats should be designed for the full width of the entrance or a minimum pad/mat width of 3.6 m wide and the minimum pad/mat length of 5 m. Shorter lengths may be required at constrained entrances.
- The stabilized site entrance should be designed in combination with other erosion and sediment control measures and in combination with vehicle wash facilities (as required).

Sediment Retention Ponds

Sediment retention ponds are constructed depressions that allow runoff to pond and promote settling of sediment. They typically serve as an “end-of-pipe” control, receiving run-off from areas using other primary sediment and erosion control methods. Sediment ponds are generally used to contain runoff or divert flow during heavy precipitation events and improve the detaining of sediment through the active regulation of filling and draining. Passive draining can also be achieved using granular filled perforated risers and pipes. Sediment ponds occupy relatively large areas and are usually only considered on sites with disturbed drainage exceeding 2 ha in size. They are generally effective for 50 to 80% for the design rainfall / runoff event.

Sediment traps are similar to sediment ponds but generally smaller in area. Sediment traps require large surface areas, and as such, are not recommended for drainage areas of more than 2 hectares in size. Used in combination with sediment bags, they are generally placed near areas where sediment laden runoff may enter a waterbody. Traps are generally constructed by excavation within a low area of drainage. Best practices and limitations (VOI, 2005) include:

- The location(s) and sizes of sediment retention ponds and/or traps shall be identified in the EMP and accepted by PCA.
- The location(s) and design of sediment retention ponds and/or traps shall be determined by a Qualified Professional(s).



- Ponds shall be designed to maximize flow path length with a length to width ratio greater than 6:1.
- Embankment materials shall be clean soil placed 2H:1V in lifts not exceeding 140 mm. Soils shall be well compacted. Ponds shall be equipped with a stabilized outlet and an armoured emergency spillway.
- Sediment retention ponds shall be installed as per design but generally as illustrated in the Figures below (VOI, 2014).
- Sediment retention ponds and traps shall be cleaned when approximately 33% of their capacity has been filled with sediment.
- Proactive pumping of sediment retention ponds and traps into filtration bags shall be undertaken to improve the feature's capacity (freeboard). Access to sediment retention ponds shall be maintained in the event that sediment-laden water needs to be removed and filtered.

Filtration Controls

- Sediment Bags
- Siltsoxx™ and Filter Rings™

Sediment bags are fabricated from non-woven geotextile materials that filter sediment-laden water from dewatering operations. Sediment laden water is pumped into the non-woven geotextile fabric bag that allows filtered water to pass through. Sediment bags are preferred for use on relatively small sites as an effective method of removing sediment rather than larger sediment retention ponds. Sediment bags require frequent routine monitoring to ensure hoses and clamps remain connected and sediment accumulation does not exceed the manufacturer's specifications. Using flocculants will improve flow rates, discharge clarity and percentage of solids retained. Best practices and limitations include:

- The location(s), types and sizes of sediment bags shall be identified in the EMP and accepted by PCA prior to installation.
- The use of flocculants shall be identified in the EMP and accepted by PCA prior to use.
- The location(s), types and sizes of sediment bags shall be determined by a Qualified Professional(s).
- The required size structural integrity and flow rate of the sediment bag is dependent upon soil type in the dewatering area, pumping rates.
 - Sediment bags should be sized to accommodate a minimum of two times the peak flow rate generated from the dewatering pump to account for a 50% clogging factor.
 - Maximum pumping rate is typically 18,170 liters / hour.
- Sediment bag locations shall be relatively flat. Sediment bags can be placed directly on the ground surface, but can also be placed on a thin gravel pad, jute or straw mats. Sediment bags can be co-located with sediment retention ponds in the event that sediment laden water needs to be removed and filtered in the bag.
- Remove and replace sediment bags when half full of sediment or when discharge rate is not being achieved.

Siltsoxx™ and Filter Rings™ are temporary filtration devices that incorporate filter media inside a prefabricated semipermeable material to filter water passing through the device. Siltsoxx also promote ponding to create settling of fine sediment behind the device and can therefore also be used as a settling control. Siltsoxx™ is typically used to prevent or reduce sheet flow on areas up to and exceeding a 2:1 slope. Both Siltsoxx™ and Filter Rings™ also have the ability to bind various contaminants contained in run-off. Siltsoxx and similar devices can be provided in biodegradable forms, allowing the addition of



seeds to promote the establishment of vegetation directly in the Soxx, thus avoiding the need to remove the device and disturb the soil.

Turbidity Curtains

Turbidity curtains consist of geotextile material vertically suspended in water to enclose an in-water work area and contain sediment transport to a limited area within the disturbed water body. They are used around construction activities undertaken in-water. The turbidity curtains act as a filter baffle and isolate/protect an important or sensitive in-water feature. Turbidity curtains should not be used as a primary or secondary settling area for dewatering activities. Best practices and limitations include:

- The location(s), types and sizes of turbidity curtains shall be identified in the EMP and accepted by PCA prior to installation.
- The location(s) and type of turbidity curtains shall be determined by a Qualified Professional(s).
- Turbidity curtains must be used when constructing or removing coffer dams. They should be placed according to OPSD 219.260 and 219.261 for the Turbidity Curtain specifications and as close to the coffer dam as possible to minimize area of potential impact of sedimentation.
- Curtain should be positioned at least five (5) metres outside of the perimeter of the area of disturbance.
- Floatation devices should provide greater than 50 mm of freeboard.
- Curtains should be overlapped by at least 75 mm at the ends and should be sewn or threaded to form a continuous barrier.

Inspection and Maintenance of Sediment Controls

- An inspection program (e.g., performance monitoring) that evaluates the integrity, functionality and effectiveness of sediment control methods shall be described in the EMP and accepted by PCA.
- Inspection of sediment controls within the construction area shall be undertaken a twice weekly, in advance of and following each rainfall or snowmelt event, and repaired as required. The inspections are intended to:
 - confirm sediment control methods and devices have been installed according to the contract plans and correctly according to installation standards;
 - confirm sediment control methods and devices are maintained and functioning as intended; and,
 - identify deficiencies of selected measures based on observations of terrain, soils, or construction progress.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control (ESG-1-Pre)
- Soil Stripping, Grubbing and Stockpiling (ESG-3-Pre)
- Vegetation Clearing and Protection (ESG-5-Pre)
- Treatment of Discharge Waters (ESG-14-C)

Related EMP Component Plans

- Dust and Air Quality Management
- Blasting



- Demolition
- Site Dewatering and Wastewater Management
- Surface Water Management, Erosion and Sediment Control
- Dredging and Sediment Removal
- Vegetation Protection
- Wildlife Protection and Management
- Aquatic Resources Management
- Spills Prevention and Emergency Response
- Dam and/or Bypass Channel Commissioning
- Site Restoration

Other Design and Environmental Considerations

All sediment controls shall be designed to control a specified area, slope and sediment type.

- All sediment controls shall be designed to control a specified area, slope and sediment type.
- Timing of works should avoid seasonally high rainfall and snowmelt periods.
- Timing windows for in-water works shall be respected.

Further Guidance

OPSD 219.260 for Turbidity Curtains, November 2015. Available at:
[http://www.ragsb.mto.gov.on.ca/techpubs/ops.nsf/0/86fe295ab74b61158525808200628e17/\\$FILE/OPSD%20219.260%20Rev%232%20Nov2015.pdf](http://www.ragsb.mto.gov.on.ca/techpubs/ops.nsf/0/86fe295ab74b61158525808200628e17/$FILE/OPSD%20219.260%20Rev%232%20Nov2015.pdf)

OPSD 219.261 for the Turbidity Curtains Seam Details, November 2016. Available at:
[http://www.ragsb.mto.gov.on.ca/techpubs/opsa.nsf/0/2ea4866bb726ba7e85257fae006851ee/\\$FILE/OPSD219.261%20Rev%231%20Nov2006.pdf](http://www.ragsb.mto.gov.on.ca/techpubs/opsa.nsf/0/2ea4866bb726ba7e85257fae006851ee/$FILE/OPSD219.261%20Rev%231%20Nov2006.pdf)

References

CISEC, 2014. Certified Inspector and Sediment and Erosion Control Training Manual. Revised Edition V6. 9520 Pine valley Drive, Woodbridge Ontario, Canada.

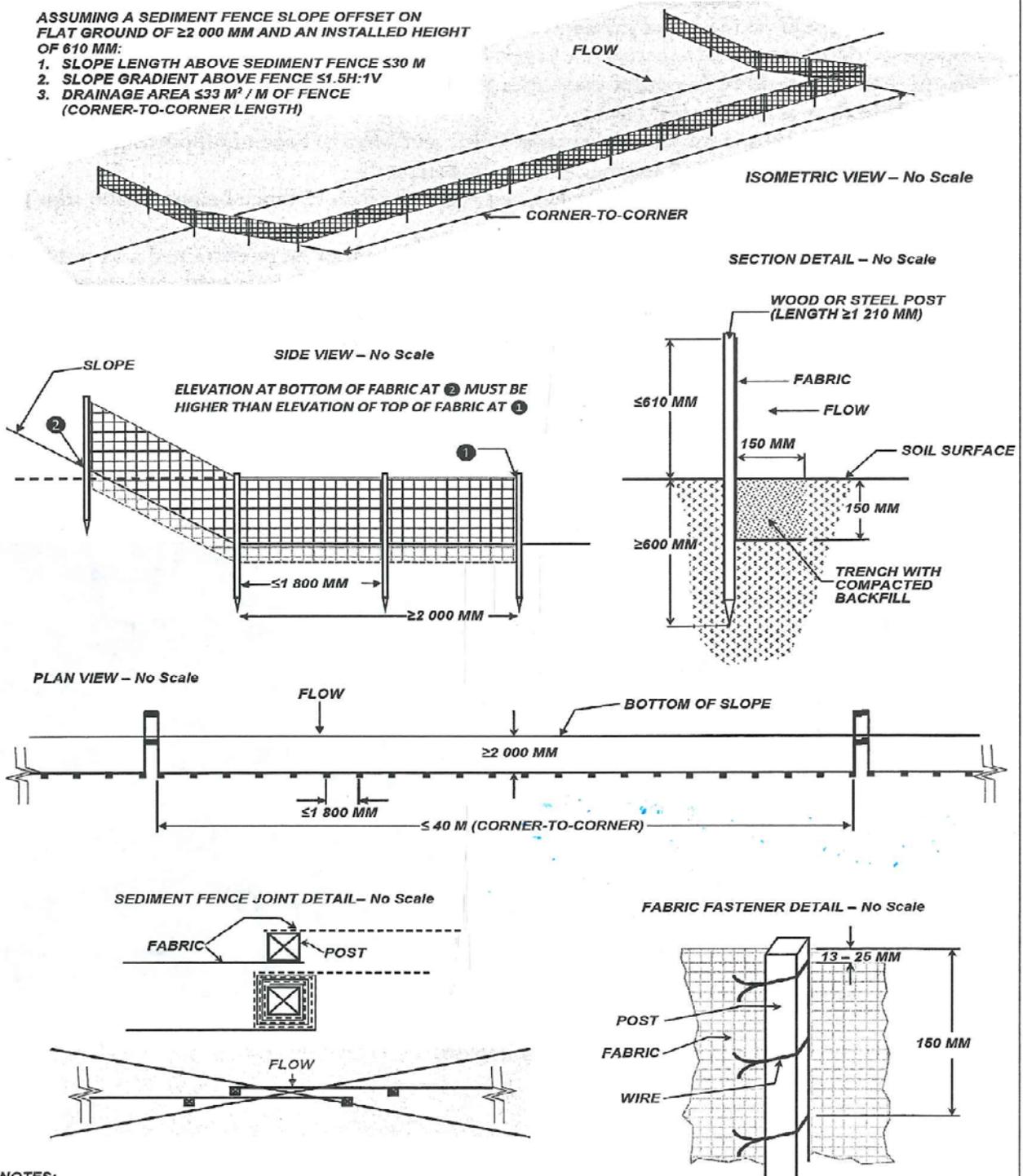
Erosion and Sediment Control Guidelines for Urban Construction, 2006. Greater Golden Horseshoe Area Conservation Authorities.

VOI Training Group, 2005. Erosion and Sediment Control – Participant’s Manual. Developed by Van Osch Innovations Ltd., 130 Columbia Street, Nanaimo, British Columbia, Canada.

VOI Training Group, 2014. Environmental Field Procedures for Works in and About Water. Developed by Van Osch Innovations Ltd., 130 Columbia Street, Nanaimo, British Columbia, Canada.

ASSUMING A SEDIMENT FENCE SLOPE OFFSET ON FLAT GROUND OF ≥ 2000 MM AND AN INSTALLED HEIGHT OF 610 MM:

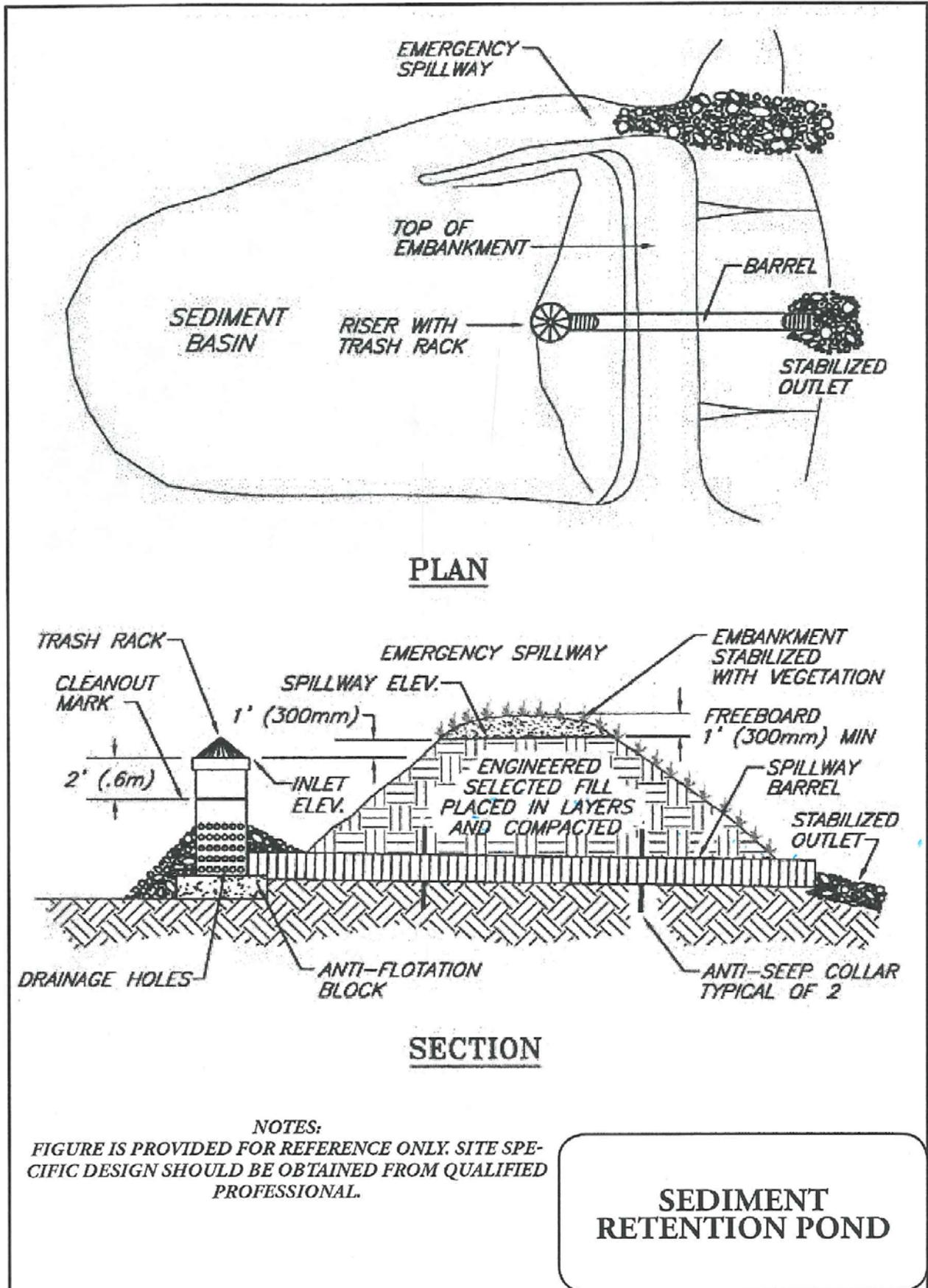
1. SLOPE LENGTH ABOVE SEDIMENT FENCE ≤ 30 M
2. SLOPE GRADIENT ABOVE FENCE $\leq 1.5H:1V$
3. DRAINAGE AREA ≤ 33 M² / M OF FENCE (CORNER-TO-CORNER LENGTH)



NOTES:

1. SEDIMENT FENCE MUST BE CORRECTLY CONFIGURED, INSTALLED AND MAINTAINED FOR EFFECTIVE SEDIMENT CONTROL FUNCTION.
2. SEDIMENT FENCE FUNCTIONS BY POOLING RUNOFF TO PROMOTE SEDIMENTATION.
3. RUNOFF THROUGH, UNDER OR AROUND FENCE IS NOT DESIREABLE.
4. DO NOT INSTALL ACROSS WATERCOURSES OR DRAINAGEWAYS.
5. ENHANCE INTEGRITY OF SEDIMENT FENCE BY INSTALLING ADDITIONAL POSTS.
6. SEDIMENT FENCING, IF INSTALLED CORRECTLY, DOES NOT REQUIRE WIRE BACKING.
7. FUNCTIONAL LIFE OF SEDIMENT FENCE IS 1 YEAR.
8. FIGURE IS PROVIDED FOR REFERENCE ONLY. CONSULT QUALIFIED PROFESSIONAL FOR SITE-SPECIFIC DESIGN.

SEDIMENT FENCE





Soil Stripping, Grubbing & Stockpiling (ESG-3-Pre)

Application to Ontario Waterways' Projects

Land based construction typically involves the disturbance and removal (stripping) of topsoil prior to excavation or contouring earthworks. The storage of stripped topsoil or other excavated surficial material creates stockpiles of erodible material that require management due to the potential for soil erosion and sediment transport into adjacent waterbodies, wetlands or forests. Proper removal and separation of topsoil from underlying soil layers preserves naturally occurring seed banks and provides a growing media that can be used during the site restoration phase. During construction and maintenance projects it is also important to protect exposed soil from erosion and to contain run-off to prevent off-site migration and deposition of fine sediment. For these reasons, the use of industry accepted standards for Soil stripping and stockpiling are used on all land based construction projects on Ontario Waterways. Soil stripping, grubbing and stockpiling activities also have invasive species management requirements.

Description of Activity

Soil stripping involves the intentional removal of the active soil layer in which rainwater, small animals and micro-organisms interact with soil particles to create conditions suitable for the growth and maintenance of vegetation. The term 'topsoil' generally refers to the A soil horizon which is usually darker than the underlying soil because of the accumulation of organic matter. Stripping is typically performed using graders or earth scrapers to remove the active growing soil layer. Storage of removed material is often accomplished by creating storage piles (stockpiles) in designated areas for later retrieval of the material.

Environmental Standards and Guidelines

General guidelines for soil management have the following objectives:

- Do not admix (i.e., mixing topsoil with other material). This helps to preserve topsoil value.
- If subsoil becomes compacted soil de-compaction measures shall be implemented (See Revegetation (ESG-1-Post)).
- All topsoil must be retained for re-use during the post-construction period.
- No vegetation shall be removed or soil shall be disturbed in riparian areas (i.e., next to wetlands and watercourses), unless identified in the site-specific EMP and accepted by PCA.

Soil Stripping

- All soil stripping locations and volumes must be identified in the site-specific EMP and accepted by PCA.
- Restrict topsoil stripping to areas that will be disturbed by the construction activities. Project staging must be described in the Construction Plan of the site-specific EMP.
- Sediment control measures must be in place prior to commencement of soil stripping activities. Erosion control measures shall be implemented for all areas following stripping;
- Vegetated buffer strips;
- Ensure full salvage of topsoil and upper root zone while avoiding admixing soil layers;



- During frozen soil conditions, topsoil/root zone salvage work is to be conducted using specialized equipment (e.g., frozen topsoil cutter) with fine excavation depth control to remove soil horizon of variable depths.

Grubbing

- All areas to be grubbed and their timing must be identified in the site-specific EMP and accepted by PCA.
- Grubbing should not be conducted unless a Site Restoration plan as part of the site-specific EMP has been accepted by PCA.
- The National Master Specification (NMS) Section 31 11 00 – Clearing and Grubbing, and OPSS 201 Guideline for “Clearing, Close Cut Clearing, Grubbing, Removal of Boulders and Mechanical Stump Cutting”, shall be adhered to during clearing and grubbing operations unless specified otherwise in the Historic Canals Regulations permit.
- Grubbing should not proceed too far ahead of construction. This will limit the time that the mineral soil is exposed to erosion.
- All stumps and visible surface roots shall be removed except where removal might endanger the health or stability of a nearby tree or other preserved element that has been identified for retention.
- Cleared and grubbed material shall be stockpiled in separate locations from growing medium stockpiles. Where noxious or undesirable weeds are found on site, grubbed materials shall not be used as a constituent of, or as a growing medium.
- Grubbing material should not be piled where it will block drainage courses.
 - If windrows are used, they should be kept behind roadside ditches and breaks should be provided so animals can move across the right-of-way (approximately 5 metres every 65 metres).
 - If push-outs are used, they should be pre-cut to a large enough size to avoid knockdown of standing trees.
- Remove material and debris, and dispose of at an authorized disposal site.
- Trees and shrubs removed from work areas during vegetation clearing activities shall be shredded and used as mulch on newly exposed surfaces. Mulch will be weed-free to prevent the introduction of invasive species.

Stockpile Management

- All stockpile locations, areas, heights and storage volumes must be identified in the site-specific EMP and accepted by PCA.
- Special attention shall be given to the placement and management of the salvaged topsoil and soils from other horizons.
 - Avoid stockpiling in low-lying wet areas that will result in saturated soils or in areas receiving site drainage flow.
 - Do not place geotextile material under topsoil stockpiles as such materials are subject to tearing mixing upon removal.



- When stockpiling topsoil, mound soil no higher than 1.3 m high for less than 1 year and preferably less than 6 months. Where space limitations necessitate higher mounds, topsoil stockpiles should not exceed 3 m.
 - Short-term stockpiles (< 6 months) should be covered with tarps or woven geotextile materials to prevent erosion and contamination by weeds during storage.
 - Longer term stockpiles (>6 months) should be stabilized by temporarily establishing ground cover vegetation using native Ontario species, either by application of seeded compost or seeded biodegradable mats.
- Ensure all stockpiles are protected with perimeter sediment controls (see Sediment Control (ESG-2-Pre)) and apply appropriate erosion control methods (see Erosion Control (ESG-1-Pre)).
- Clearly separate windrows/stockpiles of soils from different horizons, ensuring to stockpile topsoil/root zone and underlying mineral material separately and excavate in depth sequence.
- Where topsoil is stockpiled greater than 1.3 m or longer than 6 months, the soil shall be amended with compost to re-establish health soil structure and restore soil organism populations.
- Soil stockpiles shall be inspected monthly and every 6 months during construction for growth of noxious or invasive species.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control (ESG-1-Pre)
- Sediment Control (ESG-2-Pre)
- Soil Stripping, Grubbing and Stockpiling (ESG-3-Pre)
- Vegetation Clearing and Protection (ESG-5-Pre)
- Revegetation (ESG-1-Post)

Related EMP Component Plans

- Dust and Air Quality Management
- Transportation Management
- Surface Water Management, Erosion and Sediment Control
- Vegetation Protection
- Species at Risk Protection
- Invasive Species Management
- Waste Management
- Site Restoration

Other Design and Environmental Considerations

- Timing of works should avoid seasonally high rainfall and snowmelt periods.
- Timing windows for in-water works shall be respected.



Further Guidance

National Research Council of Canada, 2015. National Master Specification (NMS) Section 31 11 00 – Clearing and Grubbing. Revised August, 2015.

Government of Ontario, 2011. Ontario Provincial Standard Specification OPSS 201. Construction Specification for Clearing, Close Cut Clearing and Removal of Surface and Piled Boulders, Grubbing. November 2011.

References

CISEC, 2014. Certified Inspector and Sediment and Erosion Control Training Manual. Revised Edition V6. 9520 Pine valley Drive, Woodbridge Ontario, Canada.

Greater Golden Horseshoe Area Conservation Authorities, 2006. Erosion and Sediment Control Guidelines for Urban Construction.

Toronto and Region Conservation Authority, 2012. Preserving and Restoring Healthy Soil: Best Practices for Urban Construction. Version 1.0., June, 2012.

VOI Training Group, 2014. Environmental Field Procedures for Works in and About Water. Developed by Van Osch Innovations Ltd., 130 Columbia Street, Nanaimo, British Columbia, Canada.



Tree Protection and Hording (ESG-4-Pre)

Application to Ontario Waterways' Projects

Construction projects on Ontario Waterways are undertaken on lands that are often well vegetated with natural vegetation or grounds that have been landscaped. Individual or specimen trees may occur throughout a site and may require isolation and protection prior to site preparation works and activities (e.g., clearing, grubbing, installation of erosion and sediment controls) to prepare laydown areas, storage areas, camps, access roads/trails etc. In some cases the relocation or transplanting of trees may be warranted.

Description of Activity

Tree protection and hording involves the identification and delineation of areas and individual specimen trees to be avoided and protected from potentially damaging works and activities.

Environmental Standards and Guidelines

Trees to be Protected

All individual or specimen trees to be retained and requiring protection must be identified in the site-specific EMP and accepted by PCA. To the extent possible, retain trees >10 cm DBH intact and instead, remove lower limbs (<2.5 m high).

- All individual or specimen trees to be retained and requiring protection must be identified in the site-specific EMP and accepted by PCA. To the extent possible, retain trees >10 cm DBH intact and instead, remove lower limbs (<2.5 m high).
- Relocation or transplanting of any trees is prohibited unless accepted by PCA in the site-specific EMP. All relocations or transplanting of trees shall be planned and supervised by a Certified Arborist.
- All project personnel are to be informed of the exact location of individual or specimen trees to be retained and their protection requirements. Any special treatments or protection requirements shall be established identified in the site-specific EMP and accepted by PCA.
- Damaged trees designated for protection require assessment by a Certified Arborist.
- Delineate individual or specimen trees to be protected with flagging tape, temporary protective fence, hording or other suitable protection measures.
- The area to be protected for any individual or specimen tree shall be at a minimum radius, the area within the tree's "drip-line" plus a 1.5 m distance. This is applicable to both deciduous trees and conifers.
- The following activities are not permitted within the protected area:
 - Changes, alteration, or disturbance to grade by filling, excavating, or scraping, except as indicated in the contract documents.
 - Storage of construction materials and equipment.
 - Stockpiling of construction materials and excavated materials.
 - Disposal of liquids, including concrete slurry, gas, oil, and paint.
 - Vehicular traffic, equipment, or pedestrian traffic.
 - Attachment of wires, ropes, lights, or other such attachments other than those of a protective nature to trees to be preserved.
 - Cleaning of equipment or material under canopy of tree or group of trees to be preserved.



Protective Fencing

Individual or specimen trees to be protected shall be fenced off by either:

- Individual or specimen trees to be protected shall be fenced off by either:
 - Chain link fence of at least 1.2 m height mounted on steel or sturdy wooden posts. Fence posts should be placed no farther than 2.4 m apart.
 - Solid plywood hoarding mounted securely on durable wooden posts. Fence posts should be placed no farther than 2.4 m apart.
 - Board fencing (i.e., hording) consisting of 100 mm square posts set securely in the ground and extending at least 1 m above the ground shall be placed as in Table 3-1, with a minimum of two horizontal boards fastened securely between posts. Fence posts should be placed no farther than 2.4 m apart.
 - Plastic fencing, “international orange” plastic (polyethylene) web fencing securely mounted on a sturdy wooden framework that includes top and bottom rail. Fence posts should be placed no farther than 2.4 m apart, or
 - Plastic fencing, “international orange” plastic (polyethylene) web fencing secured to conventional metal “T” or “U” posts driven to a minimum depth of 450 mm on 2 m minimum centers shall be installed at the limits of clearing. Plastic snow fencing should not be tied to metal stakes or rebar.

Root Protection Measures

- In the event that the installation of protective fencing for an individual or specimen tree is not possible and/or ideal, alternative measures (e.g., blasting mats, mud mats) must be implemented with prior acceptance by PCA. Such measures must provide a sufficient amount of soil compaction prevention with regards to the highest level of activity to occur within the immediate area of protection.
 - For areas of light-to-medium levels of traffic activity, a geotextile cloth shall be placed over the area of protection and covered with a 20 cm (at minimum) thick layer of mulch material. Pins or staples must be used to anchor the geotextile material to the ground.
 - For areas of medium-to-high levels of traffic activity, a geotextile cloth shall be placed over the area of protection and covered with a 20 cm (at minimum) thick layer of mulch material. The mulch material shall then be covered with 2 cm (3/4 inch) sheets of laminated plywood. Large sheets are preferred.
- Mulch material should not be permitted to pile against the trunk(s) or root flare(s) of the tree(s), as this may lead to unwanted bark rot and oxygen deprivation, subsequently leading to the death of the tree(s).

Inspections and Maintenance

- Fencing and root protection measures shall be inspected monthly.
- Plywood sheets and mulch must be replaced and replenished as necessary to maintain the 20 cm root protection layers thickness at all times.
- Any damaged fencing, hording or other approved protection measures shall be replaced immediately.
- Fencing and armoring devices shall only be removed after the completion of the project, following the final cleanup.



Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control (ESG-1-Pre)
- Sediment Control (ESG-2-Pre)
- Soil Stripping, Grubbing and Stockpiling (ESG-3-Pre)
- Vegetation Clearing and Protection (ESG-5-Pre)
- Invasive Species Management (ESG-11-C)
- Revegetation (ESG-1-Post)

Related EMP Component Plans

- Vegetation Protection
- Species at Risk Protection

Other Design and Environmental Considerations

- Timing windows for migratory birds and in-water works shall be respected.

References

Government of Ontario, 2011. Ontario Provincial Standard Specification OPSS 201. Construction Specification for Clearing, Close Cut Clearing and Removal of Surface and Piled Boulders, Grubbing. November 2011.

Landscape Ontario Horticultural Trades Association, 2004. Landscape Guidelines. Available at: http://landscapeontario.com/attach/1246977850.Landscape_Guidelines.pdf.

Ontario Ministry of Natural Resources, 2009. Environmental Guidelines For Access Roads and Water Crossings.



Vegetation Clearing and Protection (ESG-5-Pre)

Application to Ontario Waterways' Projects

Site preparation for a construction project on PCA property may require the removal of natural vegetation to prepare for construction. Areas of a construction site that typically require large areas to be cleared are laydown areas, storage areas, locations of camps, new access roads or trails etc. Practically all projects completed by Parks Canada on Ontario Waterways occur in close proximity to fish bearing waterbodies. The protection of fish habitat and water quality during near water and in water construction projects is of critical importance to Park Canada. Protecting existing vegetation, especially in close proximity to waterbodies, reduces the potential for soil erosion and sedimentation (off-site migration and deposition of fine sediment) at construction sites. For these reasons, the protection of riparian vegetation is applicable to most major and small scale construction projects on Ontario Waterways. This ESG applies to the removal and protection of common, natural (non-SAR) vegetation.

Description of Activity

The primary objective of vegetation protection is to identify and retain as much vegetated areas as possible. On land this is accomplished by delineating protection or “no go” zones. Near water this is accomplished maintaining or creating a buffer strip along the riparian zone to maintain of a healthy aquatic environment. Overall, protection is accomplished by limiting the removal of vegetation, avoiding unnecessary intrusion, and delaying removals until just before the area is about to be worked. Vegetative buffers protect adjacent waterbodies or wetlands from the effects of sedimentation and stabilize the shoreline against erosion and bank failure. Nevertheless, some vegetation clearing will likely be necessary for most projects. Vegetation clearing involves felling, trimming, and cutting of trees and shrubs, the removal (e.g., downed timber, snags, brush,), and grass cutting occurring within areas to be cleared in preparation for construction (i.e., not a maintenance activity).

Environmental Standards and Guidelines

- All vegetation clearing activities are subject to compliance with the *Migratory Birds Convention Act*. Vegetation clearing work shall not be undertaken during the active bird breeding season (April 1st to August 31st),
- All vegetated areas to be cleared must be identified in the site-specific EMP and accepted by PCA. An inventory of species to be removed shall be undertaken.
- All vegetated areas to be protected must be identified in the site-specific EMP and accepted by PCA. No vegetation shall be removed until all protection or “no go” zones are established and accepted by PCA.

Vegetated Areas to be Protected

- Clearing of vegetation, including the clearing of vegetation in riparian areas, shall be minimized.
- All vegetated areas (e.g., forested areas, riparian areas, other vegetated buffers) to be retained and requiring protection must be identified in the site-specific EMP and accepted by PCA.
- All project personnel are to be informed of the exact location of the areas to be retained and their protection requirements. Any special treatments or protection requirements shall be established identified in the site-specific EMP and accepted by PCA.



- Vegetated areas to be protected shall be delineated with flagging tape, temporary protective fence, hording or other suitable protection measures.
- The forested area to be protected shall be a minimum distance from the largest “drip-line” plus a 1.5 m distance. This is applicable to both deciduous trees and conifers within a forested area.
- The following activities are not permitted within the protected area:
 - Changes, alteration, or disturbance to grade by filling, excavating, or scraping, except as indicated in the contract documents.
 - Storage of construction materials and equipment.
 - Stockpiling of construction materials and excavated materials.
 - Disposal of liquids, including concrete slurry, gas, oil, and paint.
 - Vehicular traffic, equipment, or pedestrian traffic.
 - Attachment of wires, ropes, lights, or other such attachments other than those of a protective nature to trees to be preserved.
 - Cleaning of equipment or material under canopy of tree or group of trees to be preserved.

Protective Fencing

- Vegetated areas, including riparian area buffers, to be protected shall be fenced off by either:
 - Chain link fence of at least 1.2 m height mounted on steel or sturdy wooden posts. Fence posts should be placed no farther than 2.4 m apart.
 - Solid plywood hoarding mounted securely on durable wooden posts. Fence posts should be placed no farther than 2.4 m apart.
 - Board fencing (i.e., hording) consisting of 100 mm square posts set securely in the ground and extending at least 1 m above the ground shall be placed as in Table 3-1, with a minimum of two horizontal boards fastened securely between posts. Fence posts should be placed no farther than 2.4 m apart.
 - Plastic fencing, “international orange” plastic (polyethylene) web fencing securely mounted on a sturdy wooden framework that includes top and bottom rail. Fence posts should be placed no farther than 2.4 m apart, or
 - Plastic fencing, “international orange” plastic (polyethylene) web fencing secured to conventional metal “T” or “U” posts driven to a minimum depth of 450 mm on 2 m minimum centers shall be installed at the limits of clearing. Plastic snow fencing should not be tied to metal stakes or rebar.

Clearing and Debris Handling Methods

- Vegetation clearing shall be undertaken in accordance with National Master Specification (NMS) Section 31 11 00 – Clearing and Grubbing (2015).
- Staging and sequencing of vegetation clearing shall be planned to coincide with construction activities and the installation of erosion and sediment controls.
 - Where advanced vegetation clearing is necessary, leave the vegetative ground mat and root structure intact to the extent practicable.
 - If riparian vegetation is to be removed, erosion and sediment control measures shall be in place prior to the commencement of clearing activities.
- Trees shall only be cut using tools designed for tree cutting activities (e.g., chainsaws, brush saws). Tree removal or pruning shall be a clean cut. Work on mature trees near power lines, overhead facilities or adjacent to public roads should be undertaken under the supervision of a Certified Arborist. The *Ontario Occupational Health and Safety Act* requires that people and equipment keep a minimum distance of 3 m from high voltage power lines (750 volts and above).



- Trees shall only be cut using tools designed for tree cutting activities (e.g., chainsaws, brush saws). Tree removal or pruning shall be a clean cut. Work on mature trees near power lines, overhead facilities or adjacent to public roads should be undertaken under the supervision of a Certified Arborist. The *Ontario Occupational Health and Safety Act* requires that people and equipment keep a minimum distance of 3 metres from high voltage power lines (750 volts and above).
- Vegetation clearing from unstable or erodible banks or riparian areas shall be minimized or undertaken by hand. Use of heavy machinery will not be acceptable.
- Use equipment with wide track or “high float” rubber tired vehicles and having a greater reach to reduce the overall area of disturbed vegetation and soil compaction.
- Woody material less than 10 cm DBH of non-invasive species will be chipped or mulched. The material will be stored on-site to supplement erosion and sediment controls when required. Surplus material should either be stored or disposed off-site.
- Logs of 10 cm DBH or greater may be left on-site with approval of PCA.
- Burning of vegetation or other debris is prohibited.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control ([ESG-1-Pre](#))
- Sediment Control ([ESG-2-Pre](#))
- Soil Stripping, Grubbing and Stockpiling ([ESG-3-Pre](#))
- Tree Protection and Hording ([ESG-4-Pre](#))
- Vegetation Clearing and Protection ([ESG-5-Pre](#))
- Invasive Species Management ([ESG-11-C](#))
- Use and Maintenance of Heavy Equipment ([ESG-15-C](#))
- Wildlife and Species at Risk Protection During Construction ([ESG-17-C](#))
- Revegetation ([ESG-1-Post](#))

Related EMP Component Plans

- Dust and Air Quality Management
- Transportation Management
- Surface Water Management, Erosion and Sediment Control
- Vegetation Protection
- Species at Risk Protection
- Invasive Species Management
- Waste Management
- Site Restoration

Other Design and Environmental Considerations

- Timing of works should avoid seasonally high rainfall and snowmelt periods.
- Timing windows for in-water works shall be respected.



Further Guidance

Government of Ontario, 2011. Ontario Provincial Standard Specification OPSS 201. Construction Specification for Clearing, Close Cut Clearing and Removal of Surface and Piled Boulders, Grubbing. November 2011.

National Research Council of Canada, 2015. National Master Specification (NMS) Section 31 11 00 – Clearing and Grubbing. Revised August, 2015.

References

Coker, G.A., Ming, D.L., and Mandrak, N.E. 2010. Mitigation Guide For The Protection Of Fishes and Fish Habitat To Accompany The Species at Risk Recovery Potential Assessments Conducted by Fisheries and Oceans Canada (DFO) in Central and Arctic Region. Version 1.0. Can. Manuscr. Rep. Fish. Aquat. Sci. 2904: vi + 40 p.

Environment Yukon, 2011. Best Management Practices for Works Affecting Water in Yukon. Water Resources Branch, Government of Yukon.

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VOI Training Group, 2014. Environmental Field Procedures for Works in and About Water. Developed by Van Osch Innovations Ltd., 130 Columbia Street, Nanaimo, British Columbia, Canada.



Abrasive Blasting (ESG-1-C)

Application to Ontario Waterways' Projects

Repairs and upgrades to locks, walls, dams and bridges may require abrasive blasting to remove rust, scale, paint, etc., from surfaces in preparation for finishing.

Description of Activity

The process of abrasive blasting uses compressed air to propel the abrasive material at high speeds to remove the old surface finish. Significant amounts of dust are generated during the process. A variety of abrasive materials can be used and include: silica sand, glass beads, metal slag (e.g., Kleen Blast), steel grit, metal shot, and aluminum oxide. In the case of wet blasting, water is used as the abrasive media along with compressed air to achieve the desired surface finish. Wet abrasive blast cleaning is also known as wet blasting or vapor abrasive blast cleaning. Abrasive blasting will result in the generation of solid and/or liquid wastes. The primary types of solid wastes are spent abrasives and removed coating materials, rust and scale. Other solid wastes may include off-specification coatings, contaminated soils, protective clothing and materials damaged during blasting operations. Liquid wastes are typically waters contaminated by coatings, rust and scale.

Environmental Standards and Guidelines

- The proposed use of abrasive blasting and the types of wastes that may be produced must be identified in the site-specific EMP and accepted by PCA.
- All abrasive blasting must be carried out in an approved abrasive blasting enclosure. Options include:
 - *Partial or Full Enclosure:* A partial or full enclosure is to be used when the abrasive blasting procedure is carried out in proximity to any residential area or watercourse. The abrasive blasting area is partially enclosed with a tarp on the floor to collect spent debris and partial side enclosures to prevent particles from being blown around. The sides of the enclosure shall be as high as the area which is being worked on. A full enclosure involves an abrasive blasting area that is enclosed on all sides including the top of the area.
 - *Full enclosure with negative pressure:* A full enclosure with negative pressure is to be used when escape of all or any materials or debris from the operations must be prevented. The abrasive blasting area is an area which is sealed tight on all joints and entryways to prevent any leakage of dust. It utilizes negative pressure from forced airflow along with dust collectors.
- The spent abrasive material must be cleaned out of the working area at least once a day. If heavy abrasive blasting with high accumulations of dust occurs, the area may need to be cleaned on a more regular basis (e.g., at end of shift or when sectional tasks are completed).
- Where wet abrasive blasting is carried out, care must be taken due to the accumulation of water on the floor area. Waters used in wet abrasive blasting must be separated and isolated in the work areas. If wet abrasive blasting is carried out, only a partial enclosure is required.



Spent Abrasives and Wastewater Management

- Spent abrasives along with waste generated, must be contained in covered containers with appropriate visible labels until tested.
- Spent abrasives, wastewater and other wastes generated during abrasive blasting operations cannot be removed from the project site until it is tested. This wet or dry waste material must be defined as a non-hazardous waste or hazardous waste.
- Wastewater (contaminated or otherwise) that is generated by wet abrasive blasting is to be considered as a Liquid Industrial Waste (LIW) under R.R.O 1990, Regulation 347 (O. Reg. 347) of the *Environmental Protection Act*. All wastewater must be contained in sealed containers and temporarily stored on the project site until it is collected for disposal by a licensed waste hauler.
- All off-site shipments of spent abrasives and wastewater must be accompanied by a MOECC waste manifest and the generator of the materials must be registered as a generator of hazardous waste with the MOECC. A Hazardous Waste Information Network (HWIN) number will be issued for the waste generator upon their registration with the MOECC, and this HWIN number must be used on all waste manifests.
- All other non-hazardous waste generated by abrasive blasting operations shall be disposed according to Ontario Regulation 558/00. R.R.O. 1990 (General – Waste Management).
- Environmental permits shall be obtained by the Contractor for any off-site disposal.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Fugitive Dust Control During Construction (ESG-8-C)

Related EMP Component Plans

- Dust and Air Quality Management
- Noise, Vibration and Ambient Light Management
- Blasting
- Surface Water Management Erosion and Sediment Control
- Aquatic Resources Management
- Hazardous Materials Management

Other Design and Environmental Considerations

- Timing of works should avoid seasonally high rainfall and snowmelt periods.

References

Government of Newfoundland and Labrador, 1996. Environmental Code of Practice for Abrasive Blasting. Prepared by the Department of Environment and Labour, Industrial Environmental Engineering Division. March 1995. Revised June 1996. Available at:
http://www.ecc.gov.nl.ca/env_protection/abrasive_blasting.pdf

Nova Scotia Power, 2014. Contractor Environmental Requirements. Available at:
<https://www.nspower.ca/site/media/Parent/Contractor%20Environmental%20Requirements.pdf>



Blasting (ESG-2-C)

Application to Ontario Waterways' Projects

Blasting on land is occasionally required during some construction projects when the removal of large quantities of rock is required. Blasting on land has the potential to result in adverse noise and vibration to local receptors including nearby residents and communities as well as wildlife. When conducted in proximity to Ontario Waterways, blasting also has the potential to harm or kill fish and adversely affect water quality. The use of explosives to remove quantities of rock is more likely to be associated with large scale PCA construction projects.

Blasting in or near waterbodies has the potential to disrupt or cause serious harm to fish. Uncontrolled or unmitigated blasting will adversely affect water quality. The proximity of PCA's assets to fish bearing waterbodies elevates the need to address these potential effects and adhere to strict standards and guidelines.

Description of Activity

Blasting is the controlled use of explosives to clear or excavate large quantities of intact rock. Blasting produces noise and vibration shock waves that can adversely affect nearby wildlife and temporarily affect nearby residents and communities. Blasting in / or near water produces shock waves that can damage fish swim bladders and rupture their internal organs. Blasting vibrations may also kill or damage fish eggs or larvae. Chemicals harmful to aquatic life, including ammonia, can be released from the explosive into the water during blasting.

Environmental Standards and Guidelines

- A construction and operation of a factory or a fixed site for the manufacture of blasting explosives shall be avoided. Explosives should be transported to the site and stored temporarily for use on-site.
- Blasting on land and in-water should be avoided. No blasting should occur within 300 m of known bat habitat features.
- Should blasting be required, a Blasting plan must be included in the site-specific EMP and accepted by PCA.
- The Blasting plan shall be developed by a Qualified Professional(s), in accordance with:
 - OPSS 120 General Specification for the Use of Explosives, including 120.04 Submission and Design Requirements.
 - "Guidelines for the use of Explosives In or Near Canadian Fisheries Waters" (DFO 1998) to reduce particle velocities and pressure changes created by underwater explosives that can result in fish injuries and mortality. This also includes the methods of small scare blasts and stacking of charges.
 - Canadian Standards Association Z107.54-M85 (R 1999) regarding procedure for measurement of sound and vibration due to blasting operations.
 - OPSS 120 General Specification for the Use of Explosives, including OPSS 120.07.04 Monitoring and address the following:
 - Ground vibration and the peak sound pressure level shall be monitored 100 m from the blast site or at the closest residence, utilities, structure, or facility within this radius during each blast.



- Water overpressure in affected fish habitats shall be monitored adjacent to the shore closest to the blast site.
- All blasting operations shall be undertaken under the supervision of a Qualified Professional.
- PCA shall be notified within 48 hours prior to the commencement of any blasting activities.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control (ESG-1-Pre)
- Sediment Control (ESG-2-Pre)
- Borehole and Rock Drilling (ESG-3-C)
- Fish Exclusion, Salvage and Relocation (ESG-7-C)

Related EMP Component Plans

- Dust and Air Quality Management
- Noise, Vibration and Ambient Light Management
- Blasting
- Demolition
- Surface Water Management Erosion and Sediment Control
- Vegetation Protection
- Wildlife Protection and Management
- Aquatic Resources Management
- Species at Risk Protection
- Hazardous Materials Management
- Fuel Management

Other Design and Environmental Considerations

- Timing windows for migratory birds and in-water works shall be respected.

Further Guidance

Ontario Provincial Standard Specification (OPSS) 120 - General Specification for the Use of Explosives Department of Fisheries and Oceans, 1998. Guidelines for the Use of Explosives In or Near Canadian Fisheries Waters.

Canadian Standards Association Z107.54-M85 (R 1999) Procedure for Measurement of Sound and Vibration Due to Blasting Operations.

References

British Columbia Ministry of Forests, Lands and Natural Resource Operations, 2014. A Compendium of Wildlife Guidelines for Industrial Development Projects in the North Area, British Columbia Interim Guidance, November 19 2014.

Gosse, M.M., A.S. Power, D.E. Hyslop, and S.L. Pierce. 1998. Guidelines for Protection of Freshwater Fish Habitat in Newfoundland and Labrador. Fisheries and Oceans, St. John's, NF. x + 105 pp., 2 appendices.



Borehole and Rock Drilling (ESG-3-C)

Application to Ontario Waterways' Projects

Borehole and rock drilling are occasionally required during some construction projects when there is a need to undertake geotechnical investigations to determine the physical properties of soil and rock in order to assist with the design earthworks and/or foundations for locks, dams and bridges. Borehole and rock drilling may also be required for the construction of anchors, coffer dam steel beams, the installation of ground water monitoring or dewatering wells. Borehole and rock drilling has the potential to result in adverse noise and vibration to local receptors including nearby residents and communities as well as wildlife. When conducted in water or in proximity to a waterway, borehole and rock drilling also has the potential to disturb or harm fish and adversely affect water quality.

Description of Activity

There are several types of borehole and drilling methods. Diamond drilling produces cylindrical pieces of rock called core; reverse circulation or rotary drilling produces chips of rock; overburden drilling is conducted to sample overburden, and auger drilling is used most often to sample surficial soils for geotechnical purposes. Borehole and rock drilling can be conducted with small truck mounted or track mounted drill rigs or with larger fixed drill rigs. Drill rigs may also be employed on barges.

For most drilling activities, small areas of land must be cleared to make a drill pad or for access. It must be large enough for safe operation of the drill and other equipment. Some types of drilling, including diamond drilling, pump water to the drill and down the hole. The water pumps may be placed on the shores of lakes, rivers and streams. The water is pumped through heavy hoses to the drill rig.

Environmental Standards and Guidelines

- Borehole and rock drilling shall conform to Parks Canada Agency's "BMP: Geotechnical Investigations (Bore-hole Drilling)" (2016).
- All borehole and rock drilling activities, including construction, operation and decommissioning shall be undertaken under the supervision of a Qualified Professional.
- The PCA Environmental Authority shall be contacted and advised at least fourteen (14) days in advance of the start of the proposed borehole or rock drill operations. All drilling locations will be identified on a map with GPS coordinates in the EMP. If borehole locations are moved greater than 3 m or are within 5 m of identified/know archaeological resources, PCA's Environmental Authority must review and accept changes.

Drill Cuttings and Fluid Management

- Drill cuttings and fluids shall not be released into a wetland, watercourse or waterbody under any circumstances.
- If drilling fluids are required, only fresh water shall be used for fluid preparation. No toxic or hazardous substances are to be added to the drilling fluid at any time.
- All lubricants used on drill bits, casings or down-hole applications shall be free of any toxic or hazardous substances
- Recirculation pits or in-ground sumps shall be constructed (as surface conditions allow) to contain drilling mud, cuttings, treatment chemicals and discharged water from the drilling process. Drill cuttings recirculation tanks that capture cuttings will be required where sumps cannot be constructed, such as in bedrock.
- At the conclusion of drilling, sumps will be backfilled with clean soil materials, leveled and graded.



Purged Groundwater and Drilling Wastes

- Groundwater (contaminated or otherwise) that has been purged/removed from groundwater monitoring wells is defined as a Liquid Industrial Waste (LIW) under R.R.O 1990, Regulation 347 (O. Reg. 347) of the *Environmental Protection Act*. All groundwater purged from monitoring wells must be contained in sealed containers and temporarily stored on the project site until it is collected for disposal by a licensed waste hauler.
- All off-site shipments of purged groundwater must be accompanied by a MOECC waste manifest and the generator of the purged groundwater must be registered as a generator of hazardous waste with the MOECC. A Hazardous Waste Information Network (HWIN) number will be issued for the waste generator upon their registration with the MOECC, and this HWIN number must be used on all waste manifests.
- All waste generated by drilling shall be disposed according to Ontario Regulation 558/00. R.R.O. 1990 (General – Waste Management)
- Environmental permits shall be obtained by the Contractor for any off-site disposal.

Artesian or Flowing Wells

- Artesian or flowing wells must be controlled and constructed in accordance with Ontario Regulation 903 (Wells) as amended, made under the *Ontario Water Resources Act* which provides minimum construction requirements for the construction of a flowing well.

Borehole or Well Decommissioning

- A borehole or well shall be abandoned if it is not being used or maintained for future use and decommissioned in accordance with Ontario Regulation 903 (Wells) as amended, made under the *Ontario Water Resources Act*.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control (ESG-1-Pre)
- Sediment Control (ESG-2-Pre)
- Vegetation Clearing and Protection (ESG-5-Pre)
- Fugitive Dust Control During Construction (ESG-8-C)
- Refueling and Spill Management (ESG-13-C)
- Treatment of Discharge Waters (ESG-14-C)
- Use and Maintenance of Heavy Equipment (ESG-15-C)

Related EMP Component Plans

- Dust and Air Quality Management
- Noise, Vibration and Ambient Light Management
- Site Dewatering and Wastewater Plan
- Surface Water Management, Erosion and Sediment Control
- Species at Risk Protection
- Fuel Management
- Spills Prevention and Emergency Response



Other Design and Environmental Considerations

- Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of sediment.
- Timing windows for in-water works shall be respected.

Further Guidance

Parks Canada Agency, 2016. BMP: Geotechnical Investigations (Bore-hole Drilling), September, 2016.

Ontario Water Resources Act, R.R.O. 1990, Regulation 903. Wells.

Ontario Protection Act, R.R.O. 1990, Regulation 558/00. General – Waste Management.



Chipping and Cutting (ESG-4-C)

Application to Ontario Waterways' Projects

Projects involving repairs and upgrades to assets such as locks, bridges, retaining / approach walls and concrete dams often require the removal of concrete by chipping and cutting. Construction operations that involve chipping and cutting require special consideration because concrete is alkaline and highly toxic to fish and aquatic life. Concrete and concrete wastewater that contains suspended cement particles may increase the pH of water to a pH of 10 – 12. Concrete chipping and cutting also produces fine dust and sediment that is extremely difficult to remove once in suspension with water. Measures must be taken to prevent any incidence of concrete or concrete wastewater or leachate from entering a watercourse, either directly or indirectly.

Description of Activity

Chipping typically involves breaking off small pieces of concrete from surfaces by chiseling and/or routing out cracks in concrete with a saw or angle grinder before filling with a repair material. Cutting involves scoring the concrete surface and/or slicing the concrete into pieces using a sharp, straight-edged tool (e.g., concrete saw). While chipping is primarily a dry operation undertaken on land, concrete cutting can be undertaken on land using water to wet the concrete surface and cutting tool and underwater. Both chipping and cutting of concrete results in rubble of various dimensions, from fine dust to large concrete slabs. Concrete cutting may also result in leachates and slurries or concrete pastes. Concrete pieces may contain internal or exposed materials (e.g., rebar, wood, rock)

Environmental Standards and Guidelines

General

- Chipping and cutting operations undertaken in the “dry” are preferred to operations using water or those conducted underwater.
- The work site involving chipping and cutting of concrete shall be isolated from the environment. The isolated work site should be sufficiently large to contain water run-off, residues and any waste material. Prior to commencement of the work, water, erosion and sediment control measures shall be installed to ensure that concrete debris, concrete fines, wash or contact water is not deposited directly or indirectly into any watercourse, stormwater drain, ditch or street gutter. Measures (e.g., sediment bags with or without the use of flocculants) must be tailored to capture very small fines. See Sediment Control ([ESG-2-Pre](#)).

Dry Chipping and Cutting – Fugitive Dust Control

- Fugitive dust emissions from dry chipping and cutting operations shall be strictly controlled. See Abrasive Blasting ([ESG-1-C](#)).



Wet Cutting – Water Management

- Use as little water as possible when wet cutting.
- Runoff water shall be collected by a wet industrial vacuum or suction pump and filtered into covered containers.
- Water from wet cutting operations shall be strictly controlled. The discharge of concrete leachate or slurries into a watercourse is prohibited. See Concrete Pour Operations and Grouting (ESG-5-C).

Clean-up and Waste Management

- Concrete debris shall be placed into an enclosed container daily, or more frequently if required, in order to ensure that no debris escape or remain at the site.
- Washing of cutting or chipping tools and equipment in any body of water is prohibited. All cutting and chipping equipment must be washed in a wash down area. Any wash-down area location shall be identified and approved in the EMP. (See Concrete Pour Operations and Grouting (ESG-5-C)).
- All concrete debris shall be completely removed and area restored to original state upon completion of work.
- Concrete cutting leachates or slurries generated during chipping or cutting operations cannot be removed from the project site until tested. This waste material must be defined as a non-hazardous waste or hazardous waste.
- Leachates or slurries (contaminated or otherwise) that are generated by wet cutting with a pH \geq 12.5 are considered corrosive and a hazardous waste under Ontario Regulation 347 of the *Environmental Protection Act*. All leachates and slurries must be contained in sealed containers and temporarily stored on the project site until they are collected for disposal by a licensed waste hauler.
- All off-site shipments of concrete cutting leachates or slurries must be accompanied by a MOECC waste manifest and the generator of the materials must be registered as a generator of hazardous waste with the MOECC. A Hazardous Waste Information Network (HWIN) number will be issued for the waste generator upon their registration with the MOECC, and this HWIN number must be used on all waste manifests.
- All other non-hazardous waste generated chipping or cutting operations shall be disposed according to Ontario Regulation 558/00. R.R.O. 1990 (General – Waste Management). Concrete debris that is considered to be inert should be diverted from landfill.
- Environmental permits shall be obtained by the Contractor for any off-site disposal.

Environmental Performance and Monitoring

- Concrete leachate and slurries shall be routinely tested to confirm compliance with performance standards.
- Monitor pH frequently in the intake of discharge pump, holding tank, outflow of the isolated worksite until the works are completed. Corrective measures should be implemented if downstream water pH has changed more than 1.0 pH unit, measured to an accuracy of +/- 0.2 pH units from the background level, or is below 6.5 or above 9.0 pH units.



Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control (ESG-1-Pre)
- Sediment Control (ESG-2-Pre)
- Concrete Pour Operations and Grouting (ESG-5-C)
- Treatment of Discharge Waters (ESG-14-C)

Related EMP Component Plans

- Dust and Air Quality Management
- Noise, Vibration and Ambient Light Management
- Demolition
- Surface Water Management, Erosion and Sediment Removal

Other Design and Environmental Considerations

- Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of sediment.

References

NSW Environmental Protection Authority, 2002. Environmental Management Best Practice Guideline for Concrete Contractors. ISBN 0-7347-7535-0, October 2002. Available at: www.epa.nsw.gov.au.

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Concrete Pour Operations and Grouting (ESG-5-C)

Application to Ontario Waterways' Projects

Concrete dam replacement projects, and projects involving repairs and upgrades to assets such as locks, bridges, retaining / approach walls and concrete dams may require the pouring of concrete for foundations and/or for the main structure. Concrete pours underwater are undertaken by a special technique referred to as a "Tremie Pour". Grouting and sealing operations are also undertaken to seal a dam to its foundations, stabilize rock anchors. Sealants may also be used to seal concrete surfaces or infill cracks and joints in the concrete once poured.

Construction operations that involve concrete pours and grouting require special consideration because concrete and grouts are alkaline and highly toxic to fish and aquatic life. Concrete and concrete wastewater contains suspended cement particles which may increase to a pH of 10 – 12. Measures must be taken to prevent any incidence of concrete, wastewater or concrete leachate from entering a watercourse, either directly or indirectly.

Description of Activity

Concrete pouring operations involve producing the desired concrete material either on-site or off-site, ensuring the concrete is properly mixed, placed into forms, shaped, and cured / set within time constraints. Cement pouring operations are strictly controlled to achieve its desired properties such as mechanical strength, low moisture permeability, and chemical and volumetric stability.

Tremie concrete is a special mix that allows the concrete to be placed underwater or into deep foundations. Tremie concrete has the ability to achieve full compaction by self-weight when placed by Tremie in a deep foundation, under submerged conditions. Underwater concreting using the Tremie method is convenient for pouring large amount of high flowable concrete. The concrete is moved to the hopper by either pumping, belt conveyer or skips. Tremie pipe, which upper end connected to a hopper and lower end continuously submerged in fresh concrete, is used to place concrete at the exact location from a hopper at the surface.

Any interruption in pouring of the concrete can cause the initially placed material to begin to set before the next batch is added on top. A wide variety of equipment is used for concrete pour operations, from hand tools to heavy industrial machinery (e.g., mixers, pumps). Concrete washout areas are typically used to contain concrete slurry and liquids when the chutes of concrete mixers and hoppers of concrete pumps are rinsed out after delivery to a site. The washout facilities are used to consolidate solids for easier disposal or reuse and to prevent runoff of contaminated liquids.

Grouting and sealing is carried out to fill cracks and voids in concrete and to fill voids partly occupied by several different types of materials (e.g., concrete, metal, rock, etc.). Cementitious grouts are most commonly applied in sealing of concrete, brick or rock structures. Chemical grouts (e.g., epoxy mixes, polyurethane) are used in smaller quantities for more specialized purposes. Equipment used in the application of cementitious grouting includes grout mixers, holding tanks with agitators, pumps and various grout applicators.



Environmental Standards and Guidelines

General

- All concrete pour operations must be described in the Construction Plan of the site-specific EMP and accepted by PCA.
- Use pre-cast concrete structures where feasible to minimize concrete pour operations.
- Works are preferably undertaken during periods of dry weather (e.g., summer) as this allows easier control of sediment.
- Concrete delivery routes and pump truck and/or concrete delivery system location(s) must be described in the site-specific EMP and accepted by PCA.
- Washing of concrete pouring, grouting and sealing tools and equipment in any body of water is prohibited. All concrete pouring, grouting and sealing equipment must be washed in a wash-down area.
- All wash-down area and containment facility locations must be identified in the site-specific EMP and accepted by PCA.
- All concrete products, grouts and sealants shall be stored under cover, away from watercourse, stormwater drains, ditches or street gutters
- Prior to commencement of the work, ensure water, and sediment control measures are designed to ensure that concrete is not deposited directly or indirectly into any watercourse, stormwater drain, ditch or street gutter.
- No excess concrete shall be deposited on-site.

Normal Concrete Pour Operations

- PCA shall be notified within 48 hours prior to the commencement of any significant concrete pour operations (e.g., foundations) and for all Tremie pour operations.
- Maintain complete isolation of cast-in-place concrete for a minimum of 48 hours if the ambient air temperature is above 0°C (for the entire period) and for a minimum of 72 hours if ambient air temperature is below 0°C;
- All water that contacts uncured or partly cured concrete, all leachates or wastewater with high pH (greater than 9) shall be captured in a wastewater containment area.
- The waste water containment area shall be designed by a Qualified Professional(s) and sized to hold twice the volume of anticipated water run-off, leachate or wastewater.
- Carbon dioxide (CO₂) or neutralizing acids shall be used to neutralize waters with high pH (greater than 9).
- Sufficiently sized carbon dioxide (CO₂) tanks with regulators, hoses and gas diffuser, shall be readily available during normal concrete pour operations. The tank shall be used to release carbon dioxide gas into an affected area to neutralize pH levels should a concrete spill occur. Workers shall be trained in the use of the tank.
- Neutralizing acids must be contained in a professionally established system operated by a Qualified Professional.
- Any use of carbon dioxide (CO₂) or neutralizing acids to modify pH levels shall be reported to PCA as soon as reasonably possible



Tremie Pour Operations

- Tremie pour operations must be described in the Construction Plan of the site-specific EMP and accepted by PCA.
- Tremie pour operations may be undertaken where site conditions do not allow work in the “dry” and in still water or near zero flow conditions exist (i.e., <0.5 m/sec). Justification of the need for the Tremie pour operations must be included in the site-specific EMP.
- All Tremie pour equipment shall be operated from the shore.
- All forms shall be examined prior to concrete pours to ensure they are tight.
- The work area for a Tremie pour shall be isolated with a turbidity curtain (See Sediment Control ESG-2-Pre) and/or impermeable material (e.g., sheet piling, sandbags plus impermeable material to line sandbags).
- Carbon dioxide (CO₂) shall be used to neutralize waters with high pH (greater than 9).
- Sufficiently sized carbon dioxide (CO₂) tanks with regulators, hoses and gas diffuser, shall be readily available during normal concrete pour operations. The tank shall be used to release carbon dioxide gas into an affected area to neutralize pH levels should a concrete spill or seepage from the concrete form occur. Workers shall be trained in the use of the tank.
- Any use of carbon dioxide (CO₂) to modify pH levels shall be reported to PCA as soon as reasonably possible
- The use of neutralizing acids to neutralize waters with high pH is prohibited at Tremie pour operations.

Grouting and Sealing

- The type(s) of grouts and sealants proposed for use shall be identified in the site-specific EMP and accepted by PCA.
- Avoid mixing or ordering more grout and sealant material than is required to complete the work.
- Isolate the work site involving grouting to the extent possible. The isolated work site should be sufficiently large to contain water run-off, residues and any waste material.
- Store grout and sealant products under cover, away from watercourse, stormwater drains, ditches or street gutters.
- All grout and sealant products and excess materials shall be removed in a way that will ensure material does not enter the waterway, stormwater drain, ditch or street gutter. Collect excess grout in the “dry”.

Wash-down Areas

- Provide appropriately sized containment facilities for the wash-down water from concrete delivery trucks, concrete pumping equipment.
- Containment structure area should be emptied/changed once 50% full.
- The wash-down area should be located away from a watercourse, stormwater drain, ditch or street gutter on flat even terrain.
- The wash-down area should be conveniently located for washing out equipment and clearly sign-posted.
- All wash-down water is to be contained.
- Concrete wash-down areas are generally not designed for the collection of excess concrete. Excess concrete waste should be returned to the local batching plant for treatment and re-use, or placed in a site receptacle designated for concrete and masonry, and allowed to set.
- To minimize the amount of wash-down water generated, excess concrete should be scraped off the equipment before it is washed and placed in a site receptacle designated for concrete.
- A high pressure, low volume water spray nozzle should be used to reduce water use.



Spill Response Involving Wet Concrete

In situations where wet (fresh) concrete or partially mixed cementitious materials, or waste water are released from concrete pouring equipment (e.g., the mixer drum, pumper truck) or forms in an uncontrolled situation the following release response procedures should be followed:

- Concrete is considered a deleterious substance and must be reported to PCA and the Ontario Ministry of Environment and Climate Change Spills Action Centre (SAC).
- Maintain an on-site concrete spill response kit that includes:
 - Sand bags (number to match the scale of the project) and to isolate a contaminated area
 - Impermeable material to line sandbags
 - Impermeable turbidity curtains
 - CO₂ Bubblers
- Secure concrete spill area and establish access control.
- Safely contain the released material. Build berms using available on-site surface materials to contain the wet concrete or slurry. Berms constructed from low permeability material (e.g., clays) are preferred. Ensure the flow of wet concrete or slurry is prevented from entering any storm sewer opening, drainage ditch or water body.
- Depending on site conditions and area activities, let the wet concrete set, (usually within 75 to 120 minutes). Once set up, spilled concrete can be broken up using available equipment (e.g., loader, dozer or backhoe), loaded and trucked away for recycling or disposal. If the release occurs on bare ground, some surface soil may have to be removed.
- For slurry, collect into drums or plastic garbage cans if spill volume is less than one cubic meter. A vacuum truck is recommended for collecting any larger volumes of slurry.
- If the concrete spill occurs into a drainage ditch, use berms of low permeability materials and sandbags to contain the spilled concrete.
- If concrete is spilled in a watercourse or waterbody – deploy impermeable turbidity curtains to contain area. Once site is contained, install CO₂ bubbler and removed as much solid material as possible.
- Let the wet concrete set. When set, concrete can be recovered using available equipment (e.g., loader, dozer or backhoe), broken up and trucked away for recycling or disposal. All efforts must be made in recovery to avoid further disturbance of the bed, slopes or banks of the water body or watercourse. Isolation berms cannot be removed until pH has returned to background levels.
- Monitoring of water pH downstream of a worksite or discharge point shall be undertaken at 100 m, 200, and 400 m or as directed by PCA.

Water Quality Monitoring

- All concrete pours in or near water must have a Qualified Professional(s) on-site to monitor downstream surface water turbidity and pH and assist in mitigating the effects of a concrete release.
- Water pH shall be monitored frequently in the intake of discharge pump, holding tank, outflow, and/or downstream of the isolated work site or discharge point until the works are completed. Monitoring of water downstream of a worksite or discharge point shall be undertaken at 100 m, 200, and 400 m or as directed by PCA. In addition, waters within the isolated work area for a Tremie pour operation shall be sampled.
- Water pH monitoring must be conducted by a Qualified Professional(s) using a digital pH meter with an accuracy of +/- 0.2 pH units.
- Corrective measures shall be implemented if downstream pH has changed more than 1.0 pH unit from background, measured to an accuracy of +/- 0.2 pH units, or is below 6.5 or above 9.0 pH units.



Waste and Wastewater Management

- The discharge of concrete wastewater, leachate or slurries into a watercourse is prohibited.
- Should the amount of water in the Tremie pour work site exceed the amount that the Tremie pour is able to handle, the excess water and any leachate will be pumped and contained in covered containers with appropriate visible labels and tested. Waters and leachates (contaminated or otherwise) that are generated by a concrete pour operation with a pH \geq 12.5 are considered corrosive and a hazardous waste under Ontario Regulation 347 of the *Environmental Protection Act*. All wastewater, leachates and slurries must be contained in sealed containers and temporarily stored on the project site until they are collected for disposal by a licensed waste hauler.
- All off-site shipments must be accompanied by a MOECC waste manifest and the generator of the materials must be registered as a generator of hazardous waste with the MOECC. A Hazardous Waste Information Network (HWIN) number will be issued for the waste generator upon their registration with the MOECC, and this HWIN number must be used on all waste manifests.
- All other non-hazardous waste generated by a concrete pour operation shall be disposed according to Ontario Regulation 558/00. R.R.O. 1990 (General – Waste Management).
- Environmental permits shall be obtained by the Contractor for any off-site disposal.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control (ESG-1-Pre)
- Sediment Control (ESG-2-Pre)
- Treatment of Discharge Waters (ESG-14-C)

Related EMP Component Plans

- Transportation Management
- Site Dewatering and Wastewater Plan
- Surface Water Management, Erosion and Sediment Control
- Dredging and Sediment Removal
- Hazardous Materials Management
- Spill Prevention and Emergency Response

Other Design and Environmental Considerations

- Confirm need /exemption for a PTTW based on volume and duration of removals and the requirement of a Historic Canals Regulations permit. Planning must allow sufficient time to obtain a permit from the MOECC/PCA.
- Grouting operations to be undertaken when ambient temperature falls below 4.4°C require special design considerations regarding the selection of masonry materials for cold weather performance need to protect and/or heat materials, water requirements, etc.)



References

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Dredging and Sediment Removal (ESG-6-C)

Application to Ontario Waterways' Projects

Dredging and sediment removal is occasionally undertaken in waterways to facilitate construction, for facility maintenance and/or navigation purposes. Pre-dredging to remove soil or soft sediments may be undertaken in conjunction with cofferdam installation, and dredging is often used to remove sediment from behind a cofferdam or for site restoration. Dredging and sediment removal have the potential to harm or kill benthic organisms and fish. Water quality can be adversely affected through the resuspension of sediment.

Description of Activity

Dredging and sediment removal refers to the removal of sediment from areas where sediment has accumulated over time (e.g., channel beds, water intakes, beneath boat slips / dock areas, locks and dams). Dredging and sediment removal can be undertaken using a variety of equipment, including mechanical dredges (e.g., buckets, clamshells, dippers); hydraulic or suction dredges (e.g., cutter head, auger head); and/or using speciality equipment and methods (e.g., water injection, or "jetsed", pneuma pumps and precision dredging tools).

Environmental Standards and Guidelines

General

- All sediment removal should be considered in the "dry" as the primary option. Where sediment removal in the "dry" is not feasible then dredging can be undertaken.
- All dredging activities shall be undertaken under the supervision of a Qualified Professional(s).
- Timing windows for in-water works shall be respected for dredging and sediment removal activities.
- The area(s) and volumes to be dredged, the dewatering method, equipment and operational controls to be used shall be outlined in a Dredging and Sediment Removal Plan to be reviewed and accepted by PCA prior to commencement of these activities.
- The PCA Environmental Authority shall be contacted and advised at least 48 hours in advance of the start of the proposed dredging or sediment removal operations if the activity has been previously assessed in the EIA.

Dredging Operations

- Hydraulic or suction dredging will be the preferred method for sediment removal. Where contaminated sediments exist there is a potential for contaminated sediments, hydraulic or suction dredging is the only acceptable method for sediment removal. Refer to the Canadian Sediment Quality Guidelines for the Protection of Aquatic Life (CCME, 2001).
- Dredging operations shall be conducted from the shore or from an existing structure (e.g., berm, dam) where possible.
- If necessary, dredging and sediment removal may be conducted from a floating structure (i.e., a barge). In addition:
 - sufficient water must be present to prevent the barge from grounding;
 - minimize the use of barge stabilizing spuds and their disturbance of bottom substrates;
 - fully restore any areas disturbed by barge stabilizing spuds;
 - prop scour must not occur from tending vessel(s). This may require maneuvering of barges in shallow water with ropes tied to shore and/or pilings;



- exclude fish and other wildlife from the work area prior to the commencement of any pile driving operations;
- All boats and equipment used in pile driving operations will be cleaned off-site before coming onto the project site and before leaving the project site; and
- Boats shall be free of ballast water.
- Turbidity curtains shall be deployed around the dredge area for water depths greater than 0.5 m above the sediment bed. Turbidity curtains are ineffective at depths greater than 6 m and at current velocities greater than 0.5 m/sec (approx. 1 knot). Where turbidity curtains cannot be deployed then suction dredging or alternatives that minimize re-suspension of sediments will be used.
- Dredging operations shall be monitored using a Global Positioning System (GPS) tracking device to maintain dredging within the designated area(s).

Dewatering

- The pumping of turbid water directly back into the waterbody is not permitted. Downstream waters shall be routinely tested and compared to background to confirm compliance with performance standards. The field measurement for turbidity will be in NTU.
 - At the discharge points of pumping into any waterbody, a maximum increase of 8 NTU from background levels within 100 m of the dredge area for a short-term exposure (i.e., less than 24 hours). Maximum average increase of 2 NTU from background levels for a longer term exposure (e.g., more than 30 days). Should there be exceedances the PCA Environmental Authority may analyze Suspended Solids (SS) concentration with laboratory samples. When this occurs, TSS samples should be taken upstream of the work area (background), within the work area, and 100 m downstream of the dredge area. Additional downstream samples may be required by PCA.
 - At the discharge points of pumping into any waterbody, a maximum increase of suspended sediment concentration shall not be more than 25 mg/L over background levels within 100 m of the dredge area during any short term exposure period (i.e., less than 24 hours). For longer term operations (i.e., more than 30 days), average suspended sediment concentrations shall not be increased by more than 5 mg/L over background levels. TSS (mg/L) is only acceptable from laboratory results and will only be used if there is exceedances and for potential enforcement action.

Dredged Material Management

- No dredged materials shall be stored or stockpiled on top of ice during winter operations or where turbidity can run off-site and contaminate surrounding waterbodies.
- Any dredged material must have a suitable holding area designed to contain the volume of anticipated removal in a containment area or trucked off-site immediately.
- Dredged materials shall not be disposed of in a waterbody. Dredged materials shall be disposed in an approved Confined Disposal Facility (CDF) or licensed landfill.
- Storage of dredged material shall be managed and contained in accordance with PCA Sediment and Erosion and Sediment Control standards and guidelines.

Restoration

- Prior to re-watering, site must meet navigation depth requirements (these are site specific). All materials shall be removed and the dredge site restored.



Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control (ESG-1-Pre)
- Sediment Control (ESG-2-Pre)
- Fish Exclusion, Salvage and Relocation (ESG-7-C)
- Installation and Removal of Cofferdams and Isolation Structures (ESG-10-C)
- Invasive Species Management (ESG-11-C)
- Refueling and Spill Management (ESG-13-C)
- Treatment of Discharge Waters (ESG-14-C)
- Use and Maintenance of Heavy Equipment (ESG-15-C)
- Vehicle and Equipment Washing and Cleaning (ESG-16-C)
- Wildlife and Species at Risk Protection During Construction (ESG-17-C)

Related EMP Component Plans

- Dust and Air Quality Management
- Noise, Vibration and Ambient Light Management
- Transportation Management
- Demolition
- Site Dewatering and Wastewater Plan
- Surface Water Management, Erosion and Sediment Control
- Dredging and Sediment Removal
- Vegetation Protection
- Aquatic Resources Management
- Species at Risk Protection
- Fuel Management
- Spills Prevention and Emergency Response
- Dam and/or Bypass Channel Commissioning

Other Design and Environmental Considerations

- Design and locate new structures to avoid the need for future maintenance dredging.

Further Guidance

Parks Canada Agency, 2013. Parks Canada EIA - Best Management Practice for Routine Maintenance Dredging: Trent-Severn Waterway and Rideau Canal National Historic Sites. August, 2013.

Canadian Council of Ministers of the Environment (CCME), 2001. Canadian Environmental Quality Guidelines - Canadian Sediment Quality Guidelines for the Protection of Aquatic Life. Available at: <http://cegg-rcqe.ccme.ca>

References

British Columbia Ministry of Environment, General BMPs and Standard Project Considerations - Standards and Best Practices for Instream Works. Available at: <http://www.env.gov.bc.ca/wld/instreamworks/downloads/GeneralBMPs.pdf>



Fish Exclusion, Salvage and Relocation (ESG-7-C)

Application to Ontario Waterways' Projects

In-water works often require partial isolation of work areas to perform construction and maintenance activities in the “dry”. The installation of the isolation structures like (coffer dams, turbidity curtains), coupled with dewatering operations, may result in stranded fish in the work areas to be dewatered and will require that measures are taken for fish exclusion, salvage and relocation.

Description of Activity

Fish exclusion measures are those that prevent fish from entering or re-entering the working area. Fish exclusion involves deploying netting and “sweeping” the areas to drive fish out of the work area or into the netted area for capture. Fish salvage means the physical, non-lethal, capture of fish using other gear such as netting and electrofishing. Fish relocation involves moving the salvaged fish from the work area to either storage in buckets and tanks or directly to another location for release.

Environmental Standards and Guidelines

General

- Fish exclusion, salvage and relocation procedures and equipment shall be outlined in the site-specific EMP and accepted by PCA.
- All fish exclusion, salvage and relocation operations must be completed by a Qualified Professional(s) typically supported by a trained team.

Work Site Isolation

- In low flow settings (<0.5 m/sec), deploy turbidity curtains around the perimeter of the work site unless work area is isolated using impermeable materials (coffer dam, sheet pile, etc.). See Sediment Control ([ESG-2-Pre](#)) for guidance regarding turbidity curtain installation. If using a net instead of a turbidity curtain, the mesh size must be sized according to the smallest fish expected.
- In high flow conditions, where turbidity curtains will be ineffective, low turbidity isolation structures (e.g., low berms constructed from lined sandbags) shall be used as an exclusion structure.

Fish Salvage

- Perform an initial sweep of the work area to drive fish out prior to completely closing off the turbidity curtains surrounding the work area.
- Collect fish using gear suitable for the project site, habitat complexity, fish species likely to be encountered (particularly Species at Risk), and fish activity as determined by the Qualified Professional(s). Typical gear includes seine nets, dip nets, enmeshing nets and fish traps, and/or electrofishing. Other equipment includes buckets, holding tanks, fish transportation tanks. A combination of methods will usually be required. Electrofishing as a fish salvage method will be employed only if other salvage methods prove unsuccessful.
- Salvage should occur at water depths <0.5 m or depths that are most effective for the method chosen (e.g., boat e-fishing vs. seine netting).



- Initial fish salvage must continue until a rate of decline in the catch from subsequent efforts is observed and only a few individuals are caught.
 - A minimum of three (3) passes is recommended. Larger work areas and salvage undertaken at greater depths will require more passes.
 - Fish traps (bated or unbaited) must be deployed for a minimum of 24 hours. More traps (typically more than two) are required for larger work areas.
- Following initial salvage operations, the presence of residual fish should be anticipated. Additional efforts to safely remove stranded individuals should continue until dewatering activities are complete.
- An Inventory of captured fish numbers, species caught and mortality in accordance with permit conditions shall be prepared and submitted to PCA within one week of the completion of salvage operations.
- Any substantial mortality event (greater than 2%) shall be reported immediately to PCA.
- Release live fish into the same waterbody at the location of the salvaging of the work area (i.e., upstream fish go upstream and downstream go downstream)
- If invasive species are caught, fish will be euthanized and disposed of according to Canadian Council on Animal Care's "Guidelines on The Care and Use of Fish in Research, Teaching and Testing".
- Any fish exclusion method including turbidity curtains must be monitored for the duration of in water works. If fish are observed within the exclusion area, barriers must be reinstalled and fish salvage must reoccur.

Fish Handling Guidelines

- Fish must be handled as little as possible while collecting and transferring them into buckets, holding tanks or safety pools.
- Fish shall be transferred immediately to either a safe upstream or downstream area (15 min max holding time).
- Live tanks fitted with aeration bubblers must be used for larger capture operations where numerous (i.e., thousands) fish or sensitive coldwater species are anticipated. Fish should not be crowded in the holding containers. Fish will be less stressed in larger containers (300 gallons or larger preferred), in colder water, and with supplemental oxygen or aeration.
- Fish should be carefully released into the watercourse. Buckets will be submersed and fish allowed to swim out under their own power.
- The water temperature in the holding tanks will not be substantially (within 1-2 C^o) different from the river water.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control (ESG-1-Pre)
- Sediment Control (ESG-2-Pre)
- Installation and Removal of Cofferdams and Isolation Structures (ESG-10-C)
- Treatment of Discharge Waters (ESG-14-C)
- Wildlife and Species at Risk Protection During Construction (ESG-17-C)



Related EMP Component Plans

- Blasting
- Site Dewatering and Wastewater Management
- Surface Water Management, Erosion and Sediment Control
- Dredging and Sediment Removal
- Aquatic Resources Management
- Species at Risk Protection
- Invasive Species Management
- Spills Prevention and Emergency Response
- Dam and/or Bypass Channel Commissioning
- Site Restoration

Other Design and Environmental Considerations

- None

Further Guidance

Canadian Council on Animal Care, 2005. Guidelines on The Care and Use of Fish in Research, Teaching and Testing. ISBN: 0-919087-43-4. Available at: <http://www.ccac.ca>.

References

British Columbia Ministry of Agriculture, Food and Fisheries, 2005. Drainage Management Guide – No. 17 in series order No. 527.110.1 – Fish Salvage. April, 2005.

Washington State Department of Transportation (WSDOT), undated. WSDOT Fish Exclusion Protocols and Standards. Available at: https://www.wsdot.wa.gov/NR/rdonlyres/70E7E285-ECC6-41BA-A2DF-87FD0D68128D/0/BA_FishHandling.pdf



Fugitive Dust Control during Construction (ESG-8-C)

Application to Ontario Waterways' Projects

Site preparation, construction and site restoration activities undertaken for projects on Ontario Waterways such as earthworks, excavation, soil stripping, clearing and grubbing, earthmoving and revegetation, can result in significant dust emissions, especially during dry weather periods and particularly if followed by high winds.

Description of Activity

Water or chemical dust suppressants can be applied to mitigate fugitive dust from site preparation and construction activities. The application of water is typically the most common and preferred by PCA dust control method that is employed by construction companies across Canada. A variety of chemical dust suppressants are available to suppress fugitive dust emissions from construction sites.

Environmental Standards and Guidelines

General

- All fugitive dust control measures must be described in the site-specific EMP and accepted by PCA, including all proposed chemical applications for dust control.
- Use of salts or petroleum products for dust control is prohibited.
- Fugitive dust levels, measured as total suspended particulate (TSP) at the property boundary shall not exceed the Ontario Ambient Air Quality Criteria (AAQC) of 120 micrograms per cubic metre ($\mu\text{g}/\text{m}^3$) over 24 hours or $60 \mu\text{g}/\text{m}^3$ averaged over a year. For measuring methods, refer to the Canada-wide Standards for Particulate Matter and Ozone Ambient Air Monitoring Protocol.

The following best practices for the management of construction sites shall be considered in developing a Dust and Air Quality Management Plan as part of the site specific EMP.

Site Preparation

The first principle in minimizing fugitive dust is to follow erosion control best practices (See Erosion Control ([ESG-1-Pre](#))).

- Clear and grade the construction site in stages
- Maintain vegetative buffers as wind screens and utilize wind fencing
- Stabilize surfaces of completed earthworks
- Prohibit open burning
- Where possible, reduce earthworks during windy conditions.

Storage Piles

- Locate storage piles in sheltered areas
- Utilize enclosures/coverings for storage piles where feasible
- Utilize wind fences/screens for storage piles in addition to sediment fencing.



- Stabilize short term and long term stockpiles (See Soil Stripping, Grubbing and Stockpiling, [ESG-3-Pre](#))

Material Handling and Transfer Systems

- Establish stabilized work site entrances (See Sediment Control [ESG-2-Pre](#))
- Secure loads on haul trucks. Total enclosures are preferred to partial enclosures
- Minimize material handling
- Where possible, reduce certain material handling activities during windy conditions

Using Water and Chemical Dust Suppressants at Construction Sites

- The use of water as a dust suppressant is preferred to then use of chemical agents.
- Water should be applied, at a minimum, once a daily basis, to all inactive disturbed areas, unpaved roads used for vehicular traffic and active storage or stockpiles. The frequency of application should be increased beyond once per day to prevent visible emissions of fugitive dust. Consideration should be given to spraying water onto materials with the potential to generate dust 15 minutes prior to handling and/or at points of transfer.
- Water will not be applied in volumes capable of creating erosion or uncontrolled run-off.
- Only approved chemical agents, accepted by PCA, can be applied as dust suppressants. The categories of products for dust suppression include:
 - Lignin derivatives (e.g., Tembec's Tembind or TDS)
 - Vegetable oils (canola, soybean, linseed, etc.)
 - Synthetic polymer emulsions
- Products that have not been accepted by PCA must undergo an assessment before being accepted for use as a dust suppressant.
- Application of chemical agents must follow manufacturer's specifications.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control ([ESG-1-Pre](#))
- Sediment Control ([ESG-2-Pre](#))
- Soil Stripping, Grubbing and Stockpiling ([ESG-3-Pre](#))

Related EMP Component Plans

- Dust and Air Quality Management
- Noise, Vibration and Ambient Light Management
- Blasting
- Vegetation Protection
- Wildlife Protection and Management
- Aquatic Resources Management
- Species at Risk Protection



Other Design and Environmental Considerations

- A variety of chemical dust suppressants are available to suppress fugitive dust emissions from construction sites. While being more expensive than water, they are also more effective in suppressing dust and have to be applied much less frequently.
- MSDS sheets or equivalent data for chemical dust suppressants should be available on-site.

Further Guidance

Canadian Council of Ministers of the Environment (CCME). (2011). Ambient Air Monitoring Protocol for PM_{2.5} and Ozone – Canada –wide Standards for Particulate Matter and Ozone. PN 1456. Available at: http://www.ccme.ca/files/Resources/air/pm_ozone/pm_oz_cws_monitoring_protocol_pn1456_e.pdf

References

Centre for Excellence in Mining Innovation (CEMI), 2010. Literature Review of Current Fugitive Dust Control Practices within the Mining Industry. Prepared by Golder Associates, August 11, 2010.

Cheminfo, 2005. Best Practices for the Reduction of Air Emissions from Construction and Demolition Activities. Report prepared for Environment Canada, March 2005.

Federation of Canadian Municipalities and National Research Council, 2005. Dust Control for Unpaved Roads. Version 1.0. October, 2005. ISBN 1-897094-93-0. Available at: https://www.fcm.ca/Documents/reports/Infraguide/Dust_Control_for_Unpaved_Roads_EN.pdf

Ontario Ministry of Environment, 2012. Ontario's Ambient Air Quality Criteria. Standards Development Branch, Ontario Ministry of the Environment, April 2012. PIBS#6570e01.

Provincial / Territorial Committee (PTOC) on Local Government, 2016. Dust Suppression Alternatives – 2016 Update. June 2016.



Grinding and Welding (ESG-9-C)

Application to Ontario Waterways' Projects

Grinding and welding operations are anticipated for projects on Ontario Waterways involving placement of steel and structural steel for locks, gates, building super-structure, the fabrication, installation, dismantling of mechanical equipment (HVAC equipment) and ancillary equipment such as handrails, guardrails, specialties, and ornamental metal.

Description of Activity

Grinding and welding are processes used to cut or join metal using heat. Operations such as welding and grinding, or similar, are capable of igniting combustible materials or flammable atmospheres or providing a source of ignition for a fire. They involve the use of portable compressed gas cylinders, arc welding equipment, open flame or spark-producing equipment. Compressed gas cylinders have inherent dangers. The handling and storage of compressed gas cylinders must be undertaken with great care. Grinding and welding operations on land are undertaken with shielding such as non-combustible welding drapes, used in hot work areas.

Grinding and welding can also be undertaken underwater by trained divers. Underwater grinding and welding operations involve several hazards, including lethal electrical currents and the use of oxygen and hydrogen rich gases which can explode.

Environmental Standards and Guidelines

- Land-based or grinding and welding activities conducted in the “dry” are preferred to underwater grinding and welding.

Land-based Grinding and Welding

- All land based grinding and welding activities must be conducted in a manner as to prevent release of weld rods, metal chips, or any other debris into a stormwater drain, waterbody or watercourse.
- Undertake grinding and welding activities indoors or off-site where possible and comply with health & safety, technical and waste management specifications. Ensure designated substance report is followed (if applicable).
- Fit grinders and other power tools with dust extraction and collection systems.
- Establish an isolated, well-ventilated area for using oxy-acetylene torches and welders, away from combustible materials such as fuels, oils, grease and rubber.
- Conduct all grinding operations on a sealed surface inside a screened area to minimize the dispersion of metal fragments
- Schedule outdoor grinding and welding activities for dry weather. Do not conduct outdoor grinding and welding activities during a rain event.
- Daily records must be maintained of all weld rods consumed.
- Metal scraps, filings and waste/unusable weld rods shall be stored in a container identified for scrap metal recycling.



Underwater Grinding and Welding

- All underwater grinding or welding activities must be described in the site-specific EMP and accepted by PCA, including:
 - all chemicals and gases to be used underwater;
 - Procedures for the containment or otherwise collection / retrieval of metal scraps, filings and waste/unusable weld rods from the underwater work area.
- Underwater grinding and welding operations shall only be undertaken in still or extremely low flow conditions.
- Underwater grinding and welding operations shall be undertaken by a Qualified Professional(s).
- Daily records must be maintained of all weld rods consumed.
- Metal scraps, filings and waste/unusable weld rods shall be stored in a container identified for scrap metal recycling.

Waste Management

- Wastes that are generated by grinding and welding operations that are considered to be hazardous wastes under Ontario Regulation 347 of the *Environmental Protection Act* must be contained in sealed containers and temporarily stored on the project site until they are collected for disposal by a licensed waste hauler.
- All other non-hazardous waste generated by a concrete pour operation shall be disposed according to Ontario Regulation 558/00. R.R.O. 1990 (General – Waste Management).
- Environmental permits shall be obtained by the Contractor for any off-site disposal.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Fugitive Dust Control During Construction (ESG-8-C)
- Refueling and Spill Management (ESG-13-C)

Related EMP Component Plans

- Dust and Air Quality Management
- Noise, Vibration and Ambient Light Management
- Demolition
- Fuel Management
- Hazardous Materials Management
- Spills Prevention and Emergency Response
- Dam and/or Bypass Channel Commissioning

Other Design and Environmental Considerations

- None

References

Centre for Environmental Excellence, 2017. Construction Practices for Environmental Stewardship. http://environment.transportation.org/environmental_issues/construct_maint_prac/compendium/manual/detailed_toc.aspx



Installation and Removal of Cofferdams and Isolation Structures (ESG-10-C)

Application to Ontario Waterways' Projects

In-water works often require partial isolation of work areas to perform construction and maintenance activities in the “dry”. In some instances, this may require the maintenance of downstream flow and fish passage using a coffer dam. Cofferdams may be used for larger scale projects (e.g., dam replacements) and smaller scale projects such as maintenance, minor upgrades and repairs.

Description of Activity

The use of a coffer dam involves isolating a portion of a water body to create a dry work area. In channels this involves isolating the work area from the active flow and dewatering the created isolated work area. Cofferdams are also used in static waterbodies such as lakes to isolate piers or retaining walls. This isolation technique is generally considered a “passive” method, only requiring periodic removal of water from the work area using a small pump and hose following precipitation events or minor seep inflow. Due to the passive nature of this technique, its use should be encouraged during all operations having an anticipated duration of more than one week on appropriate sized waterbodies.

Environmental Standards and Guidelines

- To the extent possible, all in-water work shall be conducted in the “dry” by using an isolation coffer dam.
- All coffer dam designs, installation and removal procedures, including timing, shall be described in the site-specific EMP and accepted by PCA.
- Cofferdams shall be designed by a Qualified Professional(s), taking into consideration the following best practices:

Sizing It is essential to use an adequately sized coffer dam in order to prevent overtopping during high flow events. A coffer dam shall be sized to isolate a specified portion of a channel during discharge events up to bankfull or the 1 in 20 year return flow, per year of construction. Frequent over-topping or persistent leaks requiring repeated dewatering of the work area shall not be permitted.

- Materials**
- It is essential that the most appropriate type of material be selected to construct a coffer dam. The preferred method is to use sheet steel, prefabricated inflatable rubber dam, meter bags filled with washed stone with a waterproof liner, or a form dam. See Pile Driving ([ESG-12-C](#)) for guidance regarding installation of sheet piling.
 - For larger coffer dams, cellular structures containing aggregate shall be used.
 - The placement of loose aggregate into a waterbody shall not be permitted.



- Dewatering
- A “clean water zone” on the inside of the coffer dam shall be established to keep water from leaking into the work area.
 - Dewatering of the work area requires the use of a pump. Clean water may be pumped directly into the active portion of the water body if no scour potential exists. The pumping of turbid water directly back into the waterbody is not permitted. Pumping operations shall ensure that the pump inlet(s) is protected using an appropriately designed and sized fixed screen or other device to prevent debris blockage and fish entrainment.
 - Screens may need to be designed and fabricated to be “fit for purpose”. See Treatment of Discharge Waters ([ESG-14-C](#)).
 - Periodic removal of water from behind the coffer dam may be required following precipitation events or minor seep inflow to keep the work area dry.
- Fish Salvage and Relocation
- Fish from within the isolated work area shall be salvaged and relocated. See Fish Exclusion, Salvage and Relocation ([ESG-7-C](#)).
 - In the event that the coffer dam is overtopped and inundated with water from the surrounding waterbody, fish shall be removed from the work area prior to de-watering.
- Dam Removal
- Following completion of works, the coffer dam shall be carefully removed from the waterbody so as to avoid disturbance of the bed and banks. Removal shall begin at the downstream end of a coffer dam in flowing water.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control ([ESG-1-Pre](#))
- Sediment Control ([ESG-2-Pre](#))
- Fish Exclusion, Salvage and Relocation ([ESG-7-C](#))
- Treatment of Discharge Waters ([ESG-14-C](#))

Related EMP Component Plans

- Dust and Air Quality Management
- Noise, Vibration and Ambient Light Management
- Blasting
- Demolition
- Site Dewatering and Wastewater Plan
- Surface Water Management, Erosion and Sediment Control
- Dredging and Sediment Removal
- Vegetation Protection
- Wildlife Protection and Management
- Aquatic Resources Management
- Species at Risk Protection
- Invasive Species Management
- Fuel Management
- Spills Prevention and Emergency Response
- Dam and/or Bypass Channel Commissioning



Other Design and Environmental Considerations

- Confirm need /exemption for a PTTW based on volume and duration of removals and the requirement of a Historic Canals Regulations permit. Planning must allow sufficient time to obtain a permit from the MOECC/PCA.
- Timing of works should avoid seasonally high rainfall and snowmelt periods.
- Timing windows for in-water works shall be respected.

Further Guidance

Department of Fisheries and Oceans (DFO), 1995. Freshwater Intake End-of-Pipe Fish Screen Guideline. ISBN 0-662-23168-6. Catalogue No. Fs 23-270 / 1995E.



Invasive Species Management (ESG-11-C)

Application to Ontario Waterways' Projects

There are a number of invasive species at properties along Ontario waterways sites that are currently being managed by PCA. Invasive species can be both plants, animals, fungi and/or viruses (e.g., dog strangling vine, water flea, butternut canker, snake fungal disease).

Construction activity requires numerous types of vehicles, boats and equipment, such as: passenger cars and trucks, motorbikes, all terrain Vehicles (ATV's), snowmobiles, boats and heavy equipment (e.g., trucks, tractors, backhoes, graders, dozers, excavators, skidders, loaders, cement pumpers, water tankers and trucks). The transport and operation of these vehicles, boats and equipment has the potential to introduce invasive species into areas of native vegetation and non-infested waters. Similarly, the disturbance of soils, stockpiling, moving impacted soils, water, wood, mulch and compost can result in the spread of invasive species across a site.

Description of Activity

Activities associated with the clearing, construction, and restoration could introduce and accelerate the spread of invasive plants. Avoiding and/or reducing the introduction and spread of invasive species during construction activity is desirable for the protection of native vegetation and wildlife habitat. The term invasive plant species includes plants listed as weeds and/or noxious listed by the Ontario Ministry of Agriculture, Food and Rural Affairs. The most current list is available at: http://www.omafra.gov.on.ca/english/crops/facts/noxious_weeds.htm

Environmental Standards and Guidelines

General

- Management or control plans to address invasive species infestations identified on-site and those highlighted in the EIA will be included in the site-specific EMP to be accepted by PCA.
- Any new invasive species identified will be reported to PCA and a management plan shall be developed and accepted by PCA.
- Management or control plans for invasive species infestations will be developed by a Qualified Professional(s).

Preventive Measures at Construction Sites

- The following preventative measures shall be implemented for all construction sites:



<p>Movement of Construction Vehicles, Vessels and Equipment</p>	<ul style="list-style-type: none"> • All construction vehicles, vessels (i.e., boats, barges, etc.) and equipment will be cleaned off-site before coming onto the project site and before leaving an area of infestation. • Boats shall be free of ballast water.
<p>Cleaning of Construction Vehicles, Vessels and Equipment</p>	<ul style="list-style-type: none"> • Vehicles, vessels and equipment should be cleaned at least weekly and in accordance with the Ontario Invasive Plant Council’s “Clean Equipment Protocol” for cleaning of vehicles and equipment. See Vehicle and Equipment Washing and Cleaning (ESG-16-C) for additional guidance. • Pressure wash (non-frozen conditions) or use compressed air (frozen conditions) to clean vehicles, vessels and equipment when leaving infested areas.
<p>Construction Crews</p>	<ul style="list-style-type: none"> • Work attire, boots, and other personal protection equipment will be cleaned in accordance with the Ontario Invasive Plant Council’s “Clean Equipment Protocol”.
<p>Construction Materials</p>	<ul style="list-style-type: none"> • Contractors shall certify that all construction material sources used for supplies of sand, gravel, rock and mulch are weed-free prior to obtaining or transporting any material from them. Obtain and use only certified weed-free straw or use fiber roll logs for sediment containment. Hay shall not be used as it contains seed heads and seeds from agricultural fields (often weedy/invasive species).
<p>Construction Works and Activities</p>	<ul style="list-style-type: none"> • Soils where invasive species are present will not be reused or left on-site but disposed off-site at a licensed facility. • No intact, untreated wood will be removed off-site or brought to the site, to prevent the spread of invasive insects, unless removed by a Qualified Professional(s) following approved treatment or disposal methods. • Invasive fish species shall not be relocated during fish salvage operations. If invasive species are caught, fish will be euthanized and disposed of according to Canadian Council on Animal Care’s “Guidelines on The Care and Use of Fish in Research, Teaching and Testing”.
<p>Inspections</p>	<ul style="list-style-type: none"> • Vehicle, vessel and equipment inspection shall be done before: <ul style="list-style-type: none"> ○ Moving vehicles out of a local area of operation. ○ Moving machinery between properties or sites within the same property where invasive species may be present in one area, and not in another. ○ Using machinery along roadsides, in ditches, and along watercourses. ○ Vehicles using unformed dirt roads, trails or off road conditions. ○ Using machinery to transport soil and quarry materials. ○ Visiting remote areas where access by vehicles is limited.



Post-Construction Works and Activities	<ul style="list-style-type: none">• Revegetate or otherwise prevent the establishment of invasive species in all areas of the job site through a program of monitoring and post-construction weed treatment for the life of the project.• Revegetate using soil components and mulches obtained from non-weed infested sources.• Utilize seed and other plant material that has been checked and certified as noxious weed-free and that has a weed content of 0.05% or less.• Revegetate using native plant materials that have a high likelihood of survival.• Maintain all planted material and native vegetation located on the project site for the life of the project.• Monitor all seeded sites for weed infestation. Treat all weeds adjacent to newly seeded areas prior to planting and treat planted areas for weeds in the first growing season.
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Control Measures in Areas Infested with Invasive Species

- Control measures shall be undertaken for infestations of invasive plant species prior to and after construction under the supervision of a Qualified Professional(s). The control method should be informed by the biological characteristics of the species, the size of the infestation, and the potential to transport on-site and off-site. Acceptable methods of invasive species control include:
 - **Mechanical Control** – Mechanical control methods involve doing manual labour to remove the vegetation from the ground. Some techniques include cutting, pulling, mowing, smothering, removing the outer layer from the stem, or prescribed burning.
 - **Chemical Control** – Chemical control methods involve using herbicides to target the invasive plant species. Pesticides should only be used if other more desirable methods did not work and if there is a net benefit to the environment that is positive. Any proposed chemical control must be included in the site-specific EMP and accepted by PCA.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Vegetation Clearing and Protection (ESG-5-Pre)
- Fish Exclusion, Salvage and Relocation (ESG-7-C)
- Revegetation (ESG-1-Post)

Related EMP Component Plans

- Transportation Management
- Wildlife Protection and Management
- Aquatic Resources Management
- Species at Risk Protection
- Invasive Species Management



Further Guidance

Canadian Council on Animal Care, 2005. Guidelines on The Care and Use of Fish in Research, Teaching and Testing. ISBN: 0-919087-43-4. Available at: <http://www.ccac.ca>.

Ontario Invasive Plant Council, 2013. Clean Equipment Protocol for Industry - Inspecting and cleaning equipment for the purposes of invasive species prevention. Available at: http://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/Clean-Equipment-Protocol_June2016_D3_WEB-1.pdf

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Ontario Ministry of Agriculture, Food and Rural Affairs, 2015. Noxious Weeds in Ontario. Available at: http://www.omafra.gov.on.ca/english/crops/facts/noxious_weeds.htm

Ontario Invasive Species Strategic Plan 2012. Government of Ontario. Available at: http://www.mnr.gov.on.ca/stdprodconsume/groups/lr/@mnr/@biodiversity/documents/document/stdprod_097634.pdf

Invasive Species Management for Infrastructure Managers and the Construction Industry 2008.

Wade, M. Booy, O. and White, V. Available at:

http://www.ciria.org/service/Web_Site/AM/ContentManagerNet/ContentDisplay.aspx?Section=Web_Site&ContentID=9001



Pile Driving (ESG-12-C)

Application to Ontario Waterways' Projects

Pile driving is often used to establish or support the foundations of buildings and structures, control settlement or used as part of a coffer dam installation (e.g., sheet pile coffer dam). Pile driving has the potential to result in adverse noise and vibration to local receptors including nearby residents and communities as well as wildlife. When conducted in water or in proximity to a waterway, pile driving also has the potential to disturb or harm fish and adversely affect water quality.

Description of Activity

Pile driving can be undertaken using a variety of construction methods, equipment and materials. Hammers; including drop, diesel, air, vibratory and hydraulic, vibroflot, and rotary, air and churn drills are the primary instruments in a pile driving operation. These hammers and drills are supported by a wide variety of heavy equipment, including a range of conventional cranes (truck mounted, crawler and pedestal mounted), scows and barges. The piling types may include: lumber, concrete and steel piles (pipes, beams and sheets).

Environmental Standards and Guidelines

- All pile driving activities shall be undertaken under the supervision of a Qualified Professional.
- The PCA Environmental Authority shall be contacted and advised at least 48 hours in advance of the start-up of the proposed pile driving operations.
- Use inert (concrete, steel) or untreated materials that are to be submerged in water. Treated lumber must not be used as it may contain compounds that can be released into the water and become toxic to the aquatic environment. Any proposed use of treated wood must be approved by PCA and undertaken in accordance with PCA's "Guidelines for the Use, Handling and Disposal of Treated Wood" (Parks Canada, 2009).
- Timing windows for in-water works shall be respected for pile driving activities in water.
- The energy required to drive the pile to the final point of installation shall not result in sound pressure in excess of 30 kPa (BC Marine and Pile Driving Contractors Association and Fisheries and Oceans Canada, 2003).
- Visual and hydrophone monitoring of the impact on fish by the sound waves emitted will be required when driving concrete piles with a diameter greater than 60 cm (approximately 24 inches) (BC Marine and Pile Driving Contractors Association and Fisheries and Oceans Canada, 2003).
- Pile driving should be done within an isolated work area where fish have been excluded, salvaged and relocated.
- Pile driving shall be conducted from the shore or from an existing structure (e.g., berm, dam) where possible.
- If necessary, pile driving in water shall be conducted from a floating structure (i.e., a barge) so that disturbance to the waterbody bottom is prevented. In addition:
 - sufficient water must be present to prevent the barge from grounding;
 - minimize the use of barge stabilizing spuds and their disturbance of bottom substrates;
 - fully restore any areas disturbed by barge stabilizing spuds;
 - prop scour must not occur from tending vessel(s). This may require maneuvering of barges in shallow water with ropes tied to shore and/or pilings;



- exclude fish and other wildlife from the work area prior to the commencement of any pile driving operations;
- All boats and equipment used in pile driving operations will be cleaned off-site before coming onto the project site and before leaving the project site; and
- Boats shall be free of ballast water.
- If conducting pile driving work during the winter, inspect shoreline conditions and foreshore substrates to determine whether frozen conditions exist and if machine pads are required to minimize disturbance.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Fish Exclusion, Salvage and Relocation ([ESG-7-C](#))
- Invasive Species Management ([ESG-11-C](#))
- Refueling and Spill Management ([ESG-13-C](#))
- Treatment of Discharge Waters ([ESG-14-C](#))
- Use and Maintenance of Heavy Equipment ([ESG-15-C](#))
- Vehicle and Equipment Washing and Cleaning ([ESG-16-C](#))
- Wildlife and Species at Risk Protection During Construction ([ESG-17-C](#))

Related EMP Component Plans

- Dust and Air Quality Management
- Noise, Vibration and Ambient Light Management
- Blasting
- Site Dewatering and Wastewater Plan
- Surface water Management, Erosion and Sediment Control
- Dredging and Sediment Removal
- Fuel Management
- Spills Prevention and Emergency Response
- Dam and/or Bypass Channel Commissioning

Further Guidance

Parks Canada, 2009. Guidelines for the Use, Handling and Disposal of Treated Wood.

BC Marine and Pile Driving Contractors Association and Fisheries and Oceans Canada, 2003.

Best Management Practices for Pile Driving and Related Operations. March 2003. Available at: <https://projects.eao.gov.bc.ca/api/document/5887e34fad20ac134d916367/fetch>

References

British Columbia Ministry of Environment, General BMPs and Standard Project Considerations - Standards and Best Practices for Instream Works. Available at: <http://www.env.gov.bc.ca/wld/instreamworks/downloads/GeneralBMPs.pdf>



Refueling and Spill Management (ESG-13-C)

Application to Ontario Waterways' Projects

The use of heavy equipment and other machinery near water is generally required on many PCA construction and maintenance projects on Ontario Waterways. Refueling and routine maintenance of this machinery occur at the work site on a daily basis. Although most machinery is mobile, some equipment such as pumps and cranes cannot practically be relocated for fueling and maintenance. Fuel, grease and other mechanical fluids are pollutants and considered a deleterious substance under the *Fisheries Act*. The proximity of PCA's assets to natural areas and fish bearing waterbodies elevates the need to address refueling and routine maintenance through the application of these standards and guidelines. Most Ontario Waterways sites do not have space to allow for refueling in areas greater than 30 m from the water.

Description of Activity

Refueling and maintenance refer to the regular activity of providing fuel, upkeep and light duty repair to heavy equipment and other construction machinery throughout the construction period. The most common form of potential fuel contamination on work sites occurs from drips and spills released from fueling nozzles and gas can spouts as they are moved between the fuel tank and the equipment. Being a daily activity, the potential for drips and minor spills is a common and frequently occurring potential environmental hazard.

Environmental Standards and Guidelines

General

- A Fuel Management plan, including refueling procedures, shall be developed as part of the site-specific EMP and accepted by PCA.
- A Spill and Emergency Management Plan will be developed as part of the site-specific EMP and accepted by PCA. The Spill and Emergency Management plan shall use a risk based approach. It shall be tailored to seasonal conditions at the site.

Fuel Storage

- Fuel storage facilities and containers shall comply with the CCME Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products. Double-walled storage containers must be used and located within a berm or impermeable containment boom.
- All fuel storage and containment must be intact, monitored and replaced as required through all phases of the project.

Refueling

- Vehicle, heavy equipment and machinery re-fuelling shall be conducted in a designated, flat and low sensitive area. Commonly, this area is the same location that fuel and other chemicals are stored.
- Designated refueling areas shall be constructed with impermeable containment such as berms, booms and liners. They shall contain an adequately sized drip tray or other impermeable layer to capture and contain drips from the nozzle and minor spills. Snow and water must be managed



from the drip trays to prevent contamination of the water. Drip trays must be on level ground. Any contaminated soil or aggregate must be disposed of properly.

- Spill containment for refueling shall be sized adequately to accommodate the volume of the fuel source container.
- The use of small volume fuel cubes is preferred for refueling immobile equipment and equipment operating in or near water.
- Fuel trucks and hoses cannot be used on coffer dam or within dewatered areas.

Spill Management and Reporting

- All construction staff should be trained and familiar with the Spills and Emergency Management plan, including roles and responsibilities, locations and contents of spill kits, and use of equipment. A check list approach should be developed for staff to sign-off and confirm training.
- Upon identification of a spill, immediate containment is required. All areas affected by the spill shall be remediated.
- Spill response equipment shall be located and maintained on-site and utilized in accordance with applicable the spill containment procedures. Multiple spills kits (number to match the scale of the project and to isolate a contaminated area) shall be placed in covered, accessible structures around the construction site.
 - Typical spill response equipment (spill kit) shall include as a minimum: absorbent spill pads, berms, cover drains and personal protective equipment (materials for both in-water and on land spill) to be used to contain the spill as appropriate. Replace or repair material after use.
 - Concrete spill response equipment (spill kit) will include as a minimum: sand bags (number to match the scale of the project and to isolate a contaminated area); impermeable material to line sandbags; Impermeable turbidity curtains; and CO₂ Bubblers. Replace or repair material after use.
- Wastes that are generated from remedial operations that are considered to be hazardous wastes under Ontario Regulation 347 of the *Environmental Protection Act* must be contained in sealed containers and temporarily stored on the project site until they are collected for disposal by a licensed waste hauler.
- All other non-hazardous waste generated by a concrete pour operation shall be disposed according to Ontario Regulation 558/00. R.R.O. 1990 (General – Waste Management).
- Environmental permits shall be obtained by the Contractor for any off-site disposal
- Any spill into water, onto ice or in a dewatered area must be reported immediately to PCA's Environmental Authority, the Departmental Representative and the Ontario Ministry of Environment and Climate Change's Spills Action Centre (SAC).
- Any spill on land must be reported immediately to PCA's Environmental Authority and the Departmental Representative. Any spill on land meeting the criteria set out in Ontario's *Environmental Protection Act*, O. Reg. 675/98 must be reported immediately to the Ontario Ministry of Environment and Climate Change's Spills Action Centre (SAC).

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Use and Maintenance of Heavy Equipment (ESG-15-C)



Related EMP Component Plans

- Dust and Air Quality Management
- Noise, Vibration and Ambient Light Management
- Transportation Management
- Site Dewatering and Wastewater Plan
- Surface Water Management, Erosion and Sediment Control
- Dredging and Sediment Removal
- Vegetation Protection
- Aquatic Resources Management
- Species at Risk Protection
- Hazardous Materials Management
- Fuel Management
- Spills Prevention and Emergency Response

Other Design and Environmental Considerations

- Spill prevention and response measures shall consider spills on land, in water and on ice.

References

Environment Yukon, 2011. Best Management Practices for Works Affecting Water in Yukon. Water Resources Branch, Government of Yukon.

VOI Training Group, 2014. Environmental Field Procedures for Works in and About Water. Developed by Van Osch Innovations Ltd., 130 Columbia Street, Nanaimo, British Columbia, Canada.



Treatment of Discharge Waters (ESG-14-C)

Application to Ontario Waterways' Projects

In-water works often require isolation of work areas to perform construction and maintenance activities in the “dry”. This will require pumping of water from the isolated worksite (e.g., from behind a coffer dam, aqua-dams, or other temporary dams constructed with rock, pea gravel bags, concrete blocks, steel or wood walls) or from inside a lock and discharging the water into a receiving watercourse or elsewhere. Most construction sites on Ontario Waterways will have limited area that can be used for sediment retention pond construction, which limits pond size and consequently decreases settling efficiency. Therefore, novel methods will need to be considered to ensure that the water discharged meets specified performance criteria in the receiving waters. Design coffer dams to have a clean water collection area that can be directly discharged back to the river – this will limit the need to remove turbid water from the worksite.

High velocity flows from discharge structures (e.g., pipes) or outfalls can cause extensive erosion and scour at an outfall and/or receiving waterway. Every attempt should be made to decrease this energy where erosion concerns warrant. If discharged directly to a watercourse there may be no requirement.

Description of Activity

Treatment of discharge waters is intended to control sediment concentrations in water pumped from a work area and discharged downstream. Treatment options include:

- Isolate clean water from the worksite to minimize the amount of turbid water requiring treatment
- Sediment retention and waste water storage ponds;
- Water tanks and tanker trucks;
- Dedicated wastewater and filtration equipment;
- Sediment retention “bags”.
- The use of a flocculation treatment

Suitable techniques for energy dissipation must be tailored to the amount of flow expected compared to the erodibility of the soil at the outflow location. These techniques are also used to slow the flow out of lined open channels such as spillways, ditches and other hydraulic structures.

Environmental Standards and Guidelines

- The pumping of turbid water directly back into the waterbody is not permitted. Water which is in exceedance of the following performance criteria must be treated/managed appropriately:
 - At the discharge points of pumping into any waterbody, a maximum increase of suspended sediment concentration shall not be more than 25 mg/L over background levels during any short term exposure period (i.e., less than 24 hours). For longer term operations (i.e., more than 30 days), average suspended sediment concentrations shall not be increased by more than 5 mg/L over background levels. Note: the field measurement for turbidity will be in NTU. TSS (mg/L) is only acceptable from lab results and will only be used if there is exceedances and potential enforcement action.
 - At the discharge points of pumping into any waterbody, a maximum increase of 8 NTU from background levels for a short-term exposure (i.e., 24 hours). Maximum average increase of 2 NTU from background levels for a longer term exposure (e.g., more than 30 days). Should



there be exceedances then PCA/Contractor may analyze Suspended Solids (SS) concentration with lab samples. Measurements should be taken μ s(background) within the work area and downstream directly in the receiving water.

- Receiving waters at the point of discharge shall be routinely tested and compared to background to confirm compliance with performance standards (e.g., pH readings should be taken if there is any concrete work being completed).

Sediment Retention and Waste Water Storage Ponds

- Avoid steep and or unstable slopes, surface water and wetlands, areas with soils susceptible to erosion and existing drainage channels (VOI).
- Ponds are to be used when the anticipated volume of water is very large. A site specific design (e.g., location, size, configuration) for the sediment pond shall be prepared by a Qualified Professional in accordance with standards provided in Sediment Control (ESG-2-Pre).
- A Qualified Professional(s) should design embankment dykes and other water retaining structures to avoid failure.
- The optimal design parameters is a 5:1 to 10:1 length to width ratio is preferred (VOI Training Group, 2014).
- Areas to be used for a pond shall be identified in the site-specific EMP and accepted by PCA.
- Ponds shall be constructed prior to any construction activity with the exception of vegetation clearing and grubbing for the pond itself.
- Ponds are largely dependent on the sediment type as a result there needs to be sufficient retention time for the various sediment types to settle.
- Embankment dykes should be stripped of vegetation, and fill materials should be clean soil, properly compacted.
- The main outlet structure should be installed at the farthest possible point from the inlet to encourage settling. An emergency spillway should be constructed to convey flows not carried by the main outlet to prevent embankment failure during high volume and flow periods.
- Prevent erosion of outlets by reinforcing/armoring them with rip rap or other appropriate measures If utilizing reinforcement/armoring measures consider the following:
 - place large, durable, clean (free of fine particulate matter), suitably graded and sized angular rocks (rip rap) into the eroding area at the outlets only;
 - carefully unload and key into place (if placing rocks along the embankment) above the high water mark (HWM);
 - implement appropriate erosion and sediment control measures and maintain their functionality;
 - do not obtain rocks from below the high water mark (HWM) of any water body;
 - install rip rap at a similar slope as the stream bank to maintain a uniform stream bank slope and natural stream alignment;
 - use acid-free rocks; and
 - ensure rip rap does not constrict the channel width or flow.
- Sediment retention ponds should be inspected regularly and during high volume and flow periods.
- Sediment accumulation in the ponds must be measured regularly as required. Bathymetric surveys indicate the amount of sediment that has accumulated within the pond and consequently, estimates the remaining stormwater pond life, and dreading volumes. The pond will require cleaning when sediment accumulation reaches 50% of the design capacity.
- Waste water storage ponds are used to store waste waters with no provision to discharge the water into a well vegetated area or a receiving watercourse.



Water Tanks and Trucks

- Water tanks and trucks can be used to temporarily store small volumes of water prior to discharge, typically at an off-site location.
- An incremental or iterative approach should be used, whereby additional capacity is added
- Any off-site or on-site discharge location shall be identified and approved in the EMP. Environmental permits shall be obtained by the Contractor for any off-site discharges.
- If transport and disposal is interrupted, in-water works that require pumping should be stopped.
- If clean, Water stored in tanks and trucks can be used for fugitive dust control

Sediment Retention Bags

- Sediment retention bags are best used when appropriately sized sediment retention or waste water ponds cannot be located on-site. See Sediment Control (ESG-2-Pre) for further guidance.
- For fine sediment soils treating discharge water prior to the filter bag with a flocculant will improve results.
- Bags are manufactured in various sizes with various opening sizes. The numbers, type and size of filter bag should be determined by a Qualified Professional(s) based on expected discharge rates and predicted particle sizes to be treated.
- Not to be used for concrete waste water as it will not filter pH.
- High quality woven monofilament geotextile of 100% polypropylene stable fibers are preferred to non-woven geotextile materials.
- Areas to be used for sediment retention bags shall be identified in the site-specific EMP and accepted by PCA. A minimum setback of 10 m from a watercourse is recommended.
- The sediment retention bag must be secured to the ground surface, surrounded by silt fencing and straw bales with a designed outlet.
- If a flocculant is used it must be designed for the soil type and for optimum mixing and retention time prior to release at the outlet. Use a treated Jute with flocculant to clarify the discharge water.
- Any off-site disposal location shall be identified in the site-specific EMP and accepted by PCA. Environmental permits shall be obtained by the Contractor for any off-site disposal of bags and sediment.

Dedicated Wastewater and Filtration Equipment

- Must be designed by engineer for expected flows and soil types
- Dedicated filtration equipment should be used when appropriately sized sediment retention or waste water ponds or sediment retention bags cannot be located on-site. Suitable options include:
 - Sediment treatment tank with internal weirs (over and under weirs), to remove waste, solids (gravel, sand, and silt), visible oil grease and hydrocarbons, and some metals (removed with sediment);
 - Sand Media Filters, Clay & Carbon Media Filters; and
 - Canister Filters.
- Flocculent addition can be done to waters contained Enviro-Tanks and canister filters so that mixing can be done in a controlled mode.
- Any off-site disposal location shall be identified and approved in the EMP. Environmental permits shall be obtained by the Contractor for any off-site disposal of sediment.



Energy Dissipation

- All water discharge structures or outfalls will be designed with energy dissipation devices where erosion is likely to occur.
- The design of an energy dissipation device is unique to the site. The Qualified Professional designing the system should consider that the device may not match these specifications. However, as long as it can be proven to both dissipate energy and protect against erosion and scour, it can be considered acceptable.
- The energy dissipater (width, length substrate) will be designed according to the expected outflow velocities and soil types and will be detailed in the dewatering plan.
- Outfalls shall not be located in areas of steep slopes or banks or where the bank is susceptible to slumping.
- Any erosion protection applied must be free of fines (overburden, spoil, silt, clay, and or organic material).
- Energy dissipation devices will be inspected before periods of flow to ensure they are functioning as expected. The devices should also be inspected periodically to check for scour and if there are any repairs required. Typical maintenance practices include:
 - Restore dissipater to its original specifications if it is found to diverge from design criteria.
 - Replace rock or other components that have been dislodged by heavy flows.
 - If rock continues to wash away, consider using larger material.
 - Repair and damage to underlying fabric.
 - Where erosion/scour is occurring outside dissipater area, increase dissipater size in the eroded area.
 - Frequently remove sediment and other debris accumulations from inlets, flow pipes/ditches, and the dissipater area.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control (ESG-1-Pre)
- Sediment Control (ESG-2-Pre)

Related EMP Component Plans

- Blasting
- Demolition
- Site Dewatering and Wastewater Plan
- Surface Water Management, Erosion and Sediment Control
- Dredging and Sediment Removal
- Vegetation Protection
- Aquatic Resources Management
- Invasive Species Management
- Waste Management
- Spill Prevention and Emergency Response



Other Design and Environmental Considerations

- Sediment retention bags have seasonal limitations as they can freeze in the winter, reducing capacity and effectiveness.
- Large retention ponds may be required to retain fine sediments, while smaller ponds may only be effective to retain larger sediment sizes (e.g., sands).
- If suspended sediment concentrations are very high in the discharge water and/or receiving watercourse, discharges could be shut down until issues are identified and rectified.
- The design of an energy dissipation device is unique to the site. The engineer designing the system should consider that the device may not match these specifications. However, as long as it can be proven to both dissipate energy and protect against erosion and scour, it can be considered acceptable.
- For appropriate design for drainage system outfalls, OMAFRA Factsheet, Subsurface Drainage System Outfalls.

Further Guidance

Ontario Ministry of Agriculture, Food and Rural Affairs, 2015. Subsurface Drainage System Outfalls Factsheet. October 2015. Available at: <http://www.omafra.gov.on.ca/english/engineer/facts/13-035.htm>

Ontario Ministry of Environment and Energy (MOEE), 2003. Stormwater Management Planning and Design Manual, March, 2003.

References

Department of Fisheries and Oceans (DFO), 1995. Freshwater Intake End-of-Pipe Fish Screen Guideline. ISBN 0-662-23168-6. Catalogue No. Fs 23-270 / 1995E.

Nova Scotia Ministry of Environment, 2015. Nova Scotia Watercourse Alterations Standard.

Ontario Ministry of Transportation, 2011. OPSS511 – Construction Specification for Rip-Rap, Rock Protection and Granular Sheeting. April 2001.

Oregon Department of Transportation. Hydraulics Manual. Chapter 11 – Energy Dissipaters. Available at: https://www.oregon.gov/ODOT/HWY/GEOENVIRONMENTAL/docs/Hydraulics/Hydraulics%20Manual/CHAPTER_11.pdf

VOI Training Group, 2014. Environmental Field Procedures for Works in and About Water. Developed by Van Osch Innovations Ltd., 130 Columbia Street, Nanaimo, British Columbia, Canada.



Use and Maintenance of Heavy Equipment (ESG-15-C)

Application to Ontario Waterways' Projects

The use of heavy equipment near water is generally required on many PCA construction and maintenance projects on Ontario Waterways. Heavy equipment moving through the construction area has the potential to render soils susceptible to erosion. Used in proximity to waterbodies, heavy equipment can destabilize banks and affect water quality through the release of fuel, grease and other fluids. In-water use of heavy machinery can also affect fish habitat through the resuspension of fine sediments and creation of elevated turbidity. The proximity of PCA's assets to fish bearing waterbodies elevates the need to address these potential impacts and adhere to best practices and guidelines for the protection of fish and water quality during near water and in water construction projects on Ontario Waterways.

Description of Activity

Heavy equipment includes all specialized construction tracked or tired vehicles or machinery used during PCA maintenance, upgrade or construction projects. Such equipment is often used to transport or lift into place construction materials or move, excavate or compact soil.

Environmental Standards and Guidelines

- All heavy equipment to be used on-site, their anticipated designated work areas and site entrances shall be described in the site-specific EMP and accepted by PCA.
- An equipment maintenance program shall be described in the site-specific EMP and accepted by PCA.

Heavy Equipment Condition

- All heavy machinery brought to the work site shall be in good repair, free of leaks and be externally cleaned / degreased. All equipment using hydraulic fluids shall use vegetative (non-petroleum based) based fluids.
- All heavy equipment should comply with the latest equipment specifications in the *Off-Road Compression-Ignition Engine Emission Regulations (SOR/2005-32)* that contain emission standards for diesel engines used in off-road applications such as those typically found in construction. The Regulations, under Section 160 of the *Canadian Environmental Protection Act, 1999 (CEPA 1999)*, are applied to engines of the 2006 and later model year.
- All heavy machinery brought to the work site shall arrive free of soil, seeds and vegetation fragments to avoid the import and spread of invasive species.
- Equipment shall be inspected prior to arrival on site. An inspection checklist shall be included in the site-specific EMP and accepted by PCA.



Stabilized Site Entrances and Heavy Traffic Areas

- All site entrances shall be stabilized as per standards set in Sediment Control (ESG-2-Pre).
- Equipment storage areas, laydown areas and other high traffic areas shall be stabilized with geotextile overlain with a minimum 15 cm of clean gravel surface layer or other suitable cover material.

Heavy Equipment Use

- Heavy equipment shall be operated exclusively by trained equipment operators or other Qualified Professionals.
- Heavy machinery shall operate from above the top of the streambank, on-shore above the normal water level, or within a dewatered site. Heaving equipment shall not enter water. Only working part of equipment (bucket or drill end or equivalent) entering the water shall be free of fluid leaks and externally cleaned/degreased to mitigate any deleterious substance from entering the water.
- Heavy machinery shall not be parked overnight or for long periods of shutdown in dewatered areas or on coffer dams. Where site conditions do not allow for removal of equipment, other measures to address potential flooding must be implemented (e.g., ground protection mats or rig mats)
- For guidance on refueling, see Refueling and Spill Management (ESG-13-C).

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control (ESG-1-Pre)
- Sediment Control (ESG-2-Pre)
- Vegetation Clearing and Protection (ESG-5-Pre)
- Installation and Removal of Cofferdams and Isolation Structures (ESG-10-C)
- Refueling and Spill Management (ESG-13-C)
- Vehicle and Equipment Washing and Cleaning (ESG-16-C)

Related EMP Component Plans

- Dust and Air Quality Management
- Noise, Vibration and Ambient Light Management
- Transportation Management
- Blasting
- Demolition
- Site Dewatering and Wastewater Management
- Surface Water Management, Erosion and Sediment Control
- Dredging and Sediment Removal
- Vegetation Protection
- Wildlife Protection and Management
- Aquatic Resources Management
- Invasive Species Management
- Fuel Management
- Spills Prevention and Emergency Response



Other Design and Environmental Considerations

- The Regulations Amending the Off-Road Compression-Ignition Engine Emission Regulations (the Amendments) impose stricter standards and new requirements starting with engines of the 2012 and later model years.

References

CISEC, 2014. Certified Inspector and Sediment and Erosion Control Training Manual. Revised Edition V6. 9520 Pine valley Drive, Woodbridge Ontario, Canada.

Coker, G.A., Ming, D.L., and Mandrak, N.E. 2010. Mitigation Guide For The Protection Of Fishes and Fish Habitat To Accompany The Species at Risk Recovery Potential Assessments Conducted by Fisheries and Oceans Canada (DFO) in Central and Arctic Region. Version 1.0. Can. Manuscript Rep. Fish. Aquatic. Sci. 2904: vi + 40 p.

Erosion and Sediment Control Guidelines for Urban Construction, 2006. Greater Golden Horseshoe Area Conservation Authorities.

VOI Training Group, 2014. Environmental Field Procedures for Works in and About Water. Developed by Van Osch Innovations Ltd., 130 Columbia Street, Nanaimo, British Columbia, Canada.



Vehicle and Equipment Washing and Cleaning (ESG-16-C)

Application to Ontario Waterways' Projects

Construction activity requires numerous types of vehicles, boats and equipment, such as: passenger cars and trucks, all terrain vehicles (ATV's), snowmobiles, boats and heavy equipment (e.g., trucks, tractors, backhoes, graders, dozers, excavators, skidders, loaders, cement pumpers, water tankers and trucks). Construction vehicles, boats and equipment will become soiled over time and require washing and cleaning, particularly if they are to be used or transported off the construction site. Washing and cleaning reduces fugitive dust emissions and is integral to invasive (non-native) species management.

Description of Activity

Washing and cleaning is a process of inspection, sweeping, vacuuming or using a compressed air or a high pressure hose to wash and clean vehicles, boats and equipment from visible direct and plant material. This ESG does not address solvent cleaning, abrasive cleaning, and other types of cleaning such as ultrasonic cleaning, chemical polishing and electro-polishing.

Environmental Standards and Guidelines

- Inspection, washing and cleaning of all vehicles, boats and equipment should be performed in accordance with the procedures, checklists and diagrams provided in the "Clean Equipment Protocol for Industry - Inspecting and Cleaning Equipment for the Purposes of Invasive Species Prevention", as summarized below:
 - When vehicle/equipment washing/cleaning must occur on-site, and the operation cannot be located within a structure or building equipped with appropriate water management facilities, the outside cleaning area should be:
 - accepted by PCA prior to use;
 - mud free, gravel covered or a hard surface (i.e., stabilized construction entrance if designated to handle runoff). If this option is not available, choose a well maintained (i.e., regularly mowed) grassy area;
 - gently sloping to assist in draining water and material away from the vehicle or equipment;
 - at least 30 m away from any watercourse, water body and natural vegetation; and
 - large enough to allow for adequate movement of larger vehicles and equipment.
 - Washing and cleaning is required when inspection identifies visible dirt, plant material or snow and when moving vehicles, boats or equipment from one area to another or off-site.
 - Used of compressed air is preferred to pressure washing. Compressed air may also be used under frozen conditions.
 - Clean the interior of the vehicle by sweeping, vacuuming or using a compressed air device. Particular attention should be paid to the floor, foot wells, pedals, seats, and under the seats.
 - Clean the interior of the vehicle by sweeping, vacuuming or using a compressed air device. Particular attention should be paid to the floor, foot wells, pedals, seats, and under the seats.



- Clean exteriors of vehicles, boats and equipment with either compressed air or a high pressure hose in combination with a stiff brush and/or pry bar to further assist the removal of dirt.
- Equipment such as boats that may be exposed to aquatic invasive species should also be disinfected with bleach solution before conducting work in a new area or left to dry for 5-7 days in warm, dry weather.
- The use of diesel for vehicle and equipment cleaning is prohibited. Cleaning of vehicles and equipment with soap, solvents or steam should not occur on the project site.
- Resulting wastewater must be fully contained and treated in accordance with Treatment of Discharge Waters ([ESG-14-C](#)) and Sediment Controls ([ESG-2-Pre](#)).
- If the area has been identified as having invasive species, waste water will be disposed of off-site.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Sediment Control ([ESG-2-Pre](#))
- Vegetation Clearing and Protection ([ESG-5-Pre](#))
- Invasive Species Management ([ESG-11-C](#))
- Revegetation ([ESG-1-Post](#))

Related EMP Component Plans

- Dust and Air Quality
- Transportation Management
- Surface Water Management, Erosion and Sediment Control
- Vegetation Protection
- Aquatic Resources Management
- Invasive Species Management
- Fuel Management

Further Guidance

Ontario Invasive Plant Council, 2013. Clean Equipment Protocol for Industry - Inspecting and cleaning equipment for the purposes of invasive species prevention. Available at: http://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/Clean-Equipment-Protocol_June2016_D3_WEB-1.pdf



Wildlife and Species Protection During Construction (ESG-17-C)

Application to Ontario Waterways' Projects

Construction projects on Ontario Waterways are undertaken on lands that are often well vegetated with natural vegetation (e.g., forests, wetlands, grasslands, etc.) or grounds that have been landscaped. Similarly, projects on Ontario Waterways are undertaken in or near water. These areas and watercourses can provide suitable habitat for a variety of wildlife species including Species at Risk (SAR).

All projects on Ontario Waterways must be in compliance with the *Species at Risk Act (SARA)* and have regard for listed species identified by the Province in the *Ontario Endangered Species Act* that are not listed under the federal *SARA*.

Ontario Waterways evaluates the impact on species listed under the *SARA* whenever it grants a formal permit, or undertakes work that has the potential to affect species or habitats. Ontario Waterways may require follow-up and monitoring to be undertaken that is consistent with relevant species' recovery strategies and action plans, and the objectives, scope, timelines and responsibilities for monitoring activities outlined in the EIA report.

Description of Activity

Wildlife protection during construction involves the diligent implementation of wildlife and related habitat mitigation measures identified in the EIA along with relevant best practices, specifications and performance criteria, particularly timing windows. In addition, wildlife protection during construction will require recording and reporting of incidental encounters with wildlife (non-SAR).

SAR protection involves the diligent implementation of SAR mitigation measures identified in the EIA along with relevant best practices, specifications and performance criteria, particularly timing windows. In addition, SAR protection will require contractor staff training and awareness that support the implementation of procedures and work modifications to be undertaken in the event of encounters with SAR. Prompt recording and reporting of SAR encounters is also required.

Environmental Standards and Guidelines

General

- All wildlife and habitat related mitigation measures identified in the EIA and any other measures proposed must be included in the site-specific EMP and accepted by PCA. All measures must be implemented, with special emphasis on:
 - the construction timing windows identified in the Project's EIA;
 - tailoring protection measures to wildlife seasonal patterns; and
 - the implementation of any protection measures aimed at excluding wildlife species from the work area, minimizing disturbance/harm and any "no go" areas aimed at excluding project works activities from species habitats.
- The work site should be inspected by a Qualified Professional(s) prior to vegetation clearing, to identify potential wildlife issues (e.g., hibernating animals or nursing mothers and their young, etc.) and to inform or adjust mitigation planning as needed. The timing and scope of this



inspection will vary depending on the type and extent of habitat to be affected and the anticipated timing for site clearing. If recommended by a Qualified Professional and accepted by PCA, exclusion zones or “no go” areas will be established to protect critical habitat or areas with known residences (e.g., hibernacula, dens, nests).

- If recommended by a Qualified Professional and accepted by PCA, conduct “Pre-stressing” activities within a few days prior to the onset of site preparation to encourage wildlife to move away from a site. The need for, type and frequency of pre-stressing activities will consider:
 - The amount and quality of information available about wildlife;
 - The size of the area to be affected;
 - The proposed timing of project works and activities (i.e., within or outside of prescribed timing windows);
 - The need for multiple pre-stressing events.
- On a daily basis, an inspection or “sweep” of the work area shall be performed prior to commencement of project works and activities to ensure wildlife is not present in the work area. A site inspection checklist shall be included in the site-specific EMP and accepted by PCA.
- Animals should be provided a safe corridor to escape and/or move around the construction site. Corridors designed to facilitate species movement should be a minimum of 50 m to 100 m in width.
- Any proposed material changes to the EIA or EMP must be reviewed and accepted by PCA.

Wildlife Protection Best Practices

- All vehicles and equipment used by project personnel will follow construction zone speed limits to reduce the risk of hitting wildlife, as enforced by the site supervisor.
- Camps and associated infrastructure will be designed to exclude wildlife. Options include security fencing, regular snow removal, covering vents with wire mesh to exclude small mammals and birds, and metal mesh skirting around elevated trailers, walkways, and stairs to prevent wildlife access. Fencing should be tailored to the wildlife expected on-site. Fencing will be used to prevent wildlife from entering waste storage areas. See Tree Protection and Hording (ESG-4-Pre) for guidelines regarding exclusion fencing.
- Work areas will be kept clean and free of potential hazards to wildlife such as wire, cable, tubing, plastic, antifreeze or other materials that wildlife may eat or become entangled in.
- Waste will be stored, handled, and transported in accordance with the Waste Management Plan included in the site-specific EMP, including external storage of all solid waste in sealed, bear-proof containers. Proper food storage/cleanup of all wildlife attractants. Avoid littering, keeping all trash secured in wildlife-proof containers and promptly remove waste from site especially in warm weather.
- Feeding of wildlife is prohibited.
- Hunting or trapping by project personnel is prohibited.

Encounters with Wildlife (SAR and/ non-SAR)

The following procedures shall be followed for incidental encounters with all species, including SAR

- For a SAR, immediately cease activity within the work area of the encounter;
 - Immediately notify site supervisors and PCA and prepare a report to PCA;
 - Do not approach or handle the species (i.e., do not harm or harass the species);
 - Identify the individual species and determine species status.



- For mobile species:
 - Provide 24 hours and a safe corridor for species to leave the area before continuing the activity. If the species does not leave the site within 24 hours and work must proceed in the area of the encounter, take measures to relocate the species to a nearby suitable location.
 - Only a Qualified Professional should handle or relocate species.

- For injured species:
 - Take measures to ensure the species is protected from further harm (e.g. provide operator/worker awareness to avoid the location of the encounter).
 - Contact a Qualified Professional to determine and implement required actions (e.g., if feasible, the capture and relocation of an injured species to an appropriate care facility by the Qualified Professional).
 - Do not perform any work in the immediate location of the encounter until the species is removed from further harm.
 - Species handling and relocation measures will be based on the Ontario Species at Risk Handling Manual and will be implemented by, or under the guidance of the Qualified Professional.

- For a nest or breeding site of a species:
 - Stop work within 100 m and consult with a Qualified Professional.
 - Contact a Qualified Professional to determine whether the nest is active or inactive.
 - Notify PCA immediately of the nest status.
 - If active, mark an area at the location of the encounter around the nest and implement protective measures. Ensure that the nest is not more identifiable to predators.
 - Monitor the species to ensure it is not stressed or disturbed, including not disturbing its habitat. If the species appears stressed or disturbed cease operations immediately and contact a Qualified Professional for direction.
 - If a protected underground nest has been exposed, ensure it is covered with the same material and to the same depth if appropriate.
 - If it is necessary to remove a nest to proceed with work, contact the Qualified Professional to determine options for removal in accordance with the legislation and regulation (including the *Migratory Birds Convention Act*) and to determine consultation requirements with regulatory agencies.
 - Understand the nesting periods of various species.

- For species giving live birth, with eggs, or young:
 - Mark an area at the location of the encounter in a way that will protect the species from harm and will not identify the species to predators.
 - Contact the Qualified Professional to determine and implement required actions.
 - Monitor the species to ensure it is not stressed or disturbed, including not disturbing its habitat. If the species appears stressed or disturbed cease operations immediately and contact a Qualified Professional for direction.
 - Species handling and relocation measures will be based on the Ontario Species at Risk Handling Manual and will be implemented by, or under the guidance of the qualified biologist.

- For hibernating species:
 - Contact a Qualified Professional to determine how work may proceed. If the species must be relocated, obtain a SAR permit to proceed.



- Species handling and relocation measures will be based on the Ontario Species at Risk Handling Manual and will be implemented by, or under the guidance of the qualified biologist.
- For mosses, lichens, or vascular plant species:
 - Mark and protect the area at the location of the encounter in a way that will protect the species from harm and will not identify the species to predators.
- For reptile and amphibian species:
 - Contact a Qualified Professional to determine how to proceed.
 - Turtles can often be gently moved to a safe location nearby. Wear gloves or use a broom to steer the turtle in the direction of safety.
 - Exclusion fencing shall be used to eliminate access to specific area where activities could harm animals are occurring.
 - Exclusion fence design should consider the target species as well as those that might be unintentionally impacted. Fencing material should not pose a risk of entanglement or permit individuals to pass under or between openings.
 - For short-term activities (<6 months), a light-duty geotextile fence is appropriate and for longer term or permanent fencing projects, a more durable material such as heavy-duty geotextile, wood, concrete, woven-wire etc. would be appropriate.
 - Geotextile fencing with nylon mesh lining should be avoided due to the risk of entanglement by snakes.
 - To deter digging, bury the fence at least 10 cm down with an additional 10 cm horizontal lip. For snakes and toads, the fence should have an overhanging lip on the species side.
 - Exclusion fences should be installed prior to emergence from hibernation. Once the fence is installed, a survey should be done to ensure that no individuals have been trapped inside.
 - Fences should be inspected at regular intervals throughout the active season, especially following heavy rain events.
- For any other wildlife species:
 - No shut down is required unless young are present or animals do not calmly move away.
 - Provide the animal with a safe corridor to escape.
 - If young are present, stop construction activities within 100 m of sighting until animal moves away.
 - If a bear is detected within 1 kilometer away from the work area, issue an alert to all workers.

SAR Protection Measures

- The site-specific EMP must reflect the project as designed for implementation and the most current Species at Risk (SAR) records.
- Prior to any physical works or activities to be conducted on the project site, the Historic Canals Regulations permit for the project, and the site-specific EMP accepted by PCA should be reviewed to confirm if any SAR and/or habitat may be present and potentially affected by project works and activities.
- If SAR and/or habitat are present and are likely to be affected by the project, the SAR mitigation measures identified in the EIA and accepted site-specific EMP must be implemented, with special emphasis on:
 - the construction timing windows identified in the Project's EIA;
 - tailoring protection measures to wildlife seasonal patterns; and



- the implementation of any protection measures aimed at excluding wildlife species from the work area, minimizing disturbance/harm and any “no go” areas aimed at excluding project works activities from species habitats.

SAR Training and Awareness

All personnel conducting work on the site should be provided with SAR information and/or awareness training so they are familiar with the SAR procedures for the work, including reporting requirements. A record of all persons provided information and awareness training should be kept. The information and training should include:

- Obligations under the SARA;
- Information about the specific species that may be present in the work area;
- How to identify the species;
- Habitat characteristics for the species/where species are likely to be found;
- Potential threats and impacts to the species; and
- EMP commitments regarding SAR protection, including the SAR encounters procedure.

Recording and Reporting

- For all wildlife encounters, the following information should be recorded in the field:
 - Locations, dates and time of day where species at risk were encountered;
 - the names of species encountered;
 - photographs of the species, if taken.
 - Condition of the animal.
- PCA shall be notified immediately if injured/dead wildlife are encountered. PCA may require retrieval and storage on ice of carcass for laboratory testing.
- Field information regarding incidental encounters with wildlife (non-SAR wildlife) shall be compiled and reported on a monthly daily basis.
- To document that the SAR encounter procedure has been followed for the purpose of demonstrating compliance, record and make available the following information:
 - A description of the work or activity being undertaken;
 - The locations, dates and times of day the activity was undertaken;
 - A list of SAR potentially affected and its condition / status during the encounter;
 - All measures implemented to avoid or minimize harm; including specific locations the best practices process was implemented;
 - The Qualified Professional assisting in implementation;
 - The duration of the work stoppage; and
 - The restart and completion dates of the activity at each location.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control (ESG-1-Pre)
- Sediment Control (ESG-2-Pre)
- Vegetation Clearing and Protection (ESG-5-Pre)
- Invasive Species Management (ESG-11-C)
- Revegetation (ESG-1-Post)



Related EMP Component Plans

- Dust and Air Quality Management
- Noise, Vibration and Ambient Light Management
- Site Dewatering and Wastewater Plan
- Vegetation Protection
- Wildlife Protection and Management
- Aquatic Resources Management
- Species at Risk Protection
- Invasive Species Management
- Spills Prevention and Emergency Response
- Site Restoration

Other Design and Environmental Considerations

- For sites located within or adjacent to existing developed areas, nearby residents should be informed about the onset of pre-stressing activities and the potential for increased encounters with wildlife dispersing from the site. Local noise by-laws shall be respected.
- Scratches and bites from animals, whether domestic or wild, can result in serious infections and/or transmit diseases. Immediate medical treatment should be sought for any person injured by an animal.

Further Guidance

Environment and Climate Change Canada, 2017. General Nesting Periods of Migratory Birds in Canada. Available at: <http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=4F39A78F-1#cn-tphp>

Ontario Ministry of Natural Resources and Forestry, 2016. Best Management Practices for Mitigating the Effects of Roads on Amphibian and Reptile Species at Risk in Ontario.

Ontario Ministry of Natural Resources and Forestry, 2013. Species at Risk Branch Best Practices Technical Note: Reptile and Amphibian Exclusion Fencing. Version 1.1. Available at: http://files.ontario.ca/environment-and-energy/species-at-risk/mnr_sar_tx_rptl_amp_fnc_en.pdf

Ontario Ministry of Transportation, 2016. MTO Best Management Practices for Species at Risk Protection during Maintenance Activities. Draft for Comment, November 18, 2016.

Ontario Ministry of Natural Resources and Forestry. Ontario Species at Risk Handling Manual: For *Endangered Species Act* Authorization Holders. Available at: http://files.ontario.ca/environment-and-energy/species-at-risk/mnr_sar_tx_sar_hnd_mnl_en.pdf

References

City of Ottawa, 2015. Ottawa Region Best Management Practices for Wildlife During Construction. Available at <http://ottawa.ca/en/wildlife-strategy-city-ottawa/wildlife-construction-protocol>

Environment and Climate Change Canada, 2013. How Much Habitat is Enough? Third Edition. Environment Canada, Toronto, Ontario. Available at: <https://www.ec.gc.ca/nature/default.asp?lang=En&n=E33B007C-1>



Winter Weather Stabilization and Operations (ESG-18-C)

Application to Ontario Waterways' Projects

Winter weather stabilization activities are critical to projects that carry over more than one construction season or require construction during the winter. Heavy accumulation of snow in disturbed areas or poor snow management practices can create blowing snow that reduces visibility or lead to severe erosion and sediment transport during temporary thaws or during the spring melt. Heavy truck and equipment traffic over unprotected and recently thawed or wet ground can create deep ruts that could divert or hold meltwater. Water accumulation can freeze creating a slippery ice hazard.

Description of Activity

Winter weather stabilization or winterization activities involve preparing disturbed areas and erosion and sediment control features for effective operation during winter, temporary thaws and during the spring melt. Winter operations involve snow and meltwater management through plowing, dozing and/or storing snow on the site and measures to prevent excessive snow accumulation and uncontrolled meltwater.

Environmental Standards and Guidelines

- All construction sites must be winterized no later than November 15 of each year.
- No fish salvage operations shall be undertaken after freeze-up or November 15 of each year.
- Areas of a construction site that will remain **inactive** over winter (i.e., where construction activity will not occur), must meet the following winterization requirements:
 - Install and maintain effective temporary erosion and sediment control devices prior to ground freezing.
 - Stabilize all disturbed and bare soil areas with native vegetation, mulch, hydro-mulch with a tackifier or erosion control blankets. See Erosion Control ([ESG-1-Pre](#)) and Sediment Control ([ESG-2-Pre](#)).
 - All mulch applied during winter shall be anchored. Installing erosion control blankets is not recommended on frozen ground or if more than one inch of snow is present.
 - Cover soil stockpiles to be used next season with mulch or plastic sheeting and contain within sediment fencing. Sediment fences shall not be installed when frozen conditions prevent proper embedment.
- All drainage ditches, swales, berms and channels should be constructed and stabilized prior to ground freeze. Temporary stabilization shall be undertaken using stone or erosion control blankets appropriate for the design flow conditions, as determined by a Qualified Professional.
- All spills on snow, ice or frozen ground shall be cleaned-up immediately and reported.
- Ice shall not be used as a catchment area for construction debris (concrete rubble/dust, gravel, etc.)
- Frozen materials that are removed during winter construction, should be stockpiled separately from previously excavated materials in a designated location.
- Prior to the onset of a forecasted thaw and following each rainfall, or thaw period, the site Contractor shall conduct an inspection of all installed erosion and sediment control devices and



perform repairs as needed to ensure they function as required. If supplementary ditching or berming needs to be constructed this shall be done before melt starts to prevent flooding.

- For any area stabilized by temporary or permanent seeding prior to the onset of the winter season, the Contractor should conduct an inspection in the spring to ascertain the condition of vegetation cover, and repair any damaged areas or bare spots and reseed as required to achieve an established vegetative cover (at least 85% of area vegetated with healthy, vigorous growth).

Snow and Meltwater Management

- The storage and application of road salt for de-icing purposes is prohibited. Only environmentally friendly sand and de-icing products approved by PCA shall be used at a construction site. Grit and deicers should be ordered and on-site prior to first snow fall, usually in September. Follow manufacture's specifications for application of de-icing products.
- Accumulated snow shall be removed from active construction work areas prior to significant earth-moving activities when accumulations reach up to 30 cm.
- Utilize snow blowers, snowploughs or other equipment to remove snow into windrows or to move snow to designated storage areas. Do not pile snow on erosion sensitive areas. These areas should be identified in the EMP. For snow windrows, gaps would be left at natural drainage swales to allow for cross drainage.
- Designated snow disposal areas within the site shall be identified in the EMP. They should be clearly delineated in a way that is easily identifiable under adverse winter conditions, to ensure that the snow is placed in the proper location on the site.
- Snow storage areas should be designated in locations where soil rutting will not be an issue otherwise storage areas shall be constructed with a solid base as designed by a Qualified Professional (e.g., Geotechnical engineer).
- All excavations occurring through the winter season should be marked with high visibility markers, blinking lights or bermed / barricaded. Snow cover can hide leading edges of excavations causing deep holes to look like shallow depressions.
- Remove equipment and supplies from flood prone areas prior to snow melt or spring thaw.
- To avoid flooding during spring melt, snow disposal areas should not be placed on high ground. Site meltwater should be directed away from the snow piles and dumping area to reduce ponding/rutting.
- Remove snow accumulations from around flow conveyance structures such as culverts and ditches following major snowfalls to minimize ice jamming or structure failure during freeze-thaw cycles.
- Install snow fences in areas where snow drifts of more than 1.5 m in depth can occur. Snow fences should be between 1.5 to 2.0 m in height, placed at a distance of 15 to 20 times the fence height from the area to be protected.
- Prior to spring melt, review the site's surface water management plan and ensure that planned water run-off areas are still appropriate. If supplementary ditching or berming needs to be constructed, this should be done before melt starts to prevent flooding.

Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control (ESG-1-Pre)
- Sediment Control (ESG-2-Pre)
- Fish Exclusion, Salvage and Relocation (ESG-7-C)
- Refueling and Spill Management (ESG-13-C)
- Revegetation (ESG-1-Post)



Related EMP Component Plans

- Transportation Management
- Demolition
- Site Dewatering and Wastewater Management
- Surface Dewatering and Wastewater Plan
- Aquatic Resources Management
- Waste Management
- Hazardous Materials Management
- Fuel Management
- Spills Prevention and Emergency Response

References

Transportation Association of Canada, 2013. Syntheses of Best Practices Road Salt Management - Snow Storage and Disposal. April 2013. Available at: <http://www.tac-atc.ca/en/bookstore-and-resources/free-resources-and-tools/syntheses-practice>

Hawryluk, T., 2014. Winter Works Best Practice. Available at: <https://www.coaa.ab.ca/COAA-Library/SAF-WTW-PBP-01-2014-v1%20Winter%20Works%20with%20Appendices.pdf>



Revegetation (ESG-1-Post)

Application to Ontario Waterways' Projects

Site preparation for a construction project on PCA property will require vegetation removal (i.e., clearing and grubbing) to prepare laydown areas, storage areas, camps, access roads/trails etc. Riparian and aquatic vegetation removal may also be necessary for in-water works (e.g., bridge and dam sites, water crossings). Revegetation is required as part of site restoration. Revegetation covers many different habitat types, boreal, St. Lawrence lowlands, Carolinian, manicured, open/savannah, riparian, etc.

Description of Activity

Revegetation is a key component of site restoration. Revegetation stabilizes soil, reduces erosion and sediment runoff, and inhibits growth of invasive species. Revegetation involves providing a suitable growing medium for vegetation. Revegetation can include reseeding and replanting of shrubs and trees. There are two approaches to seeding: 1) temporary seeding for short-term exposed soils and 2) long-term seeding associated with site restoration. Replanting of shrubs and trees is undertaken for long-term site restoration following the completion of construction works and activities.

Environmental Standards and Guidelines

General

- All proposed revegetation measures shall be described in the site-specific EMP and accepted by PCA.
- Develop revegetation objectives in terms of short-term and long-term goals (revegetation plan in EMP provided to PCA):
 - Short Term: stabilize the ground surface at all disturbed areas.
 - Long Term: restore the site and work areas to a specific future state or for a specific end use (e.g., public use, recreation, wildlife habitat), including any remediation, if required.
- Native species to Ontario will be used when revegetating sites, with the exception of sod. Species will be appropriate for site conditions and habitat. Invasive species will not be used.
- Necessary erosion and sedimentation control practices should be established prior to seeding.
- Optimal timing for seeding is early spring (before spring runoff) or fall; however, seeding can occur throughout summer with irrigation.

Soil De-compaction

- De-compact soil which has been compacted from the movement of construction equipment and project staging.
 - The most effective way to manage soil compaction on construction sites is to avoid compacting the soil in the first place. This can be accomplished by dedicating access and haul routes and restricting access to areas of the site that are more susceptible to compaction such as clay soils and wet soils. All site entrances will be identified in the site-specific EMP and accepted by PCA.



- Topsoil stripping and stockpiling should be employed at all construction sites where heavy machinery, continuous lightweight traffic, equipment storage or stockpiling of materials is anticipated. See Soil Stripping, Grubbing and Stockpiling, [ESG-3-C](#).
- Areas that have been compacted or had the topsoil layer removed must be decompacted and amended by reapplying topsoil, the addition of compost or through other techniques that are capable of mitigating lost moisture holding capacity.
- Prior to de-compaction activities, the location of all buried utilities must be determined. Avoid de-compaction of soils in areas that have buried utilities, wires, pipes, culverts, or diversion channels.
- Soil de-compaction is most effective when the ground is dry. This is especially important for clay soils.
- Perform ripping operations during late summer or fall to take advantage of the relatively dry seasonal conditions while allowing soil settling for early spring tree planting.
- When ripping is performed on nearly level ground, the direction of ripping is not critical. However, when ripping is performed on slopes, it is advisable to rip along the contour to minimize erosion. Once soil has been decompacted follow up immediately with topsoil placement and seeding/erosion control or sod as per the specifications.
- It is recommended to following ground contours whenever possible when performing de-compaction to increase water capture, protect run-off quality, and reduce soil erosion.
- Decompaction becomes increasing important in relation to the root depth of the vegetation being planted as part site restoration. Deeper rooted plants such as shrubs and trees require deeper de-compaction to facilitate healthy root penetration and vigorous growth. Ensure that de-compaction depth is consistent with the revegetation plan.
- Placement of topsoil over disturbed lands shall be undertaken to provide a suitable growing medium for revegetation plant species and site conditions. Most of the soil to be used for this purpose should come from on-site topsoil stockpiles (See Invasive Species Management [ESG-11-C](#)). Typically, topsoil is not applied to slopes greater than 2:1.
- Suitable sub-soils must also be used for revegetated areas if the native fill has been removed. Revegetation will follow the poorly drained soil requirements in the table below.
- The following minimum depths of growing medium should be achieved to the extent possible (given soil availability and site conditions).

Application	Over Prepared Sub-grade, retaining the "A" horizon	Over rapidly draining soil	Over poorly draining soil
Lawns	100 mm	150 mm	225 mm
Ground Cover Areas	150 mm	300 mm	225 mm
Small Shrubs	300 mm	450 mm	225 mm
Large Shrubs	450 mm	600 mm	450 mm
Trees	600 mm	600 mm	600-900 mm

- Mulch will be applied to areas where invasive plants have been removed. Areas where mulch has been displaced by a rainfall event or high winds should be repaired when conditions allow.
- Any seeding requires some form of erosion protection product (e.g., compost, mulch, erosion control blanket) in order to minimize disturbance and provide immediate stabilization while establishment occurs. See Erosion Control ([ESG-1-Pre](#)).



- Where a seedbed cannot be prepared properly, hydromulching, compost shall be used on slopes up to 1.5:1 or for anything steeper, an anchored rolled erosion protection measures (see Erosion Control ESG-1-Pre) shall be used. Hydromulching may also be used where seedbeds may retain large clods of soil or rocks, and on sites where other soil stabilising, seeding, and mulching practices would not be effective due to unacceptable levels of surface soil disturbance. See Erosion Control (ESG-1-Pre) and Sediment Control (ESG-2-Pre) for further guidance on hydromulching and required thickness for slopes.
- Revegetation of all exposed soils shall be undertaken using Ontario native seed mixes, as soon as practicable and accepted by PCA, to reduce the risk of soil erosion and sedimentation.
- Sod can be used at lock stations where areas are expected to be mowed. Any areas where plants will be left to go to seed, then Ontario native species must be used.
- Seeding shall be undertaken on slopes of 3:1 or less. For greater slopes, hydraulic seeding is recommended.
- Native Ontario seed mixes should be applied at a rate that produces a seedling density such that each seedling develops into a viable reproducing plant. Some species require only small quantities of seed. According to the Ontario Construction Specification for Seeding and Mulching, Temporary Cover, and Erosion Control Blanket, the minimum rate of seed application for standard roadside, salt tolerant, lowland or acidic soil mix should be 100 kg/ha and for crown vetch or birdsfoot trefoil mix the rate is 75 kg/ha.
- Bags of commercial seed are frequently sources of non-native invasive species. Only certified, weed-free seed will be used.
- Areas that fail to establish adequate cover, or have been invaded by weedy species shall be reseeded. Spot seeding can be done on small areas to fill in bare spots where seed did not germinate. Successful re-vegetation is considered once seeded/planted species have reached a ground cover of 80%.
- Where shrubs and/or deciduous trees were present along a watercourse or wetland prior to construction, willow stakes, red-osier dogwood, aspen, and other riparian trees and shrubs will be implanted in moist soils along the edge up to 20 m of the width of the clearance area and for the full area of work areas to stabilize disturbances and reduce sedimentation.
- All tree and shrubs planted should be covered by mulch (the size of planted root ball) with a well around the trunk to allow for water infiltration.
- The use of fertilizers is prohibited. Compost will be considered the first option where fertilizers would otherwise be utilized. Compost must be weed-free or from a facility where temperatures have rendered seeds non-viable.
- Ensure Qualified Professional(s) complete post-construction vegetation monitoring to ensure success of revegetation.
- During the establishment period of the new plants, the plants will need to be watered (weather dependant) at minimally every 7 to 10 days or preferably every 2-3 days between May and August 30, and minimally every 14 to 21 days between September 1 and November 15.
 - Watering should be enough to penetrate the full depth of the growing medium.
 - Soil moisture should be monitored throughout the growing season and the frequency of watering should be increased when plant materials are reaching the permanent wilting point. Scheduled applications of water should be skipped when rainfall has penetrated the soil fully.



Related Environmental Standards and Guidelines

- General Environmental Protection Procedures
- Erosion Control (ESG-1-Pre)
- Sediment Control (ESG-2-Pre)
- Soil Stripping, Grubbing and Stockpiling (ESG-3-Pre)
- Vegetation Clearing and Protection (ESG-4-Pre)
- Invasive Species Management (ESG-11-C)

Related EMP Component Plans

- Vegetation Protection
- Wildlife Protection and Management
- Species at Risk Protection
- Invasive Species Management
- Site Restoration

Other Design and Environmental Considerations

- Necessary erosion and sedimentation control practices should be established prior to seeding.
- Optimal timing for seeding is early spring (before spring runoff) or fall; however, seeding can occur throughout summer with irrigation.
- Timing of works should avoid seasonally high rainfall and snowmelt periods.

Further Guidance

Landscape Ontario Horticultural Trades Association, 2004. Landscape Guidelines. Available at: http://landscapeontario.com/attach/1246977850.Landscape_Guidelines.pdf.

TRCA. 2010. Preserving and Restoring Healthy Soil: Best Practices for Urban Construction. Version 1.0. June 2012. Available online: www.conservationhalton.ca/.../preserving_and_restoring_healthy_soil_trca_2012.pdf

References

Kees, 2008. Using Subsoiling To Reduce Soil Compaction; USDA Forest Service Technology and Development Program Missoula, MT 5E52F74 Soil Tilth Restorer

Government of Yukon, 2011. Best Management Practices for Works Affecting Water in Yukon. Water Resources Branch, Environment Yukon. May 2011. ISBN 978-1-55362-525-4.

Government of Ontario. 1990. Contract Design, Estimating and Documentation – Special Provisions Volumes, Seeding and Cover. August 1990. Index 572S01. Available online: <http://www.raqsa.mto.gov.on.ca/techpubs/cdedspa.nsf/83b14ef9766e4ae385257081006823bb/ecb4894b75949c39852568070076d35e?OpenDocument>

Minnesota Stormwater Manual, 2016. Alleviating Compaction from Construction Activities; URL: https://stormwater.pca.state.mn.us/index.php?title=About_the_Minnesota_Stormwater_Manual&oldid=21614

Virginia Department of Conservation and Recreation (VA-DCR), 2011. Virginia DCR Stormwater Design Specification No. 4: Soil Restoration, <http://vwrrc.vt.edu/swc/>.

APPENDIX H
PCA STANDARD DETAILS



SCALE = 1:8

SIGN COLOURS

-  SIGN BOARD BACKGROUND RED
PANTONE COLOUR MATCHING SYSTEM NO.485 SOLID COATED
PANTONE PMS 485 C
CMYK 0/96/100/0
RGB 213/43/30
HEXIDECIMAL #D52B1E
-  SIGN BOARD TEXT AND BACKGROUND WHITE
CMYK 0/0/0/0
RGB 255/255/255
HEXIDECIMAL #FFFFFF
-  SIGN BOARD TEXT BLACK
CMYK 0/0/0/100
RGB 0/0/0
HEXIDECIMAL #000000
-  LOGO FLAG RED
PANTONE COLOUR MATCHING SYSTEM NO.032 SOLID COATED
PANTONE PMS 032 C
CMYK 0/100/100/0
RGB 213/43/30
HEXIDECIMAL #338BEE
-  LOGO TEXT BLACK
CMYK 0/0/0/100
RGB 0/0/0
HEXIDECIMAL #000000

SIGN FONTS AND TEXT HEIGHTS

- SIGN HEADER - HELVETICA NEUE 55 ROMAN (BOLD), MAX TEXT HEIGHT 300 mm, MIN. 225mm UPPERCASE
- ILLUSTRATED ON THIS DRAWING AS THE WORD 'DANGER'
- SIGN MESSAGE - HELVETICA NEUE 55 ROMAN (BOLD), MAX TEXT HEIGHT 200 mm, MIN. TEXT HEIGHT 150mm, FIRST LETTER CAPITALIZED EVERY WORD
- INCLUDES 2 LINES OF TEXT AS ILLUSTRATED ON THIS DRAWING AS THE WORDS 'DAM AHEAD' AND 'KEEP OUT'
- *NAME OF DAM - HELVETICA NEUE 55 ROMAN (BOLD), TEXT HEIGHT 60 mm, NAME CASE UPPERCASE (ADHESIVE DECAL BY OTHERS)
- *EMERGENCY CONTACT - HELVETICA NEUE 55 ROMAN (BOLD), TEXT HEIGHT 40 mm, UPPERCASE (ADHESIVE DECAL BY OTHERS)
- PARKS CANADA LOGO - DIGITAL LOGO FILE TO BE PROVIDED TO FABRICATOR BY PARKS CANADA

TOLERANCES FOR MODIFYING TEXT SIZES - TEXT HEIGHTS MAY BE MODIFIED AS REQUIRED TO FIT ON SIGN PANEL. ALL TEXT IS TO BE AS LARGE AS POSSIBLE, NOT TO EXCEED THE MAXIMUM TEXT HEIGHTS INDICATED BELOW AND AT MINIMUM EQUAL TO THE MINIMUM TEXT HEIGHTS INDICATED BELOW. BOTH LINES OF SIGN MESSAGE TEXT MUST BE A SINGLE HEIGHT. WHERE MODIFYING TEXT HEIGHTS, MAINTAIN SPACING AND HEIGHT TO WIDTH PROPORTIONS OF LETTER FONT TYPES SPECIFIED. CONDENSED FONTS WILL NOT BE ACCEPTED. ALL TEXT MUST BE BOTTOM LEFT JUSTIFIED. MAINTAIN MINIMUM EDGE DISTANCES SPECIFIED ON DRAWING, AS A GENERAL RULE HEADER LINE TEXT MUST BE AT MINIMUM 1.5 TIMES LARGER THAN MESSAGE LINE TEXT.

+/-3MM MUST BE THE ALLOWABLE FABRICATION TOLERANCE FOR ALL LETTERS AND SYMBOLS

NOTE: WORDING ON THE SIGN SHOWN ON THIS DRAWING IS SHOWN FOR ILLUSTRATIVE PURPOSES ONLY. REFER TO THIS DRAWING FOR DIMENSIONAL AND COLOUR INFORMATION ONLY. REFER TO INDIVIDUAL SIGNS DRAWINGS FOR REQUIRED WORDING IN ENGLISH OR FRENCH AS APPLICABLE.

SIGNS MATERIALS AND FABRICATION SPECIFICATIONS

1.0 MATERIALS SPECIFICATIONS

- 1.1 ALL MATERIALS MUST BE OF NEW STOCK AND FREE FROM DEFECTS.
- 1.2 SIGNS MUST CONSIST OF ALUMINIUM FLAT SHEETS, EXTRUDED PANELS OR ALUMINIUM COMPOSITE PANELS RETRO-REFLECTORIZED ON THE FACE SIDE WITH ALL LETTERS, NUMERALS, SYMBOLS, BORDERS AND CORNERS AS SHOWN ON THE PLANS.
- 1.3 SIGNS EQUAL TO OR GREATER IN WIDTH THAN SIX FEET ARE CONSIDERED STRUCTURAL (ST) AND MUST BE FABRICATED ON EXTRUDED PANELS OR ALUMINIUM COMPOSITE PANELS. SIGNS LESS THAN SIX FEET IN WIDTH WILL BE CONSIDERED NON-STRUCTURAL (NS) SIGNS TO BE FABRICATED WITH ALUMINIUM FLAT SHEET OR FOAM CORE COMPOSITE. ANY EXCEPTIONS TO THESE FABRICATION STANDARDS WILL BE INDICATED BY THE DEPARTMENTAL REPRESENTATIVE AT TIME OF PURCHASE ORDER.

1.4 NON-STRUCTURAL - FLAT SHEET ALUMINIUM SIGNS

SHEET ALUMINIUM SIGNS MUST BE FLAT-SHEET TENSION-LEVELLED, SIGN GRADE ALUMINIUM, ALLOY 5052-H32, CONFORMING TO THE REQUIREMENTS OF ASTM B209M, SPECIFICATION FOR ALUMINIUM AND ALUMINIUM-ALLOY SHEET AND PLATE. NOMINAL THICKNESS FOR SHEET-FACED SIGNS IS 3.0 MM (0.125"). TO ENSURE MAXIMUM TOLERANCING AND BEST APPEARANCE, SHEET ALUMINIUM SIGN PANELS MUST BE CUT USING A NUMERICALLY CONTROLLED DEVICE SUCH AS WATER JET OR LASER CUTTING SYSTEM. ALTERNATIVELY, SHEET ALUMINIUM SUBSTRATES MAY BE SHEARED TO SIZE, CORNER-PUNCHED AND DETAILED, PROVIDED THAT THE DIMENSIONS AND CORNER RADII EXACTLY MATCH THE SUPPLIED SIGN ARTWORK. ALL EDGES MUST BE BROKEN, DE-BURRED AND MADE SMOOTH.

1.5 STRUCTURAL - EXTRUDED ALUMINIUM SIGNS

STRUCTURAL EXTRUSION BASED SIGN FACES (FIGURE 5.3) MUST BE CONSTRUCTED USING 305 MM (12") STANDARD HIGHWAY EXTRUDED BLADES (SHAPE # 73247) USING ALUMINIUM ALLOY 6061-T6 OR 6063-T5. EXTRUDED BLADES ARE TO BE MILL FINISHED WITH NO EXPOSURE TO ANY SILICONE-BORNE PRODUCTS.

FOR MORE INFORMATION AND TYPICAL DETAIL, PLEASE REFER TO THE FOLLOWING SOURCES:

ALBERTA T&U DRAWING TEB 1.95 ([HTTP://WWW.TU.GOV.AB.CA/CONTENT/DOCTYPE233/PRODUCTION/SIGNAGE.PDF](http://www.tu.gov.ab.ca/content/doctype233/production/signage.pdf))

BRITISH COLUMBIA STANDARD SPECIFICATION FOR HIGHWAY CONSTRUCTION, 2004 ([HTTP://WWW.TH.GOV.BC.CA/PUBLICATIONS/CONST_MAINT/CONTRACT_SERV/STANDARDSPECS.HTM](http://www.th.gov.bc.ca/publications/const_maint/contract_serv/standardspecs.htm))

MINISTÈRE DES TRANSPORTS DU QUÉBEC ([HTTP://WWW.PUBLICATIONSDUQUEBEC.GOUV.QC.CA/PRODUITS/OUVRAGE_ROUTIER.FR.HTML](http://www.publicationsduquebec.gouv.qc.ca/produits/ouvrage_routier.fr.html))



1.6 NON-STRUCTURAL AND STRUCTURAL - ALUMINIUM COMPOSITE SIGNS

NON-STRUCTURAL ALUMINIUM COMPOSITE PANELS ARE TO CONSIST OF DOUBLE SIDED 0.3 mm (0.012") TO 0.4mm (0.015") THICK ALUMINIUM FRONT AND BACK FACE BONDED TO 3 mm POLYETHYLENE FOAM CORE.

STRUCTURAL ALUMINIUM COMPOSITE PANELS ARE TO CONSIST OF DOUBLE SIDED 0.3mm (0.012") TO 0.4mm (0.015") THICK ALUMINIUM FRONT AND BACK FACE BONDED TO 10 mm CORRUGATED OR SINGLE PROFILE (FLUTED) POLYALLOMER CORE. SOLID POLYETHYLENE OR FOAM CORE COMPOSITE PRODUCTS WILL NOT BE ACCEPTED FOR STRUCTURAL PANELS DUE TO EXCESSIVE WEIGHT.

ALUMINIUM FACE SHEETS FOR COMPOSITE PANELS TO BE SIGN GRADE ALLOY 5052-H32, CONFORMING TO THE REQUIREMENTS OF ASTM B209M, SPECIFICATION FOR ALUMINIUM AND ALUMINIUM-ALLOY SHEET AND PLATE.

SINGLE FACE TO BE FINISHED WITH 20 MICRONS FACTORY BAKED ACRYLIC WHITE PAINT MEETING REQUIREMENTS OF ASTM D-4214, D-2244. FACTORY COATED FACE WILL ACT AS BACK FACE OF FINISHED SIGN. NO-FACTORY COATED FACE MAY BE SUPPLIED AS MILL FINISH PROVIDED IT WILL ACCEPT LAMINATED RETRO-REFLECTIVE SHEETING, SCREEN PRINT AND DIGITAL PRINT TYPE INKS ASSOCIATED WITH SIGN GRAPHICS DESIGN.

STRUCTURAL PANEL WEIGHT NOT TO EXCEED 13.6 kg (30lbs) AND NON-STRUCTURAL PANEL WEIGHT NOT TO EXCEED 9.1 kg (20lbs) WHEN CUT TO SPECIFIED DIMENSIONS.

STRUCTURAL PANELS TO BE TESTED IN ACCORDANCE WITH ASTM E72 AND DESIGNED TO WITHSTAND A MINIMUM WIND FORCE OF +/- 0.96kPa (20psf).

PANELS SHALL BE PERFORMANCE BOND TESTED TO PASS ASTM C481-C.

ACCEPTABLE PRODUCTS FOR STRUCTURAL PANELS ARE 'PROLITE' OR 'ALUMALITE' BY LAMINATORS INC. OR 'ALUMACORR' BY NUDDO OR APPROVED EQUAL.

ACCEPTABLE PRODUCT FOR NON-STRUCTURAL PANELS IS 'ALUPANEL' BY MULTIPANEL

2.0 FABRICATION SPECIFICATIONS

2.1 THE MAXIMUM ALLOWABLE DEVIATION FROM FLATNESS MUST NOT EXCEED 0.1MM PER 1CM (0.010 INCH PER INCH) WIDTH OF THE SIGN PANEL.

2.2 NO HOLES MUST BE MADE IN SIGNS FACES UNLESS REQUESTED BY DEPARTMENTAL REPRESENTATIVE. HOLES SIZES AND LAYOUT WILL BE PROVIDED TO FABRICATOR PRIOR TO FABRICATION. MOUNTING DETAILS MAY VARY FROM SIGN TO SIGN. ALL HOLES REQUESTED TO BE MADE MUST BE DRILLED AND NOT PUNCHED. TRANSPARENT PLASTIC GROMMETS OF HIGH DENSITY UV TREATED POLYCARBONATE MATERIAL SUCH AS 'LEXAN' MUST BE PROVIDED FOR EACH HOLE TO ACT AS AN INSULATOR AGAINST GALVANIC REACTION WITH SIGN PANEL FASTENERS. 'SNAP-IN' TYPE GROMMETS WILL BE ACCEPTED.

2.3 ALL ALUMINIUM SUBSTRATE MUST BE GIVEN A CHROMATE CONVERSION COATING IN ACCORDANCE WITH ASTM B 449, CLASS 2, AND MUST BE PREPARED BY ONE OF THE TREATMENT SEQUENCE OPTIONS DESCRIBED IN ASTM B 449, APPENDIX X2. THE CHEMICALS AND SOLVENTS MUST BE APPLIED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. SUFFICIENT LABORATORY FACILITIES TO TEST AND CONTROL THE CONCENTRATION OF THE SOLUTIONS USED MUST BE MAINTAINED AT THE TREATING PLANT. A LOG OF THE CONCENTRATION OF TREATING SOLUTIONS MUST BE MAINTAINED. TREATED PANELS MUST BE HANDLED IN SUCH A MANNER AS TO PREVENT CONTAMINATION. PANELS MUST BE STORED IN A DRY, CLEAN AREA FREE FROM DUST, ACID FUMES OR VAPOURS. WHEN ALUMINIUM IS SHIPPED TO A SECONDARY LOCATION FOR RETRO-REFLECTORIZING, ADEQUATE PRECAUTIONS MUST BE TAKEN TO ENSURE THAT THE MATERIAL ARRIVES AT THE DESTINATION UNCONTAMINATED.

2.4 BACKGROUND COLOURING (RED AND WHITE) MUST BE APPLIED AS A LAMINATED RETRO-REFLECTIVE SHEETING, COLOURED AS INDICATED ON DRAWINGS. SHEETING TO BE ASTM STANDARD D4956-11A, TYPE IV, CLASS I. USE ASTM D 4956 TYPE IX, XI OR AASHTO M 268 TYPE C OR D PRISMATIC RED FOR RED BACKGROUND PORTIONS OF SIGNS. RETROREFLECTIVE SHEETING MUST BE HIGH INTENSITY THAT IS AN UNMETALLIZED MICRO PRISMATIC REFLECTIVE MATERIAL.

2.5 ALL SIGNS MUST BE OF THE HIGHEST QUALITY WITH CONSISTENT DAYTIME AND NIGHTTIME COLOR AND RETRO-REFLECTIVITY

2.6 A MAXIMUM OF ONE VERTICAL OVERLAP SPLICE APPROXIMATELY 6MM WIDE WILL BE ALLOWED ON SIGN DIMENSION GREATER THAN 1220. APPLY CLEAR COATING OR EDGE SEALER AFTER APPLICATION OF THE RETRO-REFLECTIVE SHEETING AS RECOMMENDED BY THE SHEETING MANUFACTURER. WHERE CLEAR FINISH IS USED, THE FINISH MUST BE APPLIED AFTER SCREENING OF MESSAGES AND BORDERS. WHERE EDGE SEALER IS USED, THE SEALER MUST BE APPLIED TO ALL SPLICES AND EDGES. THE COMPLETED SIGN FACE MUST BE FREE FROM AIR BUBBLES, WRINKLES OR OTHER BLEMISHES.

2.7 LETTERS AND SYMBOLS MUST BE APPLIED TO THE BACKGROUND OF THE SIGN BY THE DIRECT OR REVERSE SCREEN PROCESS. MESSAGES AND BORDERS OF A COLOR DARKER THAN THE SIGN FIELD MUST BE APPLIED TO THE RETROREFLECTIVE SHEETING BY THE DIRECT PROCESS. MESSAGES AND BORDERS OF A COLOR LIGHTER THAN THE SIGN FIELD MUST BE PRODUCED BY THE REVERSE SCREEN PROCESS. INKS USED IN THE SILKSCREEN PROCESS MUST BE OF THE TYPE TO PRODUCE THE DESIRED COLOR AND DURABILITY WHEN APPLIED ON RETROREFLECTIVE SHEETING. SILKSCREEN INKS MUST BE USED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. THE INK MUST PRODUCE THE DESIRED COLOUR WHEN APPLIED ON RETROREFLECTIVE SHEETING BACKGROUND AND MUST DRY TO A GOOD FILM WITHOUT RUNNING, STREAKING OR SAGGING. THE SCREENING MUST BE DONE IN A MANNER THAT RESULTS IN A UNIFORM COLOUR AND TONE, WITH SHARPLY DEFINED EDGES OF LEGEND AND BORDER WITHOUT BLEMISHES ON THE SIGN FIELD THAT WILL AFFECT THE



Office of the Executive Director, Waterways
Parks Canada Agency
Government of Canada

Graphics Designs and Materials and
Fabrication Specifications for
Public Safety Signs around Dams

TYPICAL 4x6 (1220x1830) SIGN DIMENSIONS AND MATERIALS AND FABRICATION SPECIFICATIONS

Revised: November 3, 2014
Checked: November 3, 2014
Approved: November 3, 2014

Drawn by: S.Gauthier
Checked by: S.Gauthier
Approved by: S.Gauthier





SIGN COLOURS

-  **SIGN BOARD BACKGROUND RED**
PANTONE COLOUR MATCHING SYSTEM NO.485 SOLID COATED
PANTONE PMS 485 C
CMYK 0/96/100/0
RGB 213/43/30
HEXIDECIMAL #D52B1E
-  **SIGN BOARD TEXT AND BACKGROUND WHITE**
CMYK 0/0/0/0
RGB 255/255/255
HEXIDECIMAL #FFFFFF
-  **SIGN BOARD TEXT BLACK**
CMYK 0/0/0/100
RGB 0/0/0
HEXIDECIMAL #000000
-  **LOGO FLAG RED**
PANTONE COLOUR MATCHING SYSTEM NO.032 SOLID COATED
PANTONE PMS 032 C
CMYK 0/100/100/0
RGB 213/43/30
HEXIDECIMAL #33BBEE
-  **LOGO TEXT BLACK**
CMYK 0/0/0/100
RGB 0/0/0
HEXIDECIMAL #000000

SIGN FONTS AND TEXT HEIGHTS

- SIGN HEADER - HELVETICA NEUE 55 ROMAN (BOLD), MAX TEXT HEIGHT 70 mm, MIN TEXT HEIGHT 60 mm, UPPERCASE
- ILLUSTRATED ON THIS DRAWING AS THE WORD 'DANGER'
- SIGN MESSAGE - HELVETICA NEUE 55 ROMAN (BOLD), MAX TEXT HEIGHT 50 mm, MIN. TEXT HEIGHT 40mm, FIRST LETTER CAPITALIZED EVERY WORD
- INCLUDES 5 LINES OF TEXT AS ILLUSTRATED ON THIS DRAWING AS THE WORDS 'KEEP OUT' AND 'ACCESS BEYOND THIS POINT MAY RESULT IN DROWNING'

PARKS CANADA LOGO - DIGITAL LOGO FILE TO BE PROVIDED TO FABRICATOR BY PARKS CANADA

TOLERANCES FOR MODIFYING TEXT SIZES - TEXT HEIGHTS MAY BE MODIFIED AS REQUIRED TO FIT ON SIGN PANEL. ALL TEXT IS TO BE AS LARGE AS POSSIBLE, NOT TO EXCEED THE MAXIMUM TEXT HEIGHTS INDICATED BELOW AND AT MINIMUM EQUAL TO THE MINIMUM TEXT HEIGHTS INDICATED BELOW. BOTH LINES OF SIGN MESSAGE TEXT MUST BE A SINGLE HEIGHT. WHERE MODIFYING TEXT HEIGHTS, MAINTAIN SPACING AND HEIGHT TO WIDTH PROPORTIONS OF LETTER FONT TYPES SPECIFIED. CONDENSED FONTS WILL NOT BE ACCEPTED. ALL TEXT MUST BE BOTTOM LEFT JUSTIFIED. MAINTAIN MINIMUM EDGE DISTANCES SPECIFIED ON DRAWING. AS A GENERAL RULE HEADER LINE TEXT MUST BE AT MINIMUM 1.5 TIMES LARGER THAN MESSAGE LINE TEXT.

+/-3MM MUST BE THE ALLOWABLE FABRICATION TOLERANCE FOR ALL LETTERS AND SYMBOLS

NOTE: WORDING ON THE SIGN SHOWN ON THIS DRAWING IS SHOWN FOR ILLUSTRATIVE PURPOSES ONLY. REFER TO THIS DRAWING FOR DIMENSIONAL AND COLOUR INFORMATION. REFER TO INDIVIDUAL SIGN DRAWINGS FOR REQUIRED WORDING IN ENGLISH OR FRENCH AS APPLICABLE.

SCALE = 1:8

SIGNS MATERIALS AND FABRICATION SPECIFICATIONS

1.0 MATERIALS SPECIFICATIONS

- 1.1 ALL MATERIALS MUST BE OF NEW STOCK AND FREE FROM DEFECTS.
- 1.2 SIGNS MUST CONSIST OF ALUMINIUM FLAT SHEETS, EXTRUDED PANELS OR ALUMINIUM COMPOSITE PANELS RETRO-REFLECTORIZED ON THE FACE SIDE WITH ALL LETTERS, NUMERALS, SYMBOLS, BORDERS AND CORNERS AS SHOWN ON THE PLANS.
- 1.3 SIGNS EQUAL TO OR GREATER IN WIDTH THAN SIX FEET ARE CONSIDERED STRUCTURAL (ST) AND MUST BE FABRICATED ON EXTRUDED PANELS OR ALUMINIUM COMPOSITE PANELS. SIGNS LESS THAN SIX FEET IN WIDTH WILL BE CONSIDERED NON-STRUCTURAL (NS) SIGNS TO BE FABRICATED WITH ALUMINIUM FLAT SHEET OR FOAM CORE COMPOSITE. ANY EXCEPTIONS TO THESE FABRICATION STANDARDS WILL BE INDICATED BY THE DEPARTMENTAL REPRESENTATIVE AT TIME OF PURCHASE ORDER.
- 1.4 NON-STRUCTURAL - FLAT SHEET ALUMINIUM SIGNS

SHEET ALUMINIUM SIGNS MUST BE FLAT-SHEET TENSION-LEVELLED, SIGN GRADE ALUMINIUM, ALLOY 5052-H32, CONFORMING TO THE REQUIREMENTS OF ASTM B209M, SPECIFICATION FOR ALUMINIUM AND ALUMINIUM-ALLOY SHEET AND PLATE. NOMINAL THICKNESS FOR SHEET-FACED SIGNS IS 3.0 MM (0.125"). TO ENSURE MAXIMUM TOLERANCING AND BEST APPEARANCE, SHEET ALUMINIUM SIGN PANELS MUST BE CUT USING A NUMERICALLY CONTROLLED DEVICE SUCH AS WATER JET OR LASER CUTTING SYSTEM. ALTERNATIVELY, SHEET ALUMINIUM SUBSTRATES MAY BE SHEARED TO SIZE, CORNER-PUNCHED AND DETAILED, PROVIDED THAT THE DIMENSIONS AND CORNER RADII EXACTLY MATCH THE SUPPLIED SIGN ARTWORK. ALL EDGES MUST BE BROKEN, DE-BURRED AND MADE SMOOTH.

1.5 STRUCTURAL - EXTRUDED ALUMINIUM SIGNS

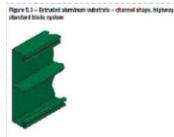
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FOR MORE INFORMATION AND TYPICAL DETAIL, PLEASE REFER TO THE FOLLOWING SOURCES:

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ALUMINIUM FACE SHEETS FOR COMPOSITE PANELS TO BE SIGN GRADE ALLOY 5052-H32, CONFORMING TO THE REQUIREMENTS OF ASTM B209M, SPECIFICATION FOR ALUMINIUM AND ALUMINIUM-ALLOY SHEET AND PLATE.

SINGLE FACE TO BE FINISHED WITH 20 MICRONS FACTORY BAKED ACRYLIC WHITE PAINT MEETING REQUIREMENTS OF ASTM D-2244. FACTORY COATED FACE WILL ACT AS BACK FACE OF FINISHED SIGN. NO-FACTORY COATED FACE MAY BE SUPPLIED AS MILL FINISH PROVIDED IT WILL ACCEPT LAMINATED RETRO-REFLECTIVE SHEETING, SCREEN PRINT AND DIGITAL PRINT TYPE INKS ASSOCIATED WITH SIGN GRAPHICS DESIGN.

STRUCTURAL PANEL WEIGHT NOT TO EXCEED 13.6 kg (30lbs) AND NON-STRUCTURAL PANEL WEIGHT NOT TO EXCEED 9.1 kg (20lbs) WHEN CUT TO SPECIFIED DIMENSIONS.

STRUCTURAL PANELS TO BE TESTED IN ACCORDANCE WITH ASTM E72 AND DESIGNED TO WITHSTAND A MINIMUM WIND FORCE OF +/- 0.96kPa (20psf).

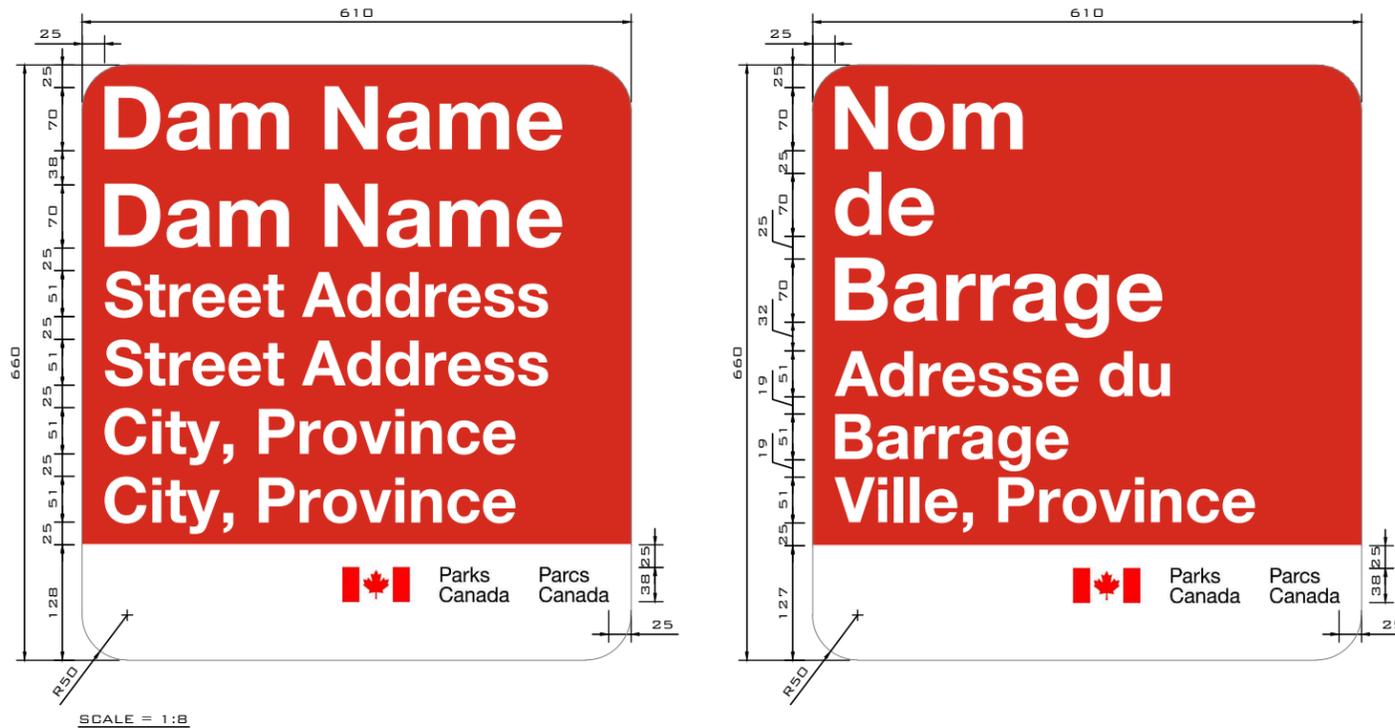
PANELS SHALL BE PERFORMANCE BOND TESTED TO PASS ASTM C481-C.

ACCEPTABLE PRODUCTS FOR STRUCTURAL PANELS ARE 'PROLITE' OR 'ALUMALITE' BY LAMINATORS INC. OR 'ALUMACORR' BY NUDD OR APPROVED EQUAL.

ACCEPTABLE PRODUCT FOR NON-STRUCTURAL PANELS IS 'ALUPANEL' BY MULTIPANEL

2.0 FABRICATION SPECIFICATIONS

- 2.1 THE MAXIMUM ALLOWABLE DEVIATION FROM FLATNESS MUST NOT EXCEED 0.1 MM PER 1CM (0.010 INCH PER INCH) WIDTH OF THE SIGN PANEL.
- 2.2 NO HOLES MUST BE MADE IN SIGNS FACES UNLESS REQUESTED BY DEPARTMENTAL REPRESENTATIVE. HOLES SIZES AND LAYOUT WILL BE PROVIDED TO FABRICATOR PRIOR TO FABRICATION. MOUNTING DETAILS MAY VARY FROM SIGN TO SIGN. ALL HOLES REQUESTED TO BE MADE MUST BE DRILLED AND NOT PUNCHED. TRANSPARENT PLASTIC GROMMETS OF HIGH DENSITY UV TREATED POLYCARBONATE MATERIAL SUCH AS 'LEXAN' MUST BE PROVIDED FOR EACH HOLE TO ACT AS AN INSULATOR AGAINST GALVANIC REACTION WITH SIGN PANEL FASTENERS. 'SNAP-IN' TYPE GROMMETS WILL BE ACCEPTED.
- 2.3 ALL ALUMINIUM SUBSTRATE MUST BE GIVEN A CHROMATE CONVERSION COATING IN ACCORDANCE WITH ASTM B 449, CLASS 2, AND MUST BE PREPARED BY ONE OF THE TREATMENT SEQUENCE OPTIONS DESCRIBED IN ASTM B 449, APPENDIX X2. THE CHEMICALS AND SOLVENTS MUST BE APPLIED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. SUFFICIENT LABORATORY FACILITIES TO TEST AND CONTROL THE CONCENTRATION OF THE SOLUTIONS USED MUST BE MAINTAINED AT THE TREATING PLANT. A LOG OF THE CONCENTRATION OF TREATING SOLUTIONS MUST BE MAINTAINED. TREATED PANELS MUST BE HANDLED IN SUCH A MANNER AS TO PREVENT CONTAMINATION. PANELS MUST BE STORED IN A DRY, CLEAN AREA FREE FROM DUST, ACID FUMES OR VAPORS. WHEN ALUMINIUM IS SHIPPED TO A SECONDARY LOCATION FOR RETRO-REFLECTORIZING, ADEQUATE PRECAUTIONS MUST BE TAKEN TO ENSURE THAT THE MATERIAL ARRIVES AT THE DESTINATION UNCONTAMINATED.
- 2.4 BACKGROUND COLOURING (RED AND WHITE) MUST BE APPLIED AS A LAMINATED RETRO-REFLECTIVE SHEETING, COLOURED AS INDICATED ON DRAWINGS. SHEETING TO BE ASTM STANDARD D4956-11A, TYPE IV, CLASS I. USE ASTM D 4956 TYPE IX, XI OR AASHTO M 268 TYPE C OR D PRISMATIC RED FOR RED BACKGROUND PORTIONS OF SIGNS. RETROREFLECTIVE SHEETING MUST BE HIGH INTENSITY THAT IS AN UNMETALLIZED MICRO PRISMATIC REFLECTIVE MATERIAL.
- 2.5 ALL SIGNS MUST BE OF THE HIGHEST QUALITY WITH CONSISTENT DAYTIME AND NIGHTTIME COLOR AND RETRO-REFLECTIVITY
- 2.6 A MAXIMUM OF ONE VERTICAL OVERLAP SPLICE APPROXIMATELY 6mm WIDE WILL BE ALLOWED ON SIGN DIMENSION GREATER THAN 1220. APPLY CLEAR COATING OR EDGE SEALER AFTER APPLICATION OF THE RETRO-REFLECTIVE SHEETING AS RECOMMENDED BY THE SHEETING MANUFACTURER. WHERE CLEAR FINISH IS USED, THE FINISH MUST BE APPLIED AFTER SCREENING OF MESSAGES AND BORDERS. WHERE EDGE SEALER IS USED, THE SEALER MUST BE APPLIED TO ALL SPLICES AND EDGES. THE COMPLETED SIGN FACE MUST BE FREE FROM AIR BUBBLES, WRINKLES OR OTHER BLEMISHES.
- 2.7 LETTERS AND SYMBOLS MUST BE APPLIED TO THE BACKGROUND OF THE SIGN BY THE DIRECT OR REVERSE SCREEN PROCESS. MESSAGES AND BORDERS OF A COLOR DARKER THAN THE SIGN FIELD MUST BE APPLIED TO THE RETROREFLECTIVE SHEETING BY THE DIRECT PROCESS. BORDERS OF A COLOR LIGHTER THAN THE SIGN FIELD MUST BE APPLIED TO THE SHEETING BY THE REVERSE SCREEN PROCESS. INKS USED IN THE SILKSCREEN PROCESS MUST BE OF THE TYPE TO PRODUCE THE DESIRED COLOR AND DURABILITY WHEN APPLIED ON RETROREFLECTIVE SHEETING. SILKSCREEN INKS MUST BE USED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. THE INK MUST PRODUCE THE DESIRED COLOR WHEN APPLIED ON RETROREFLECTIVE SHEETING BACKGROUND AND MUST DRY TO A GOOD FILM WITHOUT RUNNING, STREAKING OR SAGGING. THE SCREENING MUST BE DONE IN A MANNER THAT RESULTS IN A UNIFORM COLOR AND TONE, WITH SHARPLY DEFINED EDGES OF LEGEND AND BORDER WITHOUT BLEMISHES ON THE SIGN FIELD THAT WILL AFFECT THE INTENDED USE. SIGNS AFTER SCREENING MUST BE DRIED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS TO PROVIDE A SMOOTH HARD FINISH. ANY SIGNS ON WHICH BLISTERS APPEAR DURING THE DRYING PROCESS WILL BE REJECTED.



SIGN COLOURS

	SIGN BOARD BACKGROUND RED PANTONE COLOUR MATCHING SYSTEM NO.485 SOLID COATED PANTONE PMS 485 C CMYK 0/96/100/0 RGB 213/43/30 HEXIDECIMAL #D52B1E
	SIGN BOARD TEXT AND BACKGROUND WHITE CMYK 0/0/0/0 RGB 255/255/255 HEXIDECIMAL #FFFFFF
	SIGN BOARD TEXT BLACK CMYK 0/0/0/100 RGB 0/0/0 HEXIDECIMAL #000000
	LOGO FLAG RED PANTONE COLOUR MATCHING SYSTEM NO.032 SOLID COATED PANTONE PMS 032 C CMYK 0/100/100/0 RGB 213/43/30 HEXIDECIMAL #33BBEE
	LOGO TEXT BLACK CMYK 0/0/0/100 RGB 0/0/0 HEXIDECIMAL #000000

SIGN FONTS AND TEXT HEIGHTS

- SIGN HEADER** - HELVETICA NEUE 55 ROMAN (BOLD), MAX TEXT HEIGHT 70 mm, MIN TEXT HEIGHT 60mm, UPPERCASE
- ILLUSTRATED ON THIS DRAWING AS THE WORDS 'DAM NAME'
- SIGN MESSAGE** - HELVETICA NEUE 55 ROMAN (BOLD), MAX TEXT HEIGHT 51 mm, MIN. TEXT HEIGHT 41mm, FIRST LETTER CAPITALIZED EVERY WORD
- INCLUDES 3 LINES OF TEXT AS ILLUSTRATED ON THIS DRAWING AS THE WORDS 'STREET ADDRESS' AND 'CITY, PROVINCE'
- PARKS CANADA LOGO** - DIGITAL LOGO FILE TO BE PROVIDED TO FABRICATOR BY PARKS CANADA
- TOLERANCES FOR MODIFYING TEXT SIZES** - TEXT HEIGHTS MAY BE MODIFIED AS REQUIRED TO FIT ON SIGN PANEL. ALL TEXT IS TO BE AS LARGE AS POSSIBLE, NOT TO EXCEED THE MAXIMUM TEXT HEIGHTS INDICATED BELOW AND AT MINIMUM EQUAL TO THE MINIMUM TEXT HEIGHTS INDICATED BELOW. BOTH LINES OF SIGN MESSAGE TEXT MUST BE A SINGLE HEIGHT. WHERE MODIFYING TEXT HEIGHTS, MAINTAIN SPACING AND HEIGHT TO WIDTH PROPORTIONS OF LETTER FONT TYPES SPECIFIED. CONDENSED FONTS WILL NOT BE ACCEPTED. ALL TEXT MUST BE BOTTOM LEFT JUSTIFIED. MAINTAIN MINIMUM EDGE DISTANCES SPECIFIED ON DRAWING. AS A GENERAL RULE HEADER LINE TEXT MUST BE AT MINIMUM 1.75 TIMES LARGER THAN MESSAGE LINE TEXT.
- +/-3MM MUST BE THE ALLOWABLE FABRICATION TOLERANCE FOR ALL LETTERS AND SYMBOLS

NOTE: WORDING ON THE SIGN SHOWN ON THIS DRAWING IS SHOWN FOR ILLUSTRATIVE PURPOSES ONLY. REFER TO THIS DRAWING FOR DIMENSIONAL AND COLOUR INFORMATION ONLY. REFER TO INDIVIDUAL SIGN DRAWINGS FOR REQUIRED WORDING IN ENGLISH OR FRENCH AS APPLICABLE.

SIGNS MATERIALS AND FABRICATION SPECIFICATIONS

1.0 MATERIALS SPECIFICATIONS

- ALL MATERIALS MUST BE OF NEW STOCK AND FREE FROM DEFECTS.
- SIGNS MUST CONSIST OF ALUMINIUM FLAT SHEETS, EXTRUDED PANELS OR ALUMINIUM COMPOSITE PANELS RETRO-REFLECTORIZED ON THE FACE SIDE WITH ALL LETTERS, NUMERALS, SYMBOLS, BORDERS AND CORNERS AS SHOWN ON THE PLANS.
- SIGNS EQUAL TO OR GREATER IN WIDTH THAN SIX FEET ARE CONSIDERED STRUCTURAL (ST) AND MUST BE FABRICATED ON EXTRUDED PANELS OR ALUMINIUM COMPOSITE PANELS. SIGNS LESS THAN SIX FEET IN WIDTH WILL BE CONSIDERED NON-STRUCTURAL (NS) SIGNS TO BE FABRICATED WITH ALUMINIUM FLAT SHEET OR FOAM CORE COMPOSITE. ANY EXCEPTIONS TO THESE FABRICATION STANDARDS WILL BE INDICATED BY THE DEPARTMENTAL REPRESENTATIVE AT TIME OF PURCHASE ORDER.

1.4 NON-STRUCTURAL - FLAT SHEET ALUMINIUM SIGNS

SHEET ALUMINIUM SIGNS MUST BE FLAT-SHEET TENSION-LEVELLED, SIGN GRADE ALUMINIUM, ALLOY 5052-H32, CONFORMING TO THE REQUIREMENTS OF ASTM B209M, SPECIFICATION FOR ALUMINIUM AND ALUMINIUM-ALLOY SHEET AND PLATE. NOMINAL THICKNESS FOR SHEET-FACED SIGNS IS 3.0 MM (0.125"). TO ENSURE MAXIMUM TOLERANCING AND BEST APPEARANCE, SHEET ALUMINIUM SIGN PANELS MUST BE CUT USING A NUMERICALLY CONTROLLED DEVICE SUCH AS WATER JET OR LASER CUTTING SYSTEM. ALTERNATIVELY, SHEET ALUMINIUM SUBSTRATES MAY BE SHEARED TO SIZE, CORNER-PUNCHED AND DETAILED, PROVIDED THAT THE DIMENSIONS AND CORNER RADII EXACTLY MATCH THE SUPPLIED SIGN ARTWORK. ALL EDGES MUST BE BROKEN, DE-BURRED AND MADE SMOOTH.

1.5 STRUCTURAL - EXTRUDED ALUMINIUM SIGNS

STRUCTURAL EXTRUSION BASED SIGN FACES (FIGURE 5.3) MUST BE CONSTRUCTED USING 305 MM (12") STANDARD HIGHWAY EXTRUDED BLADES (SHAPE # 73247) USING ALUMINIUM ALLOY 6061-T6 OR 6063-T5. EXTRUDED BLADES ARE TO BE MILL FINISHED WITH NO EXPOSURE TO ANY SILICONE-BORNE PRODUCTS.

FOR MORE INFORMATION AND TYPICAL DETAIL, PLEASE REFER TO THE FOLLOWING SOURCES:

ALBERTA T&U DRAWING TEB 1.95 ([HTTP://WWW.TU.GOV.AB.CA/CONTENT/DOCTYPE233/PRODUCTION/SIGNAGE.PDF](http://www.tu.gov.ab.ca/content/doctype233/production/signage.pdf))

BRITISH COLUMBIA STANDARD SPECIFICATION FOR HIGHWAY CONSTRUCTION, 2004 ([HTTP://WWW.TH.GOV.BC.CA/PUBLICATIONS/CONST_MAINT/CONTRADT_SERV/STANDARDSPECS.HTM](http://www.th.gov.bc.ca/publications/const_maint/contradt_serv/standardspecs.htm))

MINISTÈRE DES TRANSPORTS DU QUÉBEC ([HTTP://WWW.PUBLICATIONSDUQUEBEC.GOUV.QC.CA/PRODUITS/OUVRAGE_ROUTIER.FR.HTML](http://www.publicationsduquebec.gouv.qc.ca/produits/ouvrage_routier.fr.html))

1.6 NON-STRUCTURAL AND STRUCTURAL - ALUMINIUM COMPOSITE SIGNS

NON-STRUCTURAL ALUMINIUM COMPOSITE PANELS ARE TO CONSIST OF DOUBLE SIDED 0.3 mm (0.012") TO 0.4mm (0.015") THICK ALUMINIUM FRONT AND BACK FACE BONDED TO 3mm POLYETHYLENE FOAM CORE.

STRUCTURAL ALUMINIUM COMPOSITE PANELS ARE TO CONSIST OF DOUBLE SIDED 0.3mm (0.012") TO 0.4mm (0.015") THICK ALUMINIUM FRONT AND BACK FACE BONDED TO 10 mm CORRUGATED OR SINGLE PROFILE (FLUTED) POLYALLOMER CORE. SOLID POLYETHYLENE OR FOAM CORE COMPOSITE PRODUCTS WILL NOT BE ACCEPTED FOR STRUCTURAL PANELS DUE TO EXCESSIVE WEIGHT.

ALUMINIUM FACE SHEETS FOR COMPOSITE PANELS TO BE SIGN GRADE ALLOY 5052-H32, CONFORMING TO THE REQUIREMENTS OF ASTM B209M, SPECIFICATION FOR ALUMINIUM AND ALUMINIUM-ALLOY SHEET AND PLATE.

SINGLE FACE TO BE FINISHED WITH 20 MICRONS FACTORY BAKED ACRYLIC WHITE PAINT MEETING REQUIREMENTS OF ASTM D-4214, D-2244. FACTORY COATED FACE WILL ACT AS BACK FACE OF FINISHED SIGN. NO FACTORY COATED FACE MAY BE SUPPLIED AS MILL FINISH PROVIDED IT WILL ACCEPT LAMINATED RETRO-REFLECTIVE SHEETING, SCREEN PRINT AND DIGITAL PRINT TYPE INKS ASSOCIATED WITH SIGN GRAPHICS DESIGN.

STRUCTURAL PANELS TO BE TESTED IN ACCORDANCE WITH ASTM E72 AND DESIGNED TO WITHSTAND A MINIMUM WIND FORCE OF +/- 0.96kPa (20psf).

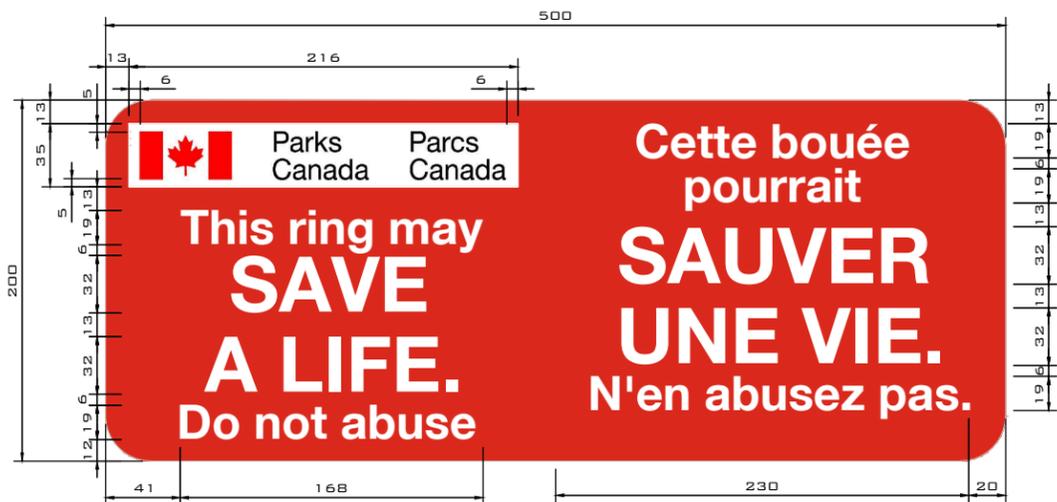
PANELS SHALL BE PERFORMANCE BOND TESTED TO PASS ASTM C481-C.

ACCEPTABLE PRODUCTS FOR STRUCTURAL PANELS ARE 'PROLITE' OR 'ALUMALITE' BY LAMINATORS INC. OR 'ALUMACORR' BY NUDD OR APPROVED EQUAL.

ACCEPTABLE PRODUCT FOR NON-STRUCTURAL PANELS IS 'ALUPANEL' BY MULTIPANEL

2.0 FABRICATION SPECIFICATIONS

- THE MAXIMUM ALLOWABLE DEVIATION FROM FLATNESS MUST NOT EXCEED 0.1MM PER 1CM (0.010 INCH PER INCH) WIDTH OF THE SIGN PANEL.
- NO HOLES MUST BE MADE IN SIGNS FACES UNLESS REQUESTED BY DEPARTMENT. MOUNTING DETAILS VARY FROM SIGN TO SIGN. WHERE HOLES ARE REQUESTED, THEY MUST BE DRILLED AND EDGE SEALED SIMILAR TO OTHER CUT EDGES.
- ALL ALUMINIUM SUBSTRATE MUST BE GIVEN A CHROMATE CONVERSION COATING IN ACCORDANCE WITH ASTM B 449, CLASS 2, AND MUST BE PREPARED BY ONE OF THE TREATMENT SEQUENCE OPTIONS DESCRIBED IN ASTM B 449, APPENDIX X2. THE CHEMICALS AND SOLVENTS MUST BE APPLIED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. SUFFICIENT LABORATORY FACILITIES TO TEST AND CONTROL THE CONCENTRATION OF THE SOLUTIONS USED MUST BE MAINTAINED AT THE TREATING PLANT. A LOG OF THE CONCENTRATION OF TREATING SOLUTIONS MUST BE MAINTAINED. TREATED PANELS MUST BE HANDLED IN SUCH A MANNER AS TO PREVENT CONTAMINATION. PANELS MUST BE STORED IN A DRY, CLEAN AREA FREE FROM DUST, ACID FUMES OR VAPORS. WHEN ALUMINIUM IS SHIPPED TO A SECONDARY LOCATION FOR RETRO-REFLECTORIZING, ADEQUATE PRECAUTIONS MUST BE TAKEN TO ENSURE THAT THE MATERIAL ARRIVES AT THE DESTINATION UNCONTAMINATED.
- BACKGROUND COLOURING (RED AND WHITE) MUST BE APPLIED AS A LAMINATED RETRO-REFLECTIVE SHEETING, COLOURED AS INDICATED ON DRAWINGS. SHEETING TO BE ASTM STANDARD D4956-11A, TYPE IV, CLASS I. USE ASTM D 4956 TYPE IX, XI OR AASHTO M 268 TYPE C OR D PRISMATIC RED FOR RED BACKGROUND PORTIONS OF SIGNS. RETROREFLECTIVE SHEETING MUST BE HIGH INTENSITY THAT IS AN UNMETALLIZED MICRO PRISMATIC REFLECTIVE MATERIAL.
- ALL SIGNS MUST BE OF THE HIGHEST QUALITY WITH CONSISTENT DAYTIME AND NIGHTTIME COLOR AND RETRO-REFLECTIVITY
- APPLY CLEAR COATING OR EDGE SEALER AFTER APPLICATION OF THE RETRO-REFLECTIVE SHEETING AS RECOMMENDED BY THE SHEETING MANUFACTURER. WHERE CLEAR FINISH IS USED, THE FINISH MUST BE APPLIED AFTER SCREENING OF MESSAGES AND BORDERS AND DRILLING OF ALL HOLES. WHERE EDGE SEALER IS USED, THE SEALER MUST BE APPLIED TO ALL HOLES AND EDGES. THE COMPLETED SIGN FACE MUST BE FREE FROM AIR BUBBLES, WRINKLES OR OTHER BLEMISHES.
- LETTERS AND SYMBOLS MUST BE APPLIED TO THE BACKGROUND OF THE SIGN BY THE DIRECT OR REVERSE SCREEN PROCESS. MESSAGES AND BORDERS OF A COLOR DARKER THAN THE SIGN FIELD MUST BE APPLIED TO THE RETROREFLECTIVE SHEETING BY THE DIRECT PROCESS. MESSAGES AND BORDERS OF A COLOR LIGHTER THAN THE SIGN FIELD MUST BE PRODUCED BY THE REVERSE SCREEN PROCESS. INKS USED IN THE SILKSCREEN PROCESS MUST BE OF THE TYPE TO PRODUCE THE DESIRED COLOR AND DURABILITY WHEN APPLIED ON RETROREFLECTIVE SHEETING. SILKSCREEN INKS MUST BE USED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. THE INK MUST PRODUCE THE DESIRED COLOR WHEN APPLIED ON RETROREFLECTIVE SHEETING BACKGROUND AND MUST DRY TO A GOOD FILM WITHOUT RUNNING, STREAKING OR SAGGING. THE SCREENING MUST BE DONE IN A MANNER THAT RESULTS IN A UNIFORM COLOR AND TONE, WITH SHARPLY DEFINED EDGES OF LEGEND AND BORDER WITHOUT BLEMISHES ON THE SIGN FIELD THAT WILL AFFECT THE INTENDED USE. SIGNS AFTER SCREENING MUST BE DRIED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS TO PROVIDE A SMOOTH HARD FINISH. ANY SIGNS ON WHICH BLISTERS APPEAR DURING THE DRYING PROCESS WILL BE REJECTED.



SIGN COLOURS

	SIGN BOARD BACKGROUND RED PANTONE COLOUR MATCHING SYSTEM NO.485 SOLID COATED PANTONE PMS 485 C CMYK 0/96/100/0 RGB 213/43/30 HEXDECIMAL #D52B1E
	SIGN BOARD TEXT AND BACKGROUND WHITE CMYK 0/0/0/0 RGB 255/255/255 HEXDECIMAL #FFFFFF
	SIGN BOARD TEXT BLACK CMYK 0/0/0/100 RGB 0/0/0 HEXDECIMAL #000000
	LOGO FLAG RED PANTONE COLOUR MATCHING SYSTEM NO.032 SOLID COATED PANTONE PMS 032 C CMYK 0/100/100/0 RGB 213/43/30 HEXDECIMAL #33BBEE
	LOGO TEXT BLACK CMYK 0/0/0/100 RGB 0/0/0 HEXDECIMAL #000000

SIGN FONTS AND TEXT HEIGHTS

SIGN MESSAGE - HELVETICA NEUE 55 ROMAN (BOLD)
- TEXT HEIGHTS AND POSITION AS SHOWN AND CENTRE JUSTIFIED.

PARKS CANADA LOGO - DIGITAL LOGO FILE TO BE PROVIDED TO FABRICATOR BY PARKS CANADA

TOLERANCES FOR MODIFYING TEXT SIZES - TEXT HEIGHTS MAY BE MODIFIED AS REQUIRED TO FIT ON SIGN PANEL. ALL TEXT IS TO BE AS LARGE AS POSSIBLE, NOT TO EXCEED THE MAXIMUM TEXT HEIGHTS INDICATED BELOW AND AT MINIMUM EQUAL TO THE MINIMUM TEXT HEIGHTS INDICATED BELOW. BOTH LINES OF SIGN MESSAGE TEXT MUST BE A SINGLE HEIGHT. WHERE MODIFYING TEXT HEIGHTS, MAINTAIN SPACING AND HEIGHT TO WIDTH PROPORTIONS OF LETTER FONT TYPES SPECIFIED. CONDENSED FONTS WILL NOT BE ACCEPTED. ALL TEXT MUST BE BOTTOM LEFT JUSTIFIED. MAINTAIN MINIMUM EDGE DISTANCES SPECIFIED ON DRAWING. AS A GENERAL RULE HEADER LINE TEXT MUST BE AT MINIMUM 1.75 TIMES LARGER THAN MESSAGE LINE TEXT.

+/-3MM MUST BE THE ALLOWABLE FABRICATION TOLERANCE FOR ALL LETTERS AND SYMBOLS

NOTE: WORDING ON THE SIGN SHOWN ON THIS DRAWING IS SHOWN FOR ILLUSTRATIVE PURPOSES ONLY. REFER TO THIS DRAWING FOR DIMENSIONAL AND COLOUR INFORMATION ONLY. REFER TO INDIVIDUAL SIGNS DRAWINGS FOR REQUIRED WORDING IN ENGLISH OR FRENCH AS APPLICABLE.

SCALE = 1:4

SIGNS MATERIALS AND FABRICATION SPECIFICATIONS

1.0 MATERIALS SPECIFICATIONS

- 1.1 ALL MATERIALS MUST BE OF NEW STOCK AND FREE FROM DEFECTS.
- 1.2 SIGNS MUST CONSIST OF ALUMINIUM FLAT SHEETS, EXTRUDED PANELS OR ALUMINIUM COMPOSITE PANELS RETRO-REFLECTORIZED ON THE FACE SIDE WITH ALL LETTERS, NUMERALS, SYMBOLS, BORDERS AND CORNERS AS SHOWN ON THE PLANS.
- 1.3 SIGNS EQUAL TO OR GREATER IN WIDTH THAN SIX FEET ARE CONSIDERED STRUCTURAL (ST) AND MUST BE FABRICATED ON EXTRUDED PANELS OR ALUMINIUM COMPOSITE PANELS. SIGNS LESS THAN SIX FEET IN WIDTH WILL BE CONSIDERED NON-STRUCTURAL (NS) SIGNS TO BE FABRICATED WITH ALUMINIUM FLAT SHEET OR FOAM CORE COMPOSITE. ANY EXCEPTIONS TO THESE FABRICATION STANDARDS WILL BE INDICATED BY THE DEPARTMENTAL REPRESENTATIVE AT TIME OF PURCHASE ORDER.

1.4 NON-STRUCTURAL - FLAT SHEET ALUMINIUM SIGNS

SHEET ALUMINIUM SIGNS MUST BE FLAT-SHEET TENSION-LEVELLED, SIGN GRADE ALUMINIUM, ALLOY 5052-H32, CONFORMING TO THE REQUIREMENTS OF ASTM B209M, SPECIFICATION FOR ALUMINIUM AND ALUMINIUM-ALLOY SHEET AND PLATE. NOMINAL THICKNESS FOR SHEET-FACED SIGNS IS 3.0 MM (0.125"). TO ENSURE MAXIMUM TOLERANCING AND BEST APPEARANCE, SHEET ALUMINIUM SIGN PANELS MUST BE CUT USING A NUMERICALLY CONTROLLED DEVICE SUCH AS WATER JET OR LASER CUTTING SYSTEM. ALTERNATIVELY, SHEET ALUMINIUM SUBSTRATES MAY BE SHEARED TO SIZE, CORNER-PUNCHED AND DETAILED, PROVIDED THAT THE DIMENSIONS AND CORNER RADII EXACTLY MATCH THE SUPPLIED SIGN ARTWORK. ALL EDGES MUST BE BROKEN, DE-BURRED AND MADE SMOOTH.

1.5 STRUCTURAL - EXTRUDED ALUMINIUM SIGNS

STRUCTURAL EXTRUSION BASED SIGN FACES (FIGURE 5.3) MUST BE CONSTRUCTED USING 305 MM (12") STANDARD HIGHWAY EXTRUDED BLADES (SHAPE # 73247) USING ALUMINIUM ALLOY 6061-T6 OR 6063-T5. EXTRUDED BLADES ARE TO BE MILL FINISHED WITH NO EXPOSURE TO ANY SILICONE-BORNE PRODUCTS.

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MINISTÈRE DES TRANSPORTS DU QUÉBEC ([HTTP://WWW.PUBLICATIONSDUQUEBEC.GOUV.QC.CA/PRODUITS/OUVRAGE_ROUTIER.FR.HTML](http://www.publicationsduquebec.gouv.qc.ca/produits/ouvrage_routier.fr.html))

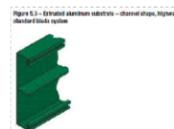
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ALUMINIUM FACE SHEETS FOR COMPOSITE PANELS TO BE SIGN GRADE ALLOY 5052-H32, CONFORMING TO THE REQUIREMENTS OF ASTM B209M, SPECIFICATION FOR ALUMINIUM AND ALUMINIUM-ALLOY SHEET AND PLATE.

SINGLE FACE TO BE FINISHED WITH 20 MICRONS FACTORY BAKED ACRYLIC WHITE PAINT MEETING REQUIREMENTS OF ASTM D-4214, D-2244. FACTORY COATED FACE WILL ACT AS BACK FACE OF FINISHED SIGN. NO-FACTORY COATED FACE MAY BE SUPPLIED AS MILL FINISH PROVIDED IT WILL ACCEPT LAMINATED RETRO-REFLECTIVE SHEETING, SCREEN PRINT AND DIGITAL PRINT TYPE INKS ASSOCIATED WITH SIGN GRAPHICS DESIGN.



STRUCTURAL PANELS TO BE TESTED IN ACCORDANCE WITH ASTM E72 AND DESIGNED TO WITHSTAND A MINIMUM WIND FORCE OF +/- 0.96kPa (20psf).

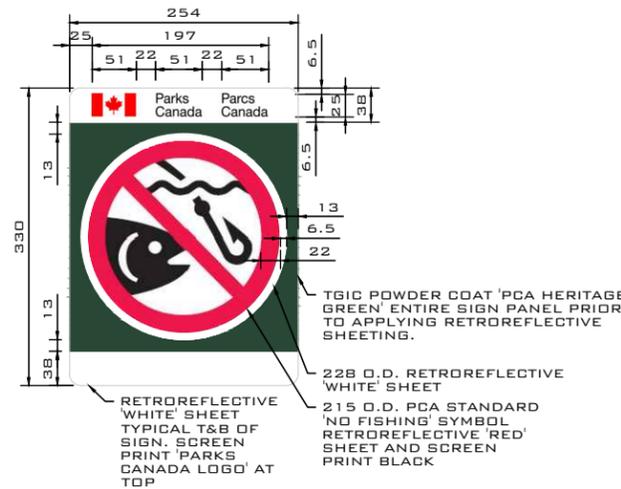
PANELS SHALL BE PERFORMANCE BOND TESTED TO PASS ASTM C481-C.

ACCEPTABLE PRODUCTS FOR STRUCTURAL PANELS ARE 'PROLITE' OR 'ALUMALITE' BY LAMINATORS INC. OR 'ALUMACORR' BY NUDD OR APPROVED EQUAL.

ACCEPTABLE PRODUCT FOR NON-STRUCTURAL PANELS IS 'ALUPANEL' BY MULTIPANEL

2.0 FABRICATION SPECIFICATIONS

- 2.1 THE MAXIMUM ALLOWABLE DEVIATION FROM FLATNESS MUST NOT EXCEED 0.1MM PER 10M (0.010 INCH PER INCH) WIDTH OF THE SIGN PANEL.
- 2.2 NO HOLES MUST BE MADE IN SIGNS FACES UNLESS REQUESTED BY DEPARTMENT. MOUNTING DETAILS VARY FROM SIGN TO SIGN. WHERE HOLES ARE REQUESTED, THEY MUST BE DRILLED AND EDGE SEALED SIMILAR TO OTHER CUT EDGES.
- 2.3 ALL ALUMINIUM SUBSTRATE MUST BE GIVEN A CHROMATE CONVERSION COATING IN ACCORDANCE WITH ASTM B 449, CLASS 2, AND MUST BE PREPARED BY ONE OF THE TREATMENT SEQUENCE OPTIONS DESCRIBED IN ASTM B 449, APPENDIX X2. THE CHEMICALS AND SOLVENTS MUST BE APPLIED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. SUFFICIENT LABORATORY FACILITIES TO TEST AND CONTROL THE CONCENTRATION OF THE SOLUTIONS USED MUST BE MAINTAINED AT THE TREATING PLANT. A LOG OF THE CONCENTRATION OF TREATING SOLUTIONS MUST BE MAINTAINED. TREATED PANELS MUST BE HANDLED IN SUCH A MANNER AS TO PREVENT CONTAMINATION. PANELS MUST BE STORED IN A DRY, CLEAN AREA FREE FROM DUST, ACID FUMES OR VAPORS. WHEN ALUMINIUM IS SHIPPED TO A SECONDARY LOCATION FOR RETRO-REFLECTORIZING, ADEQUATE PRECAUTIONS MUST BE TAKEN TO ENSURE THAT THE MATERIAL ARRIVES AT THE DESTINATION UNCONTAMINATED.
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- 2.6 APPLY CLEAR COATING OR EDGE SEALER AFTER APPLICATION OF THE RETRO-REFLECTIVE SHEETING AS RECOMMENDED BY THE SHEETING MANUFACTURER. WHERE CLEAR FINISH IS USED, THE FINISH MUST BE APPLIED AFTER SCREENING OF MESSAGES AND BORDERS AND DRILLING OF ALL HOLES. WHERE EDGE SEALER IS USED, THE SEALER MUST BE APPLIED TO ALL HOLES AND EDGES. THE COMPLETED SIGN FACE MUST BE FREE FROM AIR BUBBLES, WRINKLES OR OTHER BLEMISHES.
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STANDARD 'NO FISHING'



STANDARD 'NO SWIMMING'

ALL DIMENSIONS AND DETAILS ARE SIMILAR TO 'NO FISHING' SIGN AT LEFT

SIGN COLOURS

-  SIGN BOARD BACKGROUND PARKS CANADA HERITAGE GREEN
PANTONE COLOUR MATCHING SYSTEM NO.553 SOLID COATED
PANTONE PMS 553 C
CMYK 60/0/55/80
RGB 33/67/50
HEXIDECIMAL #214332
-  SIGN BOARD TEXT AND BACKGROUND WHITE
CMYK 0/0/0/0
RGB 255/255/255
HEXIDECIMAL #FFFFFF
-  SIGN BOARD SYMBOL BLACK
CMYK 0/0/0/100
RGB 0/0/0
HEXIDECIMAL #000000
-  LOGO FLAG RED
PANTONE COLOUR MATCHING SYSTEM NO.032 SOLID COATED
PANTONE PMS 032 C
CMYK 0/100/100/0
RGB 213/43/30
HEXIDECIMAL #338BEE
-  LOGO TEXT BLACK
CMYK 0/0/0/100
RGB 0/0/0
HEXIDECIMAL #000000

SIGN FONTS AND TEXT HEIGHTS

PARKS CANADA LOGO - DIGITAL LOGO FILE TO BE PROVIDED TO FABRICATOR BY PARKS CANADA
+/-3MM MUST BE THE ALLOWABLE FABRICATION TOLERANCE FOR ALL LETTERS AND SYMBOLS

SCALE = 1:8

SIGNS MATERIALS AND FABRICATION SPECIFICATIONS

1.0 MATERIALS SPECIFICATIONS

- 1.1 ALL MATERIALS MUST BE OF NEW STOCK AND FREE FROM DEFECTS.
- 1.2 SIGNS MUST CONSIST OF ALUMINIUM FLAT SHEETS, EXTRUDED PANELS OR ALUMINIUM COMPOSITE PANELS RETRO-REFLECTORIZED ON THE FACE SIDE WITH ALL LETTERS, NUMERALS, SYMBOLS, BORDERS AND CORNERS AS SHOWN ON THE PLANS.
- 1.3 SIGNS EQUAL TO OR GREATER IN WIDTH THAN SIX FEET ARE CONSIDERED STRUCTURAL (ST) AND MUST BE FABRICATED ON EXTRUDED PANELS OR ALUMINIUM COMPOSITE PANELS. SIGNS LESS THAN SIX FEET IN WIDTH WILL BE CONSIDERED NON-STRUCTURAL (NS) SIGNS TO BE FABRICATED WITH ALUMINIUM FLAT SHEET OR FOAM CORE COMPOSITE. ANY EXCEPTIONS TO THESE FABRICATION STANDARDS WILL BE INDICATED BY THE DEPARTMENTAL REPRESENTATIVE AT TIME OF PURCHASE ORDER.

1.4 NON-STRUCTURAL - FLAT SHEET ALUMINIUM SIGNS

SHEET ALUMINIUM SIGNS MUST BE FLAT-SHEET TENSION-LEVELLED, SIGN GRADE ALUMINIUM, ALLOY 5052-H32, CONFORMING TO THE REQUIREMENTS OF ASTM B209M, SPECIFICATION FOR ALUMINIUM AND ALUMINIUM-ALLOY SHEET AND PLATE. NOMINAL THICKNESS FOR SHEET-FACED SIGNS IS 3.0 MM (0.125"). TO ENSURE MAXIMUM TOLERANCING AND BEST APPEARANCE, SHEET ALUMINIUM SIGN PANELS MUST BE CUT USING A NUMERICALLY CONTROLLED DEVICE SUCH AS WATER JET OR LASER CUTTING SYSTEM. ALTERNATIVELY, SHEET ALUMINIUM SUBSTRATES MAY BE SHEARED TO SIZE, CORNER-PUNCHED AND DETAILED, PROVIDED THAT THE DIMENSIONS AND CORNER RADII EXACTLY MATCH THE SUPPLIED SIGN ARTWORK. ALL EDGES MUST BE BROKEN, DE-BURRED AND MADE SMOOTH.

1.5 NON-STRUCTURAL ALUMINIUM COMPOSITE SIGNS

NON-STRUCTURAL ALUMINIUM COMPOSITE PANELS ARE TO CONSIST OF DOUBLE SIDED 0.3 mm (0.012") TO 0.4mm (0.015") THICK ALUMINIUM FRONT AND BACK FACE BONDED TO 3 mm POLYETHYLENE FOAM CORE.

ALUMINIUM FACE SHEETS FOR COMPOSITE PANELS TO BE SIGN GRADE ALLOY 5052-H32, CONFORMING TO THE REQUIREMENTS OF ASTM B209M, SPECIFICATION FOR ALUMINIUM AND ALUMINIUM-ALLOY SHEET AND PLATE.

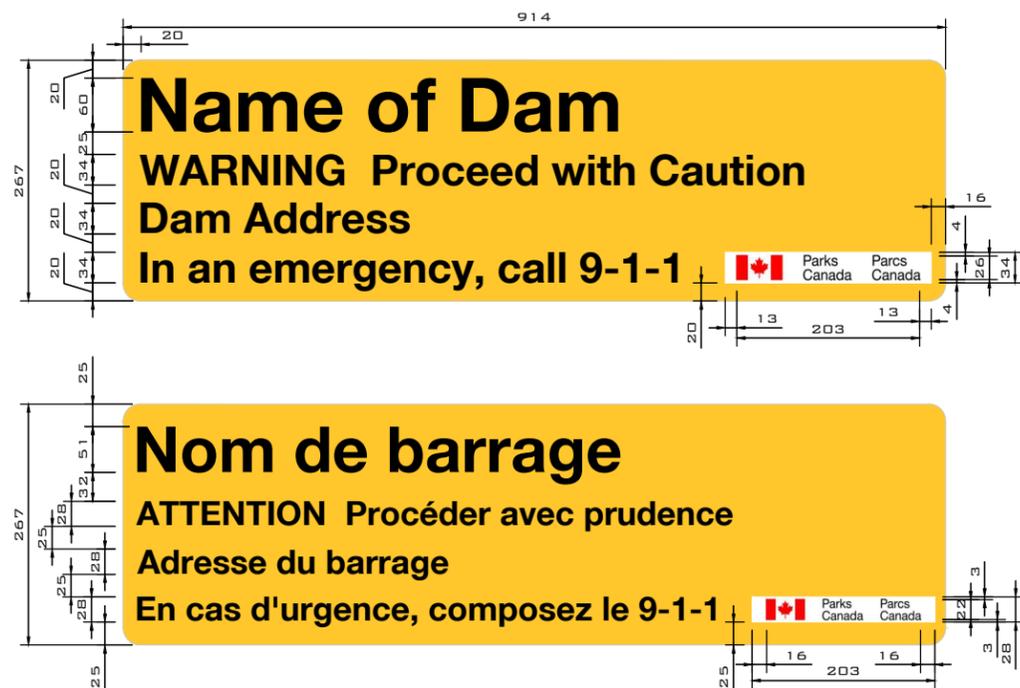
SINGLE FACE TO BE FINISHED WITH 20 MICRONS FACTORY BAKED ACRYLIC WHITE PAINT MEETING REQUIREMENTS OF ASTM D-2214, D-2244. FACTORY COATED FACE WILL ACT AS BACK FACE OF FINISHED SIGN. NO-FACTORY COATED FACE MAY BE SUPPLIED AS MILL FINISH PROVIDED IT WILL ACCEPT LAMINATED RETRO-REFLECTIVE SHEETING, SCREEN PRINT AND DIGITAL PRINT TYPE INKS ASSOCIATED WITH SIGN GRAPHICS DESIGN.

PANELS SHALL BE PERFORMANCE BOND TESTED TO PASS ASTM C481-C.

ACCEPTABLE PRODUCT FOR NON-STRUCTURAL PANELS IS 'ALUPANEL' BY MULTIPANEL

2.0 FABRICATION SPECIFICATIONS

- 2.1 THE MAXIMUM ALLOWABLE DEVIATION FROM FLATNESS MUST NOT EXCEED 0.1MM PER 1CM (0.010 INCH PER INCH) WIDTH OF THE SIGN PANEL.
- 2.2 NO HOLES MUST BE MADE IN SIGNS FACES UNLESS REQUESTED BY DEPARTMENT. MOUNTING DETAILS VARY FROM SIGN TO SIGN. WHERE HOLES ARE REQUESTED, THEY MUST BE DRILLED AND EDGE SEALED SIMILAR TO OTHER CUT EDGES.
- 2.3 ALL ALUMINIUM SUBSTRATE MUST BE GIVEN A CHROMATE CONVERSION COATING IN ACCORDANCE WITH ASTM B 449, CLASS 2, AND MUST BE PREPARED BY ONE OF THE TREATMENT SEQUENCE OPTIONS DESCRIBED IN ASTM B 449, APPENDIX X2. THE CHEMICALS AND SOLVENTS MUST BE APPLIED IN STRICT ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. SUFFICIENT LABORATORY FACILITIES TO TEST AND CONTROL THE CONCENTRATION OF THE SOLUTIONS USED MUST BE MAINTAINED AT THE TREATING PLANT. A LOG OF THE CONCENTRATION OF TREATING SOLUTIONS MUST BE MAINTAINED. TREATED PANELS MUST BE HANDLED IN SUCH A MANNER AS TO PREVENT CONTAMINATION. PANELS MUST BE STORED IN A DRY, CLEAN AREA FREE FROM DUST, ACID FUMES OR VAPORS; WHEN ALUMINIUM IS SHIPPED TO A SECONDARY LOCATION FOR RETRO-REFLECTORIZING, ADEQUATE PRECAUTIONS MUST BE TAKEN TO ENSURE THAT THE MATERIAL ARRIVES AT THE DESTINATION UNCONTAMINATED.
- 2.4 BACKGROUND COLOURING (RED AND WHITE) MUST BE APPLIED AS A LAMINATED RETRO-REFLECTIVE SHEETING, COLOURED AS INDICATED ON DRAWINGS. SHEETING TO BE ASTM STANDARD D4956-11A, TYPE IV, CLASS I. USE ASTM D 4956 TYPE IX, XI OR AASHTO M 268 TYPE C OR D PRISMATIC RED FOR RED BACKGROUND PORTIONS OF SIGNS. RETROREFLECTIVE SHEETING MUST BE HIGH INTENSITY THAT IS AN UNMETALLIZED MICRO PRISMATIC REFLECTIVE MATERIAL.
- 2.5 BACKGROUND COLOURING (GREEN) MUST BE APPLIED USING POWDER COAT PROCESS. THE ENTIRE SIGN PANEL MUST BE POWDER COATED PRIOR TO APPLYING RETROREFLECTIVE SHEETING.
 - .1 BASE COAT: THERMOSETTING EPOXY POWDER COATING, WHITE OR GRAY IN COLOUR. APPLY ONE (1) COAT OF MINIMUM THICKNESS OF 2 MILS (0.0508 MM).
 - .2 TOP COAT: TRIGLYCIDYL ISOCYANURATE (TGIC) POLYESTER POWDER COAT FINISH, HIGH GLOSS, 'PCA HERITAGE GREEN' IN COLOUR. APPLY ONE (1) COAT OF MINIMUM THICKNESS OF 2 MILS (0.0508 MM).
 - .3 USE "POWDURA POLYESTER TGIC POWDER COATING" BY SHERWIN-WILLIAMS OR APPROVED EQUAL. PRODUCT SUBSTITUTIONS MUST BE APPROVED BY MASTER PAINTER'S INSTITUTE (MPI) AND SHALL MEET ASTM D3451 - 06(2012) STANDARD GUIDE FOR TESTING COATING POWDERS AND POWDER COATINGS AS A MINIMUM STANDARD.
- 2.6 ALL SIGNS MUST BE OF THE HIGHEST QUALITY WITH CONSISTENT DAYTIME AND NIGHTTIME COLOR AND RETRO-REFLECTIVITY
- 2.7 APPLY CLEAR COATING OR EDGE SEALER AFTER APPLICATION OF THE RETRO-REFLECTIVE SHEETING AS RECOMMENDED BY THE SHEETING MANUFACTURER. WHERE CLEAR FINISH IS USED, THE FINISH MUST BE APPLIED AFTER SCREENING OF MESSAGES AND BORDERS AND DRILLING OF ALL HOLES. WHERE EDGE SEALER IS USED, THE SEALER MUST BE APPLIED TO ALL HOLES AND EDGES. THE COMPLETED SIGN FACE MUST BE FREE FROM AIR BUBBLES, WRINKLES OR OTHER BLEMISHES.
- 2.8 LETTERS AND SYMBOLS MUST BE APPLIED TO THE BACKGROUND OF THE SIGN BY THE DIRECT OR REVERSE SCREEN PROCESS. MESSAGES AND BORDERS OF A COLOR DARKER THAN THE SIGN FIELD MUST BE APPLIED TO THE RETROREFLECTIVE SHEETING BY THE DIRECT PROCESS. MESSAGES AND BORDERS OF A COLOR LIGHTER THAN THE SIGN FIELD MUST BE PRODUCED BY THE REVERSE SCREEN PROCESS. INKS USED IN THE SILKSCREEN PROCESS MUST BE OF THE TYPE TO PRODUCE THE DESIRED COLOR AND DURABILITY WHEN APPLIED ON RETROREFLECTIVE SHEETING. SILKSCREEN INKS MUST BE USED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS. THE INK MUST PRODUCE THE DESIRED COLOR WHEN APPLIED ON RETROREFLECTIVE SHEETING BACKGROUND AND MUST DRY TO A GOOD FILM WITHOUT RUNNING, STREAKING OR SAGGING. THE SCREENING MUST BE DONE IN A MANNER THAT RESULTS IN A UNIFORM COLOR AND TONE, WITH SHARPLY DEFINED EDGES OF LEGEND AND BORDER WITHOUT BLEMISHES ON THE SIGN FIELD THAT WILL AFFECT THE INTENDED USE. SIGNS AFTER SCREENING MUST BE DRIED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS TO PROVIDE A SMOOTH HARD FINISH. ANY SIGNS ON WHICH BLISTERS APPEAR DURING THE DRYING PROCESS WILL BE REJECTED.



SIGN COLOURS

SIGN BOARD BACKGROUND YELLOW
 PANTONE COLOUR MATCHING SYSTEM NO.123 SOLID COATED
 PANTONE PMS 123 C
 CMYK 0/22/83/0
 RGB 255/199/44
 HEXIDECIMAL #FFC72C

SIGN BOARD TEXT BLACK
 CMYK 0/0/0/100
 RGB 0/0/0
 HEXIDECIMAL #000000

LOGO FLAG RED
 PANTONE COLOUR MATCHING SYSTEM NO.032 SOLID COATED
 PANTONE PMS 032 C
 CMYK 0/100/100/0
 RGB 213/43/30
 HEXIDECIMAL #338BEE

LOGO TEXT BLACK
 CMYK 0/0/0/100
 RGB 0/0/0
 HEXIDECIMAL #000000

SIGN FONTS AND TEXT HEIGHTS

SIGN HEADER - HELVETICA NEUE 55 ROMAN (BOLD), MAX TEXT HEIGHT 60 mm, MIN TEXT HEIGHT 51 mm, UPPERCASE

- ILLUSTRATED ON THIS DRAWING AS THE WORDS 'NAME OF DAM'

SIGN MESSAGE - HELVETICA NEUE 55 ROMAN (BOLD), MAX TEXT HEIGHT 34 mm, MIN. TEXT HEIGHT 28mm, FIRST LETTER CAPITALIZED EVERY WORD

- INCLUDES 3 LINES OF TEXT AS ILLUSTRATED ON THIS DRAWING AS THE WORDS 'WARNING. PROCEED WITH CAUTION', 'DAM NAME' AND 'IN AN EMERGENCY, CALL 911'

PARKS CANADA LOGO - DIGITAL LOGO FILE TO BE PROVIDED TO FABRICATOR BY PARKS CANADA

TOLERANCES FOR MODIFYING TEXT SIZES - TEXT HEIGHTS MAY BE MODIFIED AS REQUIRED TO FIT ON SIGN PANEL. ALL TEXT IS TO BE AS LARGE AS POSSIBLE, NOT TO EXCEED THE MAXIMUM TEXT HEIGHTS INDICATED BELOW AND AT MINIMUM EQUAL TO THE MINIMUM TEXT HEIGHTS INDICATED BELOW. BOTH LINES OF SIGN MESSAGE TEXT MUST BE A SINGLE HEIGHT. WHERE MODIFYING TEXT HEIGHTS, MAINTAIN SPACING AND HEIGHT TO WIDTH PROPORTIONS OF LETTER FONT TYPES SPECIFIED. CONDENSED FONTS WILL NOT BE ACCEPTED. ALL TEXT MUST BE BOTTOM LEFT JUSTIFIED. MAINTAIN MINIMUM EDGE DISTANCES SPECIFIED ON DRAWING. AS A GENERAL RULE HEADER LINE TEXT MUST BE AT MINIMUM 1.75 TIMES LARGER THAN MESSAGE LINE TEXT.

+/-3MM MUST BE THE ALLOWABLE FABRICATION TOLERANCE FOR ALL LETTERS AND SYMBOLS

NOTE: WORDING ON THE SIGN SHOWN ON THIS DRAWING IS SHOWN FOR ILLUSTRATIVE PURPOSES ONLY. REFER TO THIS DRAWING FOR DIMENSIONAL AND COLOUR INFORMATION ONLY. REFER TO INDIVIDUAL SIGN DRAWINGS FOR REQUIRED WORDING IN ENGLISH OR FRENCH AS APPLICABLE.

SCALE = 1:8

SIGNS MATERIALS AND FABRICATION SPECIFICATIONS

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- 1.1 ALL MATERIALS MUST BE OF NEW STOCK AND FREE FROM DEFECTS.
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- 2.4 BACKGROUND COLOURING (YELLOW AND WHITE) MUST BE APPLIED AS A LAMINATED RETRO-REFLECTIVE SHEETING, COLOURED AS INDICATED ON DRAWINGS. SHEETING TO BE ASTM STANDARD D4956-11A, TYPE IV, CLASS I. USE ASTM D 4956 TYPE IX, XI OR AASHTO M 268 TYPE C OR D PRISMATIC RED FOR RED BACKGROUND PORTIONS OF SIGNS. RETROREFLECTIVE SHEETING MUST BE HIGH INTENSITY THAT IS AN UNMETALLIZED MICRO PRISMATIC REFLECTIVE MATERIAL.
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190
32
DANGER
32
190

Dam Outflow

Keep Out

32
Ø16 TYP.
HOLE
FOR M12
BOLT.
OVER
SIZE FOR
PLASTIC
GROMMET
AS REQ'D

32
217

Name of Dam



In An Emergency Call (XXX) XXX-XXXX

SCALE=1:5



Office of the Executive Director, Waterways
Parks Canada Agency
Government of Canada

Graphics Designs and Materials and
Fabrication Specifications for
Public Safety Signs around Dams

TYPICAL HOLE LAYOUT FOR A1 AND A8 SIZE DAM
SAFETY SIGNS (See mounting details drawing also)

Drawn: November 3, 2014
Checked: November 3, 2014
Approved: November 3, 2014

Drawn by: S.Gauthier
Checked by: M.McLay
Approved by: M.McLay

Drawing No:
H1
REV.0

DANGER

Dam Ahead

Keep Out

Name of Dam



Parks
Canada

Parcs
Canada

In An Emergency, Call 9-1-1

SCALE= 1:5

DANGER

Barrage devant

Accès interdit

Nom du barrage



Parcs
Canada

Parks
Canada

En cas d'urgence, composez le 9-1-1

SCALE = 1:5

DANGER

Dam Outflow

Keep Out

Name of Dam



Parks
Canada

Parcs
Canada

In An Emergency Call (XXX) XXX-XXXX

SCALE=1:5



Office of the Executive Director, Waterways
Parks Canada Agency
Government of Canada

Graphics Designs and Materials and
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TYPE A8 TAILRACE DANGER SIGN - ENGLISH
SIZE 4x6 (1220x1830) - REFER TO G1 FOR SPECS

Revised: November 3, 2014
Checked: November 3, 2014
Approved: November 3, 2014

Drawn by: S.Gauthier
Checked by: S.Gauthier
Approved by: S.Gauthier

Drawing No:
A8
REV.1

DANGER

Zone de décharge
du barrage
Accès interdit

Nom du barrage

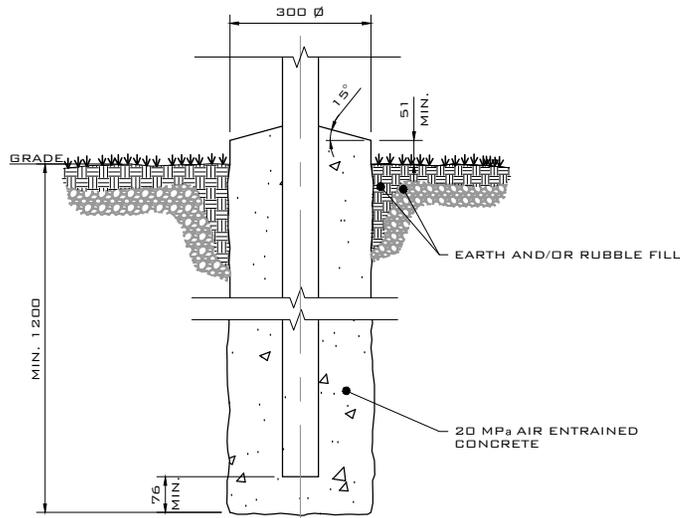


Parcs
Canada

Parks
Canada

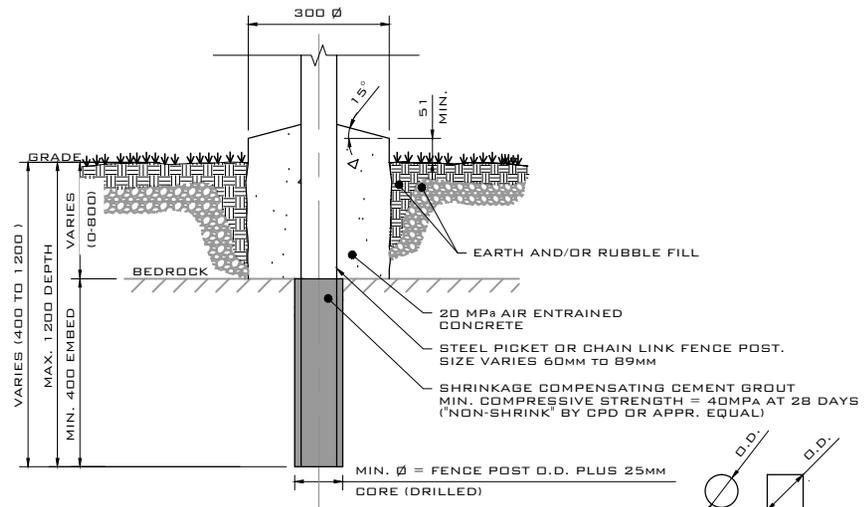
En cas d'urgence, composez le (XXX) XXX-XXXX

SCALE= 1:5



POST FOOTING TYPE I

FULL DEPTH FOOTING IN EARTH AND/OR COMPACT DOBBLESTONE RUBBLE FILL (STONE SIZE 100-300MM Ø +/-)



POST FOOTING TYPE II

FOOTING IN BEDROCK (OVERBURDEN VARIES)

GENERAL NOTES:

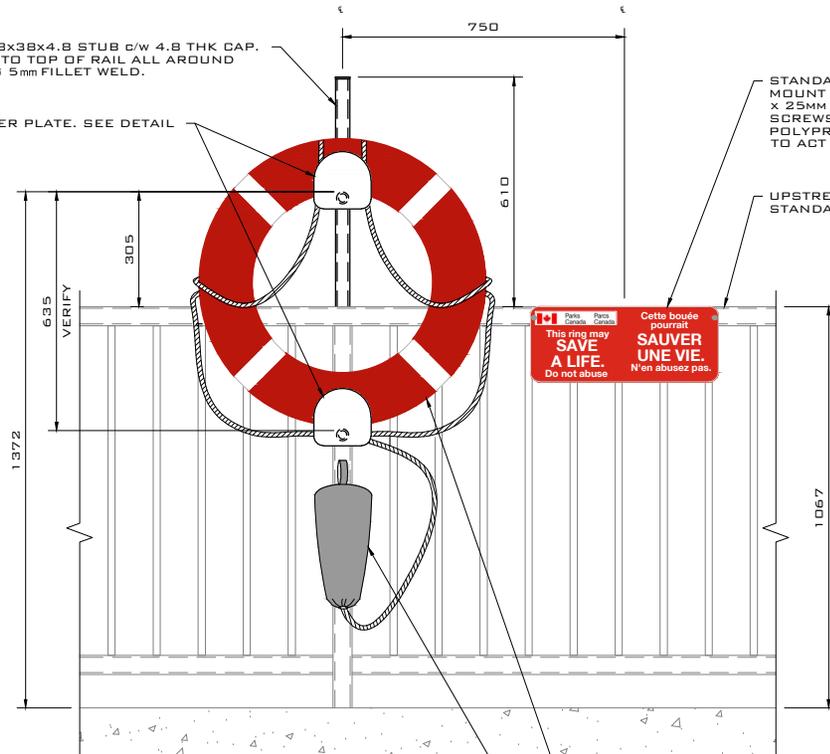
- 1) ALL DIMENSIONS ARE IN MILLIMETERS (MM) UNLESS NOTED OTHERWISE
- 2) THESE FOUNDATION DETAILS APPLY TO BOTH STANDARD CHAIN LINK AND STEEL PICKET SECURITY FENCING WHERE POSTS ARE TO BE INSTALLED IN SOIL OR ROCK CONDITIONS.
- 3) THESE DETAILS DO NOT APPLY TO CONCRETE MOUNTING APPLICATIONS. REFER TO STANDARD DRAWINGS FOR FENCE POST SURFACE MOUNT CONCRETE DETAILS.
- 4) CONCRETE MIX AS FOLLOWS:
 - .1 NOMINAL COARSE AGGREGATE SIZE: 10MM
 - .2 COMPRESSIVE STRENGTH: 20 MPA MINIMUM 28 DAYS.
 - .3 ADDITIVES: FLY ASH TO CSA A3000 OR ASTM C 618.
 - .4 EXPOSURE CLASS: C-2 (MODIFIED STRENGTH)
 - .5 MAXIMUM SLUMP: 75MM +/- 20MM
 - .5 MAXIMUM WATER TO CEMENT MATERIALS RATIO: 0.45
 - .6 AIR ENTRAINMENT: 6% TO 9%
 - .7 AVOID USE OF ADDITIVES CONTAINING CHLORIDES SUCH AS COLD WEATHER ACCELERATORS TO PREVENT CORROSION OF EMBEDDED STEEL POSTS
- 6) DETAILS ASSUME DRILLED POST HOLES. STAY IN PLACE CIRCULAR FIBREBOARD FORMS (SONOTUBES) MAY BE USED IN RUBBLE FILL OR VOIDED SOIL CONDITIONS TO PREVENT CONCRETE SEEPAGE.
- 7) FOR NON-DRILLED EXCAVATED HOLES EMPLOY STAY IN PLACE CIRCULAR FIBRE BOARD FORMS (SONOTUBES) TO ASSIST CONCRETE POUR. EXCAVATE AROUND FORM A MINIMUM OF 200MM AND BELOW FOOTING DEPTH BY 102MM. SET FORM ON 102MM COMPACTED BED OF GRANULAR A SIZE GRAVEL. PLACE AND BACKFILL AROUND FORM WITH GRANULAR A SIZE GRAVEL. TAMP COMPACT AT 1/3 DEPTHS RESERVE TOP 100MM FOR TOPSOIL AND SEED TO RESTORE EXISTING GRASS AREAS. ALTERNATIVELY THE ENTIRE HOLE MAY BE FILLED WITH CONCRETE. INQUIRE WITH DEPARTMENTAL REPRESENTATIVE FOR PREFERRED METHOD.
- 8) DO NOT DISTURB NATIVE SOIL BELOW FOOTING EXCAVATION DEPTH. WHERE SOIL IS DISTURBED REMOVE SOIL AND EXTEND CONCRETE FOOTING DEPTH

HSS38x38x4.8 STUB c/w 4.8 THK CAP. WELD TO TOP OF RAIL ALL AROUND USING 5mm FILLET WELD.

HANGER PLATE. SEE DETAIL

STANDARD PARKS CANADA LIFE RING SIGN. MOUNT TO RAIL WITH MIN. 2-ST. STEEL NO. 10 X 25MM LONG SELF TAPPING PAN HEAD SCREWS. PROVIDE CLEAR UV TREATED POLYPROPYLENE GROMMETS TO ACT AS INSULATOR

UPSTREAM RAILING. STYLE VARIES. STANDARD PUBLIC STYLE RAIL SHOWN

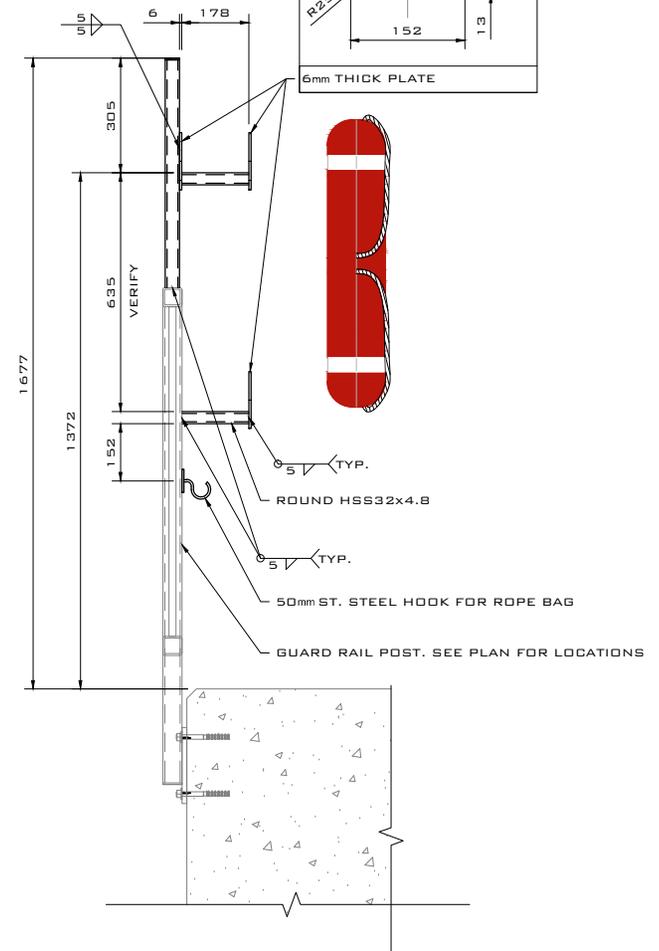
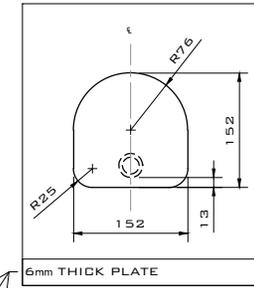


Parcs Canada / Parks Canada
 Cette bouée pourrait sauver une vie. N'en abusez pas.
 This ring may save a life. Do not abuse.

762 TRANSPORT CANADA APPROVED RING BUOY (LIFE RING) c/w GRAB LINE. INTERNATIONAL ORANGE c/w 4 - 50MM WIDE WHITE HIGH INTENSITY RETROREFLECTIVE TAPE BANDS ON BOTH SIDES. TAPE TO BE 3M OR AS PER CGSB SPEC 62.GP.11/12

WEATHER PROOF LIFE LINE THROW BAG c/w TRANSPORT CANADA APPROVED 30m LONG BUOYANT LIFE LINE. MIN. 8mm Ø AND 5KN BREAK STRENGTH. SECURELY ATTACH LIFE LINE TO LIFE RING. PROVIDE ST. STEEL MOUNT HOOK ON FACE OF GUARD RAIL POST. WELD TO POST.

FACE VIEW



SIDE VIEW

Parcs Canada / Parks Canada



Project Name: **STANDARD DETAILS FOR PUBLIC AND OPERATOR SAFETY INSTALLATIONS ON DAMS**

Drawing Name: **STANDARD 762 LIFE RING BUOY, SIGN AND AND LIFE LINE THROW BAG MOUNTING DETAILS**

Drawn by: S.Gauthier

Drawing date: Sep.23, 2014

Checked by: Mike McLay

Check date: Sep.23, 2014

Approve date: Sep.23, 2014

Approved: Mike McLay

Drawing Scale:

1:20

Plot Scale:

1:1

Plot Size:

Letter

Drawing No:

L1

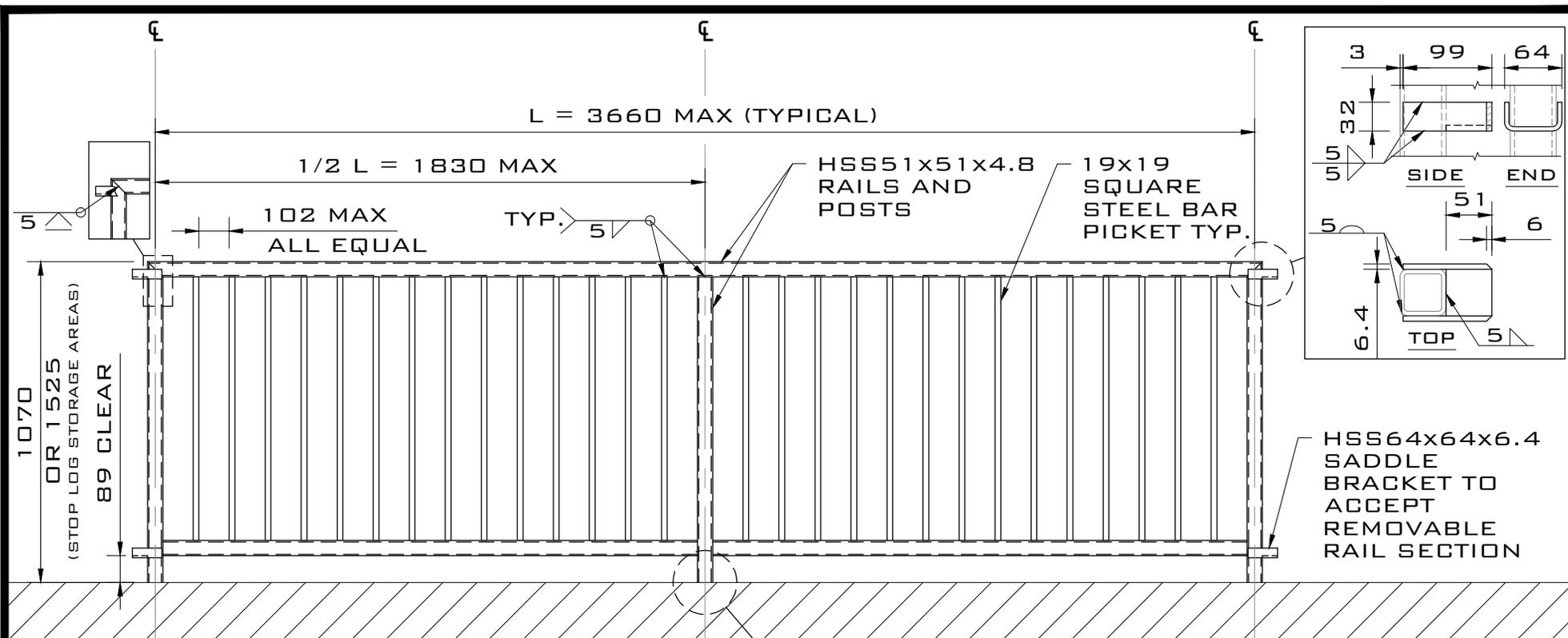
REV.A

Canada

Office of the Executive Director, Waterways

Parks Canada Agency

Government of Canada



GENERAL NOTES

1. THIS DETAIL TYPICALLY APPLIES TO AREAS ACCESSIBLE TO PUBLIC WHERE A FALL GREATER THAN 600mm OR WHERE A FALL INTO A HAZARD SUCH AS A DAM INTAKE OR SPILLWAY EXISTS. GUARD RAILS ARE TYPICALLY INTENDED TO BE INSTALLED AT THE EDGE OF AN IDENTIFIED FALL HAZARD.
2. TYPICALLY A RUN OF GUARD RAIL SHALL CONSIST OF ALTERNATING FIXED AND REMOVABLE SECTIONS.
3. COMPLETE ASSEMBLED SECTION IS TO BE HOT DIPPED GALVANIZED AFTER FABRICATION
4. ALL DIMENSIONS IN MILLIMETERS (mm) UNLESS NOTED OTHERWISE

 Parks Canada



Ontario Waterways

Parks Canada Agency

Government of Canada



Project Name: **STANDARD DETAILS FOR PUBLIC AND OPERATOR**

SAFETY INSTALLATIONS ON DAMS

Drawing Name: **STANDARD PUBLIC STYLE GUARD RAIL**

FABRICATION DETAILS - FIXED RAIL SECTION

Drawn by: S.Gauthier

Drawing date: December 21, 2015

Checked by:

Check date:

Approve date:

Approved:

Drawing Scale:

1:20

Plot Scale:

1:1

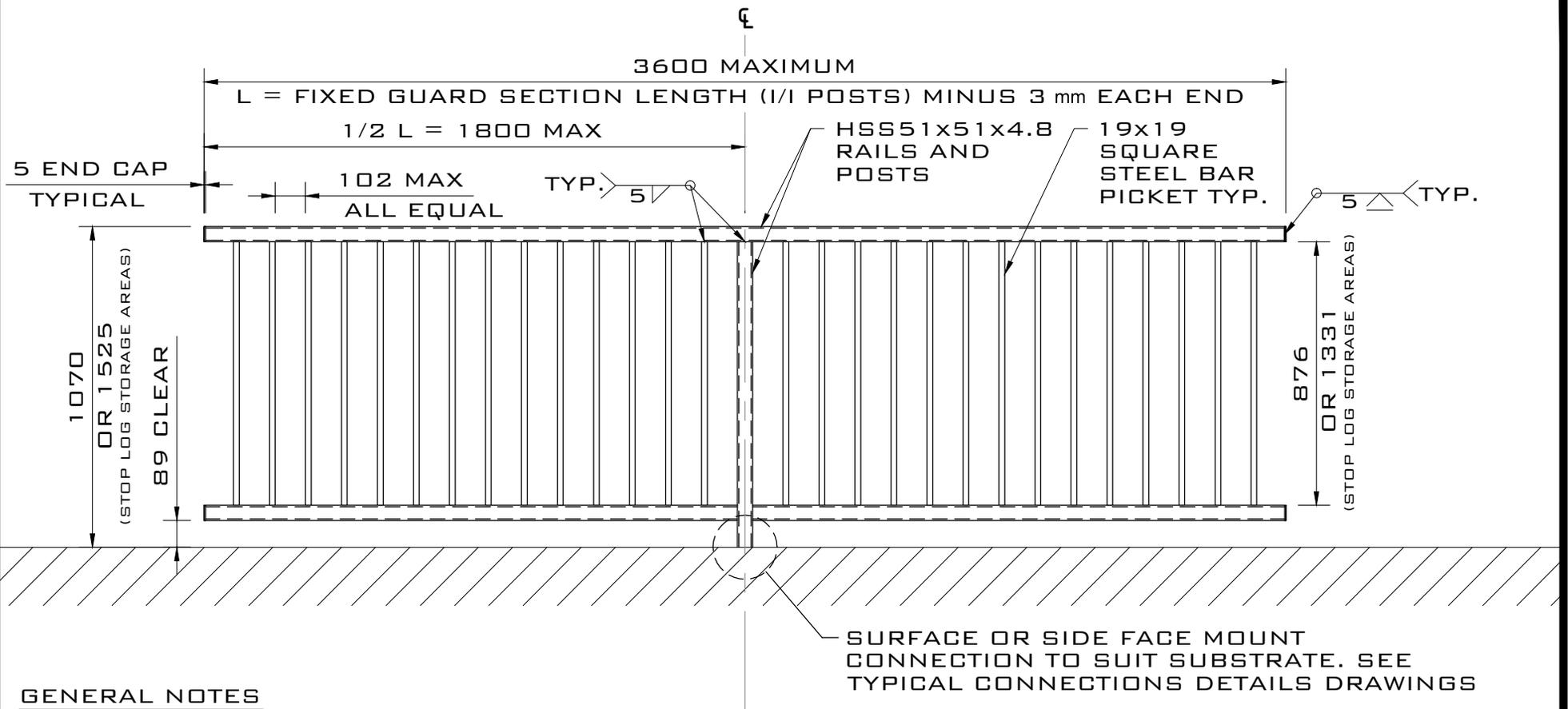
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Drawing No:

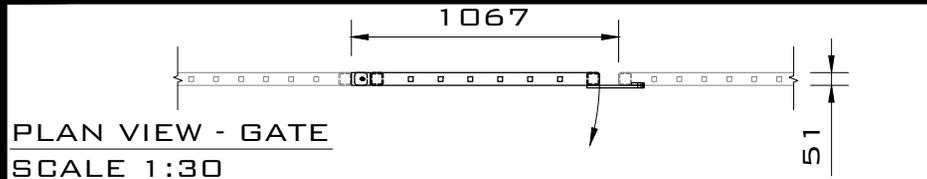
P1

REV.B

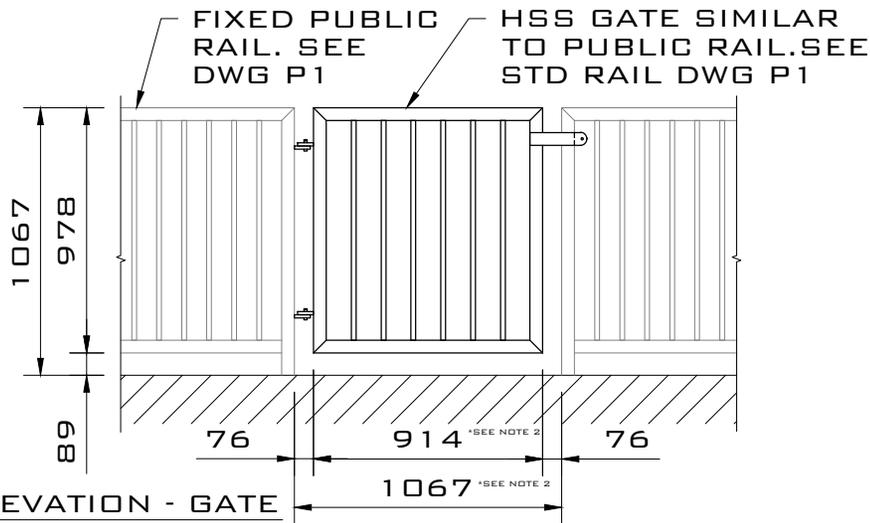


GENERAL NOTES

1. THIS DETAIL TYPICALLY APPLIES TO AREAS ACCESSIBLE TO PUBLIC WHERE A FALL GREATER THAN 600mm OR WHERE A FALL INTO A HAZARD SUCH AS A DAM INTAKE OR SPILLWAY EXISTS. GUARD RAILS ARE TYPICALLY INTENDED TO BE INSTALLED AT THE EDGE OF AN IDENTIFIED FALL HAZARD.
2. TYPICALLY A RUN OF GUARD RAIL SHALL CONSIST OF ALTERNATING FIXED AND REMOVABLE SECTIONS.
3. COMPLETE ASSEMBLED SECTION IS TO BE HOT DIPPED GALVANIZED AFTER FABRICATION
4. ALL DIMENSIONS IN MILLIMETERS (mm) UNLESS NOTED OTHERWISE



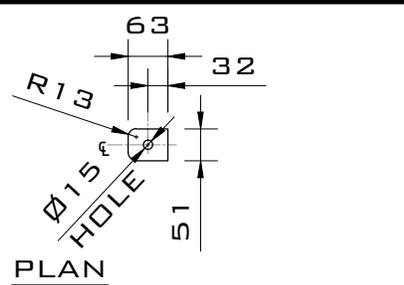
PLAN VIEW - GATE
SCALE 1:30



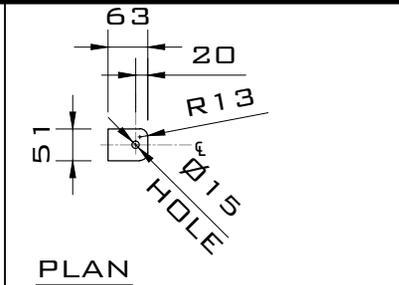
ELEVATION - GATE
SCALE 1:30

GENERAL NOTES

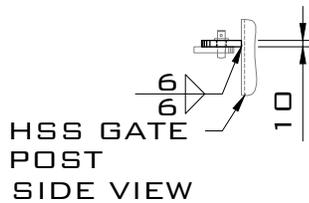
1. THIS GATE IS INTENDED TO BE COMPATIBLE WITH PUBLIC STYLE GUARD RAILS. WHERE GATES ARE TO BE INSTALLED ON GUARDRAIL RUNS, EFFORT SHALL BE MADE TO MATCH PICKET SPACING OF ADJACENT RAILS.
2. THE TYPICAL GATE WIDTH OF 914 mm OR 1067 mm CLEAR OPENING BETWEEN POSTS SHOWN IS CONSIDERED IDEAL AND IS ALSO A MAXIMUM. WHERE GATE WIDTH MUST BE REDUCED 610 mm SHALL BE TAKEN AS A MINIMUM.
3. COMPLETE ASSEMBLED SECTION IS TO BE HOT DIPPED GALVANIZED AFTER FABRICATION
4. ALL DIMENSIONS IN MILLIMETERS (mm) UNLESS NOTED OTHERWISE



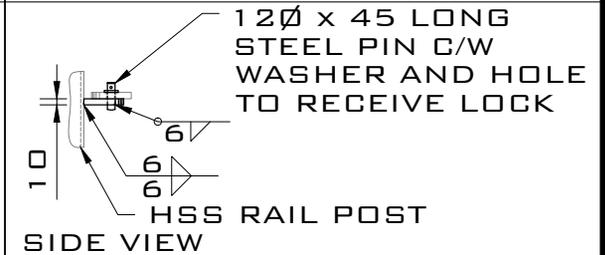
PLAN



PLAN



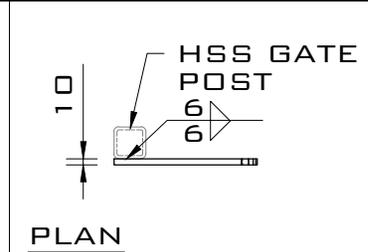
HSS GATE POST
SIDE VIEW



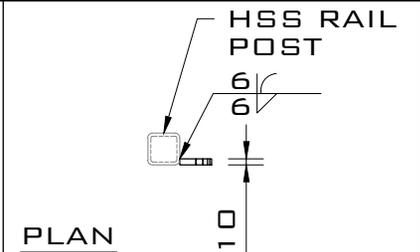
HSS RAIL POST
SIDE VIEW

TOP HINGE PLATE
SCALE 1:12

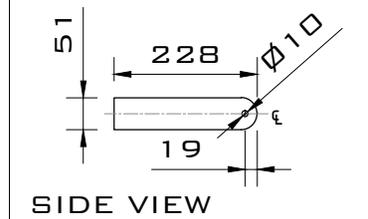
BOTTOM HINGE PLATE
SCALE 1:12



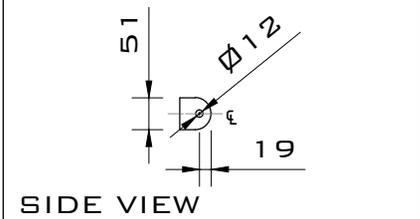
PLAN



PLAN



SIDE VIEW



SIDE VIEW

GATE LATCH PLATE
SCALE 1:12

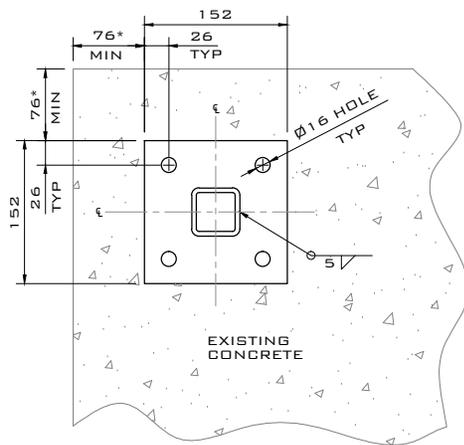
RAIL LATCH PLATE
SCALE 1:12

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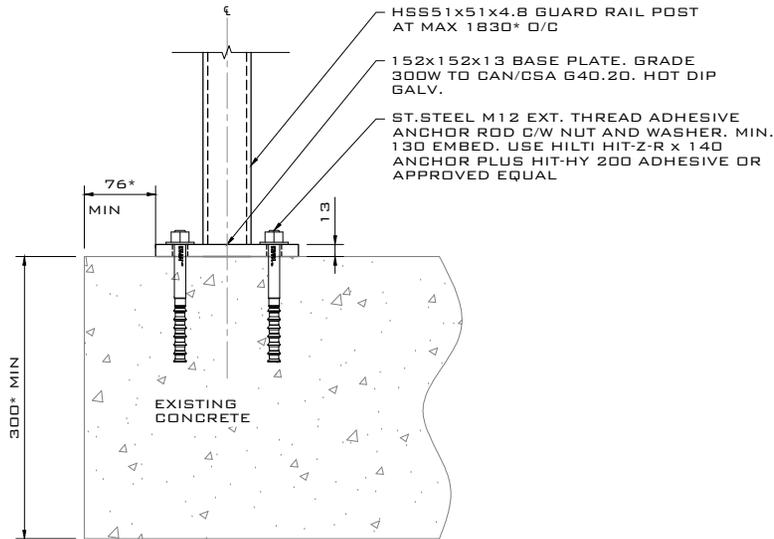
Project Name: **STANDARD DETAILS FOR PUBLIC AND OPERATOR SAFETY INSTALLATIONS ON DAMS**
 Drawing Name: **STANDARD PUBLIC STYLE GUARD RAIL FABRICATION DETAILS - ACCESS GATE**

Drawn by: S.Gauthier
 Drawing date: August 20, 2014
 Checked by:
 Check date:
 Approve date:
 Approved:

Drawing Scale: 1:30 UNO
 Plot Scale: 1:1
 Plot Size: Letter
 Drawing No: **P3**
 REV.A



PLAN VIEW



ELEVATION VIEW

GENERAL NOTES:

- 1) ALL DIMENSIONS GIVEN ARE IN MILLIMETERS (mm) UNLESS NOTED OTHERWISE
- 2) BASE PLATES SHALL BE LEVELED TO PLUMB GUARD RAIL POSTS AS REQUIRED. WHERE SHIM AMOUNT EXCEEDS 13 mm, USE OF LEVELING NUT AND A BED OF NON-SHRINKABLE GROUT OF THICKNESS MIN 25 mm TO MAX 32mm SHALL BE USED AT UNDERSIDE OF PLATE. SLOPE SIDES OF GROUT BED AT 1:1 DOWN TO SURFACE. REFER TO SLOPED SURFACE MOUNT CONNECTION DETAIL FOR SLOPED SURFACE INSTALLATIONS SUCH AS STAIR RAILS, ETC.
- 3) DIMENSIONS ATTACHED TO AN ASTERISK (*) ARE CONSIDERED MINIMUM DESIGN CONSTRAINTS. SHOULD THESE DIMENSIONS NOT BE SATISFIED CONTACT AN ENGINEER TO CONFIRM FEASIBILITY OF CONNECTION.
- 4) INSPECT SURFACE PRIOR TO INSTALLATION. WHERE SURFACE CONCRETE IS CRACKED OR SCALED IN EXCESS OF 6 mm DEPTH THE SURFACE MUST BE REPAIRED PRIOR TO BASE PLATE INSTALLATION. REFER TO TYPICAL LOCAL CONCRETE REPAIR DETAILS AND/OR CONTACT AN ENGINEER

 Parks Canada



Project Name: **STANDARD DETAILS FOR PUBLIC AND OPERATOR SAFETY INSTALLATIONS ON DAMS**

Drawing Name: **STANDARD PUBLIC STYLE GUARD RAIL TYPICAL SURFACE MOUNT CONNECTION DETAIL**

Drawn by: S.Gauthier

Drawing date: August 22, 2014

Checked by:

Check date:

Approve date:

Approved:

Drawing Scale:

1:8

Plot Scale:

1:1

Plot Size:

Letter

Drawing No:

P6

REV.A

Canada

Office of the Executive Director, Waterways

Parks Canada Agency

Government of Canada

SIGN BOARD FRAMING.
41X41 ALUMINIUM STRUT
C/W 10X76 SLOTTED
HOLES AT 102 O/C
UNI-STRUT TYPE P1000SL
OR APPROVED EQUAL

CLEAR UV TREATED
POLYPROPYLENE
GROMMET
INSULATOR TYP. ALL
4 SIGN HOLES

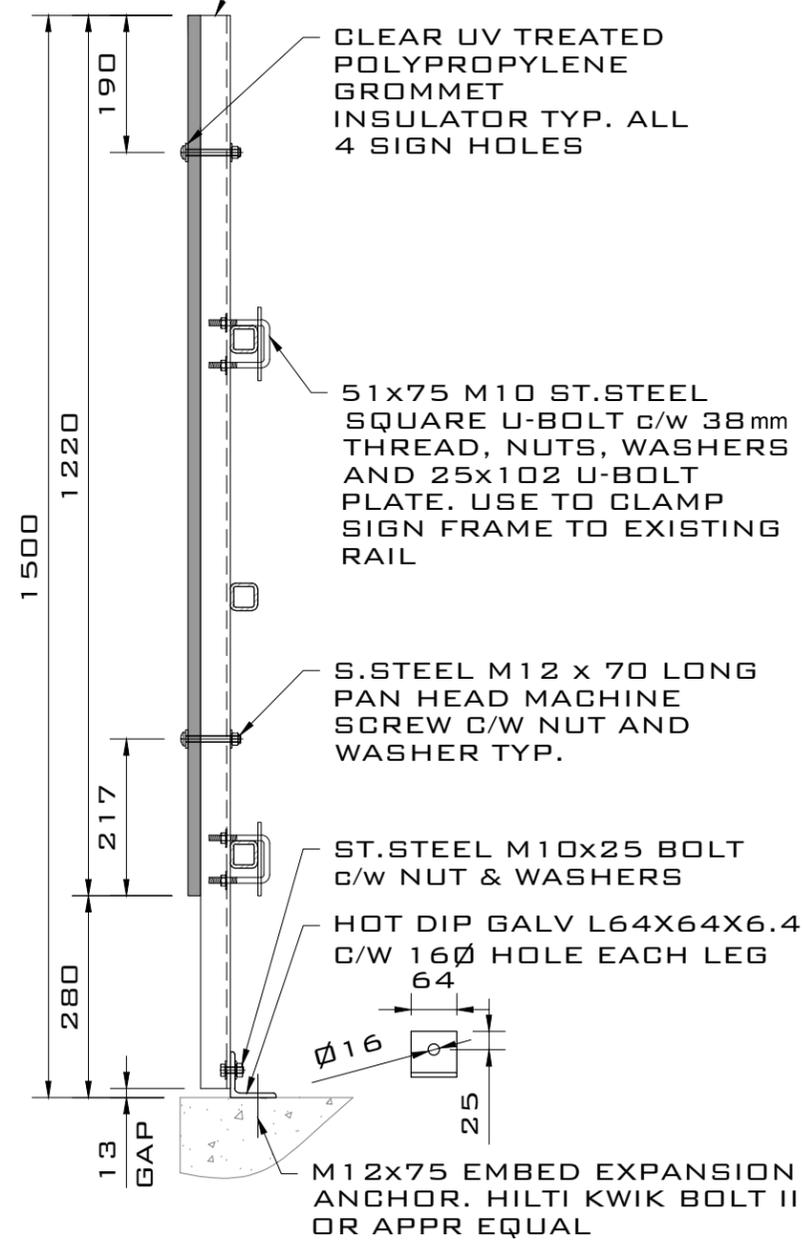
51x75 M10 ST. STEEL
SQUARE U-BOLT c/w 38mm
THREAD, NUTS, WASHERS
AND 25x102 U-BOLT
PLATE. USE TO CLAMP
SIGN FRAME TO EXISTING
RAIL

S. STEEL M12 x 70 LONG
PAN HEAD MACHINE
SCREW C/W NUT AND
WASHER TYP.

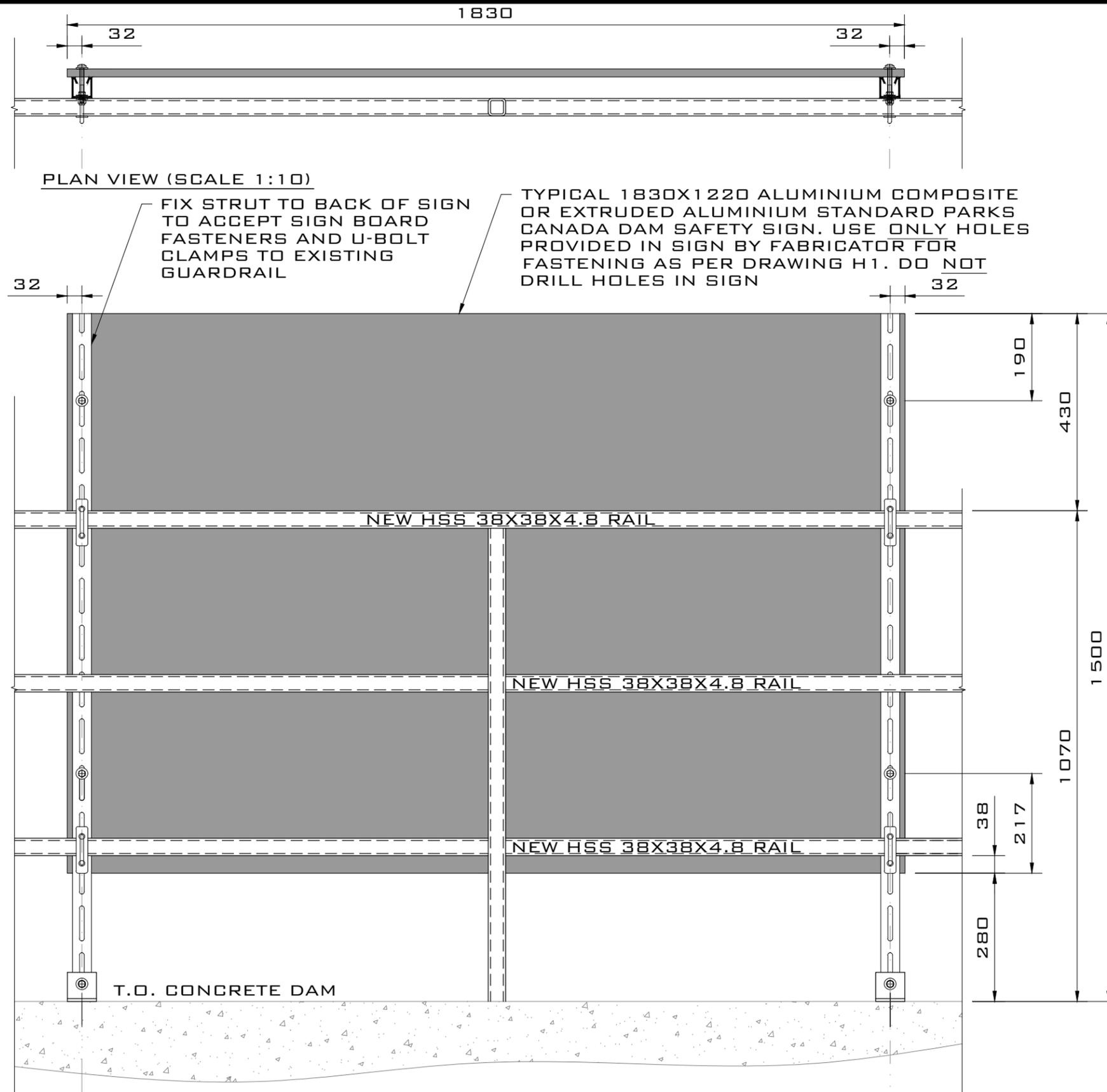
ST. STEEL M10x25 BOLT
C/W NUT & WASHERS

HOT DIP GALV L64X64X6.4
C/W 16Ø HOLE EACH LEG

M12x75 EMBED EXPANSION
ANCHOR. HILTI KWIK BOLT II
OR APPR EQUAL



SIDE FACE VIEW (SCALE 1:10)



BACK FACE VIEW (SCALE 1:10)