Government of Canada Gouvernement du Canada

SPECIFICATIONS FOR

Rideau Canal
Kingston Mills Locks 46-49

Rehabilitation

ISSUED FOR TENDER

Project No. R.079796.009

June 15, 2018

Prepared for:

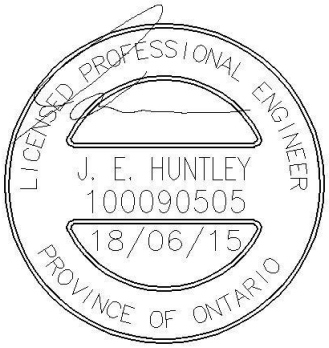
Heritage Canals and Engineering Works
Parks Canada Infrastructure Directorate
Ontario Region
Public Services and Procurement Canada

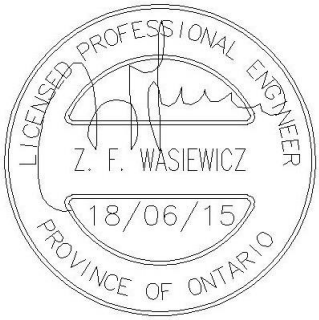
2720 Riverside Drive, Tower A, Floor 0
Ottawa, Ontario
K1A 0M2

PART 1 - GENERAL

1.1 ENGINEERING SEALS

.1 Design and Check Engineer for Locks 46-49 Rehabilitation





PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

SPECIFICATION

REFERENCE DOCUMENTS

- Kingston Mills Locks 46 to 49 Rehabilitation Geotechnical Report, No.171-02359-00 prepared by WSP Canada Inc. and dated June 2018
- Project-Specific Designated Substances and Hazardous Materials Survey prepared by DST Consulting Engineers Canada Inc. and dated March 26, 2017
- ODS Underwater Videos of Lock 46 and Lock 49, April 2017
- Basic Impact Analysis
- Environmental Standards and Guidelines, Ontario Waterway, July 2017

DRAWINGS

ADDITIONAL INFORMATION

Following award of the contract, the successful bidder contractor may request the following:

- Historical bathymetry surveys at Locks 46 and 49.
- Survey Information
- Historical drawings of past interventions.

PART 1 – GENERAL

1.1 DESCRIPTION

.1 General

.1 These detailed specifications cover requirements for furnishing of labour, materials, tools, equipment, power plant, systems, transportation, supervision and quality control necessary to completely perform work, as described by the drawings and specifications.

.2 Description of Work:

.1 Project consists of work as described below, and as indicated on drawings and in these specifications. This includes but is not limited to the following:

.1 Mobilization/Demobilization: Activation, mobilizing then demobilizing of Contractor's personnel, general equipment and operating supplies to site. Establishment of offices, storage and general facilities for operations at the site and administrative items related to project. Does not include items of work specifically addressed and paid under other work items.

.2 General Work: General work items related to setting up, operating and maintaining work or storage areas and work not specifically covered by other work items.

.3 Site Access: Providing site access for and conveyance of materials and equipment. Developing staging areas and facilities in order to undertake work.

.4 Construction Fence: Supplying, installing, maintaining and dismantling construction fence as indicated.

.5 Traffic Control: Implementing all traffic control measures required to carry out work.

.6 Environmental: Implementing and maintaining during construction all required environmental protection measures.

.7 Quality Control: Inspection, testing and Engineering as part of Contractor's Quality Control Plan.

.8 Utilities: Connect to existing public utilities and make arrangements for setup of utilities required for duration of work including; power, communications,

lighting, water, heating and ventilation.

.9 Enclosures: Design, supply, install, maintain and dismantle enclosures to contain work or for housing and heating.

.11 Temporary Guardrails: Designing, supplying, installing, maintaining and dismantling temporary guardrail around edges of lock walls for prevention of accidental falls into the lock in compliance with applicable safety standards. Design of such measures by Contractor's Engineer. Guardrails to be anchored in masonry joints. Installation of guardrails to not damage stone.

.12 Document Existing Site Conditions: Inspections and surveying to record existing conditions, verify dimensions and maintain record drawings.

.13 Cleaning: Carry out continuous progressive cleaning, final cleaning and cleaning of lock walls and lock floors. Includes removal of zebra mussels and cleaning all debris off chamber floors.

.14 Snow removal: Removal of snow from work areas, staging areas, storage areas and parking areas.

.17 Temporary Shoring and Protection of Lock Elements: Installation of temporary shoring and protection measures for lock wall components during stone removals.

.18 Scaffolding: Designing, supplying, installing, maintaining and dismantling all scaffolding required to complete work. Provide complete scaffold staircase to bottom of each level of locks. Provide scaffolding as required to complete all work as indicated on drawings and described in specifications. Design of scaffolding and stairs by Contractor's Engineer.

.19 Removals: Removal, salvage and protection of various lock accessories.

.20 Tree Removals: Removal of existing trees as required for carrying out the work.

.21 Metal Fabrications: Repair and replacement of various metal lock components.

.24 Landscaping: All landscaping measures as specified in the contract documents.

.25 Stoplogs: Retrieving, delivering, installing and removing steel and timber stoplogs as required.

.26 Dewatering: Design, supply, installation and operation of dewatering structures and dewatering systems.

.27 Concrete Removals: Concrete removals including, horizontal, vertical and underwater surfaces.

.28 Remove and Reinstall Sluice Gate Tunnel Valves and Frames: Removal, Delivery to Parks Canada shop for restoration, pick-up, and re-installation of existing sluice tunnel valves and frames.

.29 Remove, Salvage, Restore and Reinstall Sluice Gate Winches.

.30 Remove Pavers: Removal and salvage of existing pavers.

.31 Remove Asphalt: Remove asphalt pathways.

.32 Remove Railings: Remove and dispose of existing steel railings. Salvage existing newel posts as specified.

.33 Remove Lock Gates: Remove, store, and reinstall lock gates as indicated.

.34 Concrete Repairs: Carry out concrete repairs as indicated including reinforcing steel and anchors into substrate.

.35 Partial Reconstruction of Basin Bain wall: include reconstruction of section of north basin wall.

.36 Pressure Grouting: Grout deep voids in joints and core of walls as indicated including inserting tubes, underwater grouting and mobilizing pressure grouting equipment.

.37 Stone Masonry Repairs: Perform stone masonry repairs, as indicated, including stone replacement, dutchman repairs and repointing. Includes underwater raking, pointing and stone masonry repairs.

.38 New Ladders: Supply and install new ladders in all lock chambers.

.39 Mooring Cables: Remove, replace, relocate and re-install mooring cables, as indicated.

.40 New Railings: Supply and install new steel railings to replace existing railing which were removed. Refurbish and reinstall existing newel posts.

.41 New Pressure Relief Valves: Supply and install new pressure relief valves in the lock floors as specified.

.42 Excavating, trenching and backfilling.

.43 Flagstone: Installation of new flagstone pavers on monoliths, on pathways, etc...

.44 Complete general clean-up to satisfaction of Departmental Representative.

.45 Landscaping: Restoring landscape to state prior to construction between construction seasons and upon final

completion of work.

1.2 RELATED WORK

.1 Section 01 20 01 - Site Access

.2 Section 01 22 01 – Measurement and Payment

.3 Section 01 33 00 – Submittal Procedures

.4 Section 32 94 00 - General Landscaping

1.3 MEASUREMENT FOR PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 Payment for work in this section is included in Lump Sum Price:
.1 Item No. L1 - Mobilization Year 1.
.2 Item No. L2 - Mobilization Year 2.
.3 Item No. L3 - Mobilization Year 3.
.4 Item No. L4 - Demobilization Year 1.
.5 Item No. L5 - Demobilization Year 2.
.6 Item No. L6 - Demobilization Year 3.
.7 Item No. L7 – General Work - Year 1.
.8 Item No. L8 – General Work - Year 2.
.9 Item No. L9 – General Work - Year 3.
.10 Item No. L10 – Fees, Permits and Certificates.

.3 General Work items as listed below cover and work not specifically identified for payment under other items that are indicated or required to complete work. This includes but is not limited to general expenses related to site setup, layout, operation and maintenance not covered elsewhere.
.1 Item No. L7 – General Work - Year 1.
.2 Item No. L8 – General Work - Year 2.
.3 Item No. L9 – General Work - Year 3.

1.4 ACCESS TO THE SITE

.1 The Kingston Mills Lock Station is located off Kingston Mills Road, at Kingston Mills Ontario.

.2 Access to the work, construction zone, limits of work and staging areas to be as indicated in Section 01 20 01 Site Access or as directed by Departmental Representative.

.3 Remove temporary access structures and restore access and work areas to original condition upon completion of work, at Contractor's expense, except where noted otherwise.

.4 For access requiring use of public roads, make all arrangements, obtain required permits and confine activities to such routes and load limits as the authorities having jurisdiction may require.

.5 Clean public roads routinely to remove sediment and debris deposited by construction activities.

.6 Secure all work and storage areas. This includes installing a fence to prevent public access to areas where construction activities occur and where construction materials are stored.

.7 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.

.8 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.5 CANAL REGULATIONS

.1 The "Historic Canals Regulations" apply to and govern work of this Contract.

.2 The regulations may be obtained from Justice Canada's website at:

http://laws-lois.justice.gc.ca/eng/regulations/sor-93-22/

1.6 RELICS AND ANTIQUITIES

.1 Corner stones and their contents, buried artifacts, remains and evidence of ancient persons and peoples, commemorative plaques and other objects of historic value and worth, remain the property of the Crown. Protect and notify Departmental Representative immediately of discovery of such objects.

.2 Should historic objects be uncovered during the work, stop work immediately and notify Departmental Representative.

.3 Do not resume work until directed by Departmental Representative.

1.7 ARCHAEOLOGICAL REQUIREMENTS AND RESTRAINTS

.1 Site may contain possible archaeological remnants.

.2 Archaeologists may monitor and record some or all aspects of excavations, stone masonry wall work, site access routes and disturbances to soil overburden due to equipment and general work operations.

.3 If suspected artifacts are uncovered while Archaeologists are not present, stop work immediately in that area, protect artifacts and notify Departmental Representative.

.4 Proceed with other work and await further direction for work in affected area from Departmental Representative on how to proceed.

1.8 MINIMUM STANDARDS

.1 Use new materials and work to at least all applicable minimum standards of; Canadian General Standards Board, Canadian Standards Association, National Building Code of Canada 2015 (NBC), ASTM, applicable Provincial and Municipal codes, and all other national and international

.2 In case of conflict or discrepancy, most stringent requirement will apply.

1.9 ABBREVIATIONS

.1 Abbreviations used are:
- .1 ASTM - American Society for Testing and Materials.
- .2 ACI - American Concrete Institute.
- .3 ANSI - American National Standards Institute.
- .4 CSA - Canadian Standards Association.
- .5 CWB - Canadian Welding Bureau.
- .6 NBC - National Building Code of Canada.
- .7 CPM - Critical Path Method.
- .8 CGSB - Canadian General Standards Board.
- .9 GC - General Conditions.
- .10 MNRF - Ministry of Natural Resources and Forestry
- .11 MOE - Ministry of the Environment
- .12 OPSS - Ontario Provincial Standard Specifications
- .13 PCA – Parks Canada Agency
- .14 PSPC - Public Services and Procurement Canada, formerly Public Works and Government Services Canada (PWGSC).

1.10 DEFINITIONS

.1 Unless context clearly indicates otherwise, these definitions apply:
- .1 Canal - Rideau Canal National Historic Site.
- .2 Lock – Locks of Kingston Mills Lockstation.
- .3 Plans - Drawings listed in "List of Drawings".
- .4 Specifications - the subject matter listed in the "List of Contents", addenda to the specifications, and all relative written

communications sent by Departmental Representative to the Contractor regarding the Work.

1.11 BENCH MARKS

.1 Benchmark data available from Natural Resources Canada, Geodetic Survey Division or the Province of Ontario.

.2 Refer to plans for available benchmark information and location.

1.12 WATER LEVELS

.1 Contractor required to work in areas where water is present.

.2 Information on control of water levels may be obtained from Departmental Representative.

.3 Normal navigation period runs from approximately Victoria Day weekend to Thanksgiving weekend:
- .1 May 18, 2018 to October 8, 2018.
- .2 May 17, 2019 to October 14, 2019.
- .3 May 15, 2020 to October 12, 2020
- .4 May 21, 2021 to October 11, 2021
- .5 Navigation season may be subject to change.

.4 Water levels below are presented using Canadian Geodetic Vertical Datum for 1928 (CGVD28) and taken from the Rideau Canal water level rule curves and available for reference online from: http://www.rideau-info.com/canal/water-rulec urves.html

.5 Water levels fluctuate due to rain, snow, snowmelt, evaporation, leakage, spring freshet and operational requirements.

.6 Normal Navigation Season water levels are:
- .1 Upstream: 88.65m to 88.80m.
- .2 Downstream: 73.80m to 75.85m.

.7 Normal drawdown (off-season) water levels, using CGVD28 datum, are:
- .1 Upstream: 88.50 m to 88.80m.
- .2 Downstream: 73.70m to 75.85m.

.8 Maximum expected water levels are:
- .1 Upstream: 88.90 m.
- .2 Downstream: 76.00m.
- .3 Add freeboard of 600 mm to maximum expected water level to account for wave action and unexpected fluctuations in water levels.

.9 Elevation of top surface of coping stones:
.1 Lock 46 – 90.5m.
.2 Lock 47 – 86.0m.
.3 Lock 48 – 82.6m.
.4 Lock 49 - 78.8m.

.10 Operations to lower water levels begin at end of Navigation season and progress in a specific sequence from waterway to waterway and lockstation to lockstation.
.1 At this site it is not expected that drawdown levels will be reached until first week of December, 2018.
.2 Water levels fluctuate continuously due to rain, snow, snowmelt, evaporation, leakage and operational requirements.

.11 Drawings indicate elevations in both CGVA1928 and CGVD2013 datum. Adjust elevations to required datum.

.12 During drawdown period (off-season), water levels might rise occasionally, depending on weather conditions. There is no data available regarding water levels during those times. Fluctuation of water level may exceed navigational levels or maximum water level.

.13 Dates indicated are not firm commitment and approximation only based on previous years practice. Exact dates for 2018/2019 season will be provided to Contractor, as soon as Rideau Canal Operations establish schedule for season.

.14 If water level rises above or drops below these ranges because of precipitation, operating problems or any other cause, it is brought back within range as soon as reasonably possible by Departmental Representative.

.15 Departmental Representative endeavors to control water level. However, Departmental Representative cannot be held responsible for events, or results of events not under his control.

1.13 REQUIREMENTS OF REGULATORY AGENCIES

.1 Adhere to local municipality noise by-laws.

.2 Dispose of unwanted materials at location off Canal lands approved by Ontario Ministry of the Environment.

1.14 PROTECTION OF EXISTING UNDERGROUND

.1 Prior to excavating, make arrangements for utility locates to indicate possible utility locations and carefully expose existing underground utilities.

FACILITIES.

.2 Shore and protect (including winter protection) exposed utilities as required.

.3 Repair, restore and/or replace any and all utilities damaged due to the work, or activities in connection with the work.

1.15 DEPARTMENTAL REPRESENTATIVE SITE OFFICE

.1 Provide and maintain secure construction office for exclusive use of Departmental Representative as follows:
.1 Office of sound, lockable, insulated, weather-proof construction.
.2 Greater than 12 square metres in floor area.
.3 Equipped with electric light, minimum 4 electrical outlets and heat.
.4 Supply wireless data service for use by Contractor and Departmental Representatives.
.5 Supply office desk, 900 mm x 1200 mm reference table, 4 chairs, 1 drafting stool, and 1 lockable 4-drawer filing cabinet;
.6 Maintain minimum temperature of 21 degrees C during hours of work and 17 degrees during off-hours.
.7 Maintain office and utilities in good working order.

.2 Pay all costs, including heating, lighting and data.

.3 Office to remain property of Contractor.

1.16 CONTRACTOR'S OFFICE

.1 Provide an office for contractor at site location, open during regular working hours.
.1 Provide dedicated meeting room large enough to accommodate site meetings for up to 10 people.
.2 Dedicated meeting room not to be used for contractor staff or for storage. Supply dedicated tables and chairs for 10 people.

1.17 EXPLOSIVES

.1 Use of explosives is not permitted on this project.

1.18 EXAMINATIONS

.1 Examine site and conditions likely to affect work and be familiar and conversant with existing conditions.

.2 Provide photos of surrounding properties, objects and structures liable to be damaged or be the subject of subsequent claims.

1.19 CLEAN-UP

.1 Clean and tidy premises including bottom of lock on daily basis, do not permit accumulation of debris, trash and/or garbage.

.2 Remove Rubbish, debris and garbage from construction activities to off site on weekly basis.

.3 At completion of the work remove surplus materials, tools, plant, rubbish and debris and dispose of them in an approved manner off Canal property.

1.20 TAXES

.1 Pay all taxes properly levied by law (including Federal, Provincial and Municipal).

1.21 FEES, PERMITS, AND CERTIFICATES

.1 Pay all fees and obtain all permits. Provide authorities with plans and information for acceptance certificates. Provide inspection certificates as evidence that work conforms to requirements of Authority having jurisdiction.
.1 Payment to be included in Item No. LX - Fees, Permits, and Certificates.

1.22 FIELD QUALITY CONTROL

.1 Carry out work using qualified licensed workers or apprentices in accordance with Provincial Act respecting manpower vocational training and qualification.

.2 Permit employees registered in Ontario apprenticeship program to perform specific tasks only if under direct supervision of qualified licensed workers.

.3 Determine permitted activities and tasks by apprentices, based on level of training attended and demonstration of ability to perform specific duties.

1.23 HAZARDOUS MATERIALS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and the provision of Material Safety Data Sheets (MSDS) acceptable to Human Resources Development Canada, Labour Program.

1.24 TEMPORARY

.1 Make required arrangements with utility providers to

UTILITIES

provide temporary light, telephone, power and water to fulfill requirements of construction.

1.25 REMOVED MATERIALS

.1 Unless otherwise specified, materials for removal become Contractor's property and to be taken from site.

1.26 PROTECTION

.1 Protect finished work against damage until take-over.

.2 Protect work from damage by ice, flooding and/or other adverse climatic conditions.

.3 Protect adjacent work against the spread of dust and dirt beyond the work areas.

.4 Protect operatives and other users of site from all hazards.

1.27 CUT, PATCH AND MAKE GOOD

.1 Repair, replace and refinish, to Departmental Representative's approval, existing surfaces and items damaged in connection with the work, at Contractor's expense.

.2 The repaired, replaced and refinished items to be at least equal to those that existed immediately before damage occurred.

.3 Disturbed lawn areas to be reinstated in accordance with Section 32 94 00 General Landscaping.

1.28 SIGNS AND SAFETY DEVICES

.1 Provide common-use signs and safety devices related to traffic control, information, instruction, use of equipment and public safety devices in both official languages or by use of commonly-understood graphic symbols to Departmental Representative's approval.

.2 No advertising permitted on this project.

1.29 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to the normal use of premises and traffic flow around Kingston Mills Lockstation. This includes vehicular, pedestrian and cyclist traffic. Make arrangements with Departmental Representative to facilitate work as stated.

.2 The Canal must remain free of obstruction during the navigation season.

.3 Contractor will be responsible for all snow removal required in the area of the work, including access road and parking area.

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

1.30 TEMPORARY FACILITIES

.1 Provide and maintain suitable storage facilities, of type and location approved by Departmental Representative.

.2 Observe and enforce all construction safety measures required by authorities having jurisdiction.

.3 Provide and maintain all necessary enclosures, guards, guardrails, hoardings, barricades, warning signs and similar items.

.4 Provide sufficient chemical toilet conveniences in a sanitary condition for use of all persons at the site in a location approved by Departmental Representative.

.5 Enclose the work and storage area with secure fencing as directed by Departmental Representative.

1.31 ACCESS AND EGRESS

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

1.32 SCAFFOLDS AND WORK PLATFORMS

.1 Design, install, and inspect scaffolds and work platforms required for work in accordance with relevant municipal, provincial and other regulations.

.2 Provide design drawings, signed and sealed by qualified Professional Engineer licensed in the province of Ontario, where prescribed.

.3 Additions or modifications to scaffolding must be approved by Professional Engineer in writing.

1.33 GUARANTEES AND

.1 Before completion of work collect all manufacturer's

WARRANTIES

guarantees and warranties and deposit with Departmental Representative.

1.34 PROJECT MEETINGS

.1 Provide physical space and make arrangements for meetings.

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

.3 Preconstruction meetings:
.1 Within 5 days of award of contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
.2 Establish time and location of meeting and notify parties concerned minimum of 5 days before the meeting
.3 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

.4 Progress meetings:
.1 During course of work and 2 weeks prior to project completion, schedule progress meetings monthly.
.2 Notify parties minimum 5 days prior to meetings.
.3 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 7 days after meeting.
.4 Contractor to prepare and distribute minutes within 3 days of meeting.

1.35 CONTRACT DOCUMENTS

.1 Drawings and specifications are complementary. Items shown or mentioned in one and not in the other are deemed to be included in the contract work.

.2 Contractor responsible for printing/duplicating required drawings or specifications for:
.1 Suppliers;
.2 Sub-contractors;
.3 On-Site drawings & specifications;
.4 Project Record drawings.

.3 Maintain at job site, one copy each document as follows:
.1 Contract Drawings.
.2 Specifications.
.3 Addenda.
.4 Reviewed Shop Drawings.
.5 List of Outstanding Shop Drawings.
.6 Change Orders.
.7 Other Modifications to Contract.
.8 Field Test Reports.
.9 Copy of Approved Work Schedule.

.10 Health and Safety Plan and Other Safety Related Documents.
.11 Ministry of Labour Notice of Project.
.12 Parks Canada work permit.
.13 Other documents as specified

1.36 TESTING LABORATORY SERVICES

.1 Departmental Representative will appoint and pay for costs of inspection and testing services for quality assurance purposes, unless indicated otherwise.

.2 Contractor to appoint and pay for costs of inspection and testing services for quality control.

.3 Provide safe working areas and assist with testing procedures, including provisions for materials or services and co-ordination, as required by testing agency and as authorized by Departmental Representative.

.4 Where tests indicate non-compliance with specifications, Contractor to pay for initial test and all subsequent testing of work to verify acceptability of corrected work.

1.37 SCHEDULING

.1 Commence work in accordance with notification of acceptance of offer and complete the work within the dates outlined in contract.

.2 Comply with dewatering and drawdown schedule, and be aware of work restrictions in spring and Spring water level increases.

.3 Comply with work schedule restrictions.

.4 Contractor to complete all construction works, have site restored and demobilized entirely from site by end of day May 7, 2021.

.5 Submit the construction progress schedule, (in CPM form) within 10 days of award of contract. Progress schedule must include the quantity of work to be accomplished within each 2 week timeframe. No progress payments will be made until the construction progress schedule is approved. Submit together with the progress schedule a cost breakdown for each lump sum payment item.

.6 When requested by Departmental Representative, resubmit the schedule with all revisions made to show the progress of the work and to show any changes which are required to meet the approved completion dates, within 10 working days.

.7 Take all necessary measures to complete the work within the scheduled times approved by Departmental Representative.

.8 Do not make changes to the approved schedule, without Departmental Representative's approval.

.9 The requirements of Section 01 33 00 – Submittal Procedures apply to the construction progress schedule.

.10 Carry out work during "regular hours" Monday to Friday from 07:00 to 18:00 hours.

.11 Give Departmental Representative 48 hours notice for work to be carried out during "off hours".

.12 Work in waterway and lock chambers to be completed by March 15 of any given year.

.13 Work may continue in lock chambers drained or dewatered using stoplog cofferdam until end of day April 19, 2019 (Year 1 Construction), April 17, 2020 (Year 2 Construction), April 23, 2021(Year 3 Construction).

.14 Cleanup of chamber to be completed and stoplogs removed by Apr 26, 2019 (Year 1 Construction), Apr 24, 2020 (Year 2 Construction), Apr 30, 2021 (Year 3 Construction).

.15 Priority to be put on work as follows:
.1 Work outside of stoplog cofferdam
.2 Work requiring opening of swing bridge.
.3 Work in chamber, within stoplog cofferdam.

.16 Contractor to terminate construction, have site restored and demobilize entirely from site by end of day May 3, 2019 (Year 1 Construction), May 1, 2020 (Year 2 Construction), May 7, 2021 (Year 3 Construction).

1.38 LAYOUT OF THE WORK

.1 Contractor responsible for layout and control survey work, and checking plan dimensions against field measurements. Contractor to locate benchmark at described location.

.2 Lay out the work according to elevations and dimensions shown on plans and verified in field, or determined in field.

.3 Notify Departmental Representative immediately of any discrepancies between field measurements and dimensions shown on the plans.

.4 Be responsible for rectification of errors resulting from failure to verify dimensions, elevations and other pertinent data shown on the plans.

1.39 COST BREAKDOWN

.1 14 days following the award of the contract submit breakdown of Lump Sum price of Contract Amount in detail as directed by Departmental Representative. After approval by Departmental Representative cost breakdown will be used as basis for progress payments.

1.40 WORK SEQUENCE

.1 Suggested work sequence is provided on the Contract Drawings. Contractor may propose alternate work sequence with the following restrictions:

.1 All work specified to Lock 46 must be completed within year one construction season.

.2 Inspection of log gains and scour hole at the downstream end of Lock 49 to be completed in the fall of 2018. Measurements of log gains to be provided immediately to PCA upon completion of inspection.

.3 All in water work to be executed by divers at Lock 49 must be executed in the fall when water levels are low.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

PART 1 - GENERAL

1.1 RELATED WORK

.1 Section 02 42 01 – Removal and Reinstatement of Timber Lock Gates

.2 Section 35 20 22 - Dewatering

1.1 ACCESS AND EGRESS

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

.2 Access Limitations:

.1 Narrow Access at Rail Bridge Pier:

.1 Land access to the lower flight locks requires passage through a narrow area the rail bridge pier and the steep river embankment. An existing timber retaining wall is located in this area. An engineering report pertaining to the condition of this retaining wall is available from PCA. The contractor is responsible for any measures required for safe access through this area and the design of any temporary earth retaining structures, or work to the existing retaining wall, required for widening the access.

.2 Swing Bridge:

.1 Swing bridge to be left in the closed position (i.e. roadway open to traffic) during construction.

.2 Opening of the swing bridge is not permitted.

.3 Half Loads:

.1 Vehicle weight restrictions will be in effect on local roadways in the spring of each year.

.4 East Access Road:

.1 The access to the east of the locks has sharp corners, narrow lanes and steep grades. Contractor to make his own assessment of the restrictions for his access.

.5 Cataraqui River Closure Downstream:

.1 During the first construction season (Fall 2018 to Spring 2019), the Contractor will not have access to the lockstation from the downstream waterway as a temporary floating bridge will be installed across the river at Hwy 401 during this time.

.3 Snow Removal
- .1 County Road 21 is plowed in winter by the local municipality, however timely snow removal by municipality is not guaranteed. The contractor will be responsible for snow removal on these roads if required for his access.
- .2 The East Access Road is plowed by Energy Ottawa to maintain access to the power plant, however timely snow removal is not guaranteed. The contractor will be responsible for snow removal on these roads if required for his access and for full snow removal beyond the point just past the arch dam where their driveway splits off to go down to the power plant.

1.2 USE OF SITE AND FACILITIES

.1 Site shall be closed to public during each construction season.

.2 Access shall be provided for the Owner at all times.

1.3 EXISTING SERVICES

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

1.4 SCHEDULE

.1 Important Dates:
- .1 Work in waterway and lock chambers to be completed by March 15 of any given year.
  - .1 See Section 35 20 22 for Details.
- .2 Work may continue in lock chambers drained or dewatered using stoplog cofferdam until end of day April 19, 2019 (Year 1 Construction), April 17, 2020 (Year 2 Construction), April 23, 2021(Year 3 Construction).
- .3 Cleanup of chamber to be completed and stoplogs removed by Apr 26, 2019 (Year 1 Construction), Apr 24, 2020 (Year 2 Construction), Apr 30, 2021 (Year 3 Construction).
- .4 Contractor to terminate construction, have site restored and demobilize entirely from site by end of day May 3, 2019 (Year 1 Construction), May 1, 2020 (Year 2 Construction), May 7, 2021 (Year 3 Construction).
- .5 Contractor to complete all construction works, have site restored and demobilized entirely from site by end of day May 7, 2021.

.2 Lock 46 Work:
- .1 All work specified at Lock 46 shall be completed during year one construction season.

.3 Carry out work during "regular hours" Monday to Friday from 07:00 to 18:00 hours.

1.5 SPECIAL REQUIREMENTS

.1 Diving Inspection at Lock 49:

.1 As per Section 35 20 22 – Dewatering, Contractor shall perform an underwater inspection with divers at the log checks of Lock 49 at the beginning of the first year of construction. This inspection is required for the following:

.1 To determine the span between the log checks for fabrication of new stoplogs (fabrication of logs by Parks Canada).

.2 Assessment of the undermining below the Lock 49 apron slab.

.2 Replacement of Lock Gates:

.1 At onset of project, Contractor shall coordinate with Parks Canada regarding the proposed replacements of the downstream gates of locks 46 and 47. New gates to be fabricated by Parks Canada. Section 02 42 01 – Removal and Reinstatement of Timber Lock Gates outlines the Contractors responsibilities with regards to the gate replacement work.

1.6 NEARBY CONSTRUCTION PROJECTS

1. The Contractor shall be made aware of the following construction projects which will may be taking place near the site during this project.

.1 Waste Weir:

1. Repairs to the waste weir, located northeast of lock 46, are scheduled for 2018 and may be carried out at the same time as the work in this project.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This Section includes but is not limited to:
.1 Installation of temporary access paths as indicated for conveyance of materials, equipment and labour to work areas.
.2 Protecting existing surfaces along temporary access routes.
.3 Providing construction fence and perimeter security measures around work/storage areas.
.4 Maintaining access routes and work/storage areas for duration of work.
.5 Restoring access route and work/storage areas to condition found before start of work.
.6 Installing temporary scaffolding staircases from coping level to all levels of lock where work will take place.
.7 Installing temporary scaffolding in sections matching stages of work and to remain in place until work completed in each section.
.8 Parking.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 Measurement and Payment.

.2. No measurement of Site Access to be made.

.2 Payment to be included in the Lump Sum Price:
.1 Item No. L11 - Site Access – Year 1.
.2 Item No. L12 - Site Access – Year 2.
.3 Item No. L13 - Site Access – Year 3.
.4 Item No. L14 - Construction Fence – Year 1.
.5 Item No. L15 - Construction Fence – Year 2.
.6 Item No. L16 - Construction Fence – Year 3.

1.3 RELATED WORK

.1 Section 01 22 01 Measurement and Payment

.2 Section 01 33 00 – Submittal Procedures

.3 Section 01 35 30 – Traffic Control

.4 Section 01 35 46 – Archaeological, Cultural and Environmental Procedures

.5 Section 01 56 00 – Temporary Barriers and Enclosures

.6 Section 01 71 00 – Examination and Preparation

.7 Section 01 74 11 – Cleaning

.8 Section 01 74 20 - Construction/Demolition Waste Management and Disposal.

.9 Section 04 43 04 – Repointing Stone Masonry

.10 Section 05 05 20 - Anchors

.11 Section 31 05 16 – Aggregate Materials

.12 Section 31 32 19 – Geotextile

1.4 REFERENCES

.1 Canadian Standards Association (CSA).
.1 CSA Z797-09 (R2014), Code of Practice for access scaffold.

1.5 HERITAGE PROTECTION

.1 The Kingston Mills Lockstation is a National Heritage Site.

.2 Preserve heritage fabric of site by executing repointing without damage to masonry joint edges, adjacent stones or other site features.

.3 Damage to stones will not be tolerated.

.4 Ensure appropriate supervision work, adequate training for workers, and other necessary precautions to protect existing masonry structures.

.5 Notify Departmental Representative immediately where reasonable concern exists that damage will result from work.

.6 Contractor may propose alternative work methodologies to be accepted by Departmental Representative.

1.6 EXAMINATION AND PREPARATION

.1 Examine site in accordance with Section 01 71 00 – Examination and Preparation.

.2 Make arrangements to examine site with Departmental Representative 5 days in advance of mobilizing.

1.7 ACTION AND INFORMATION

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

SUBMITTALS

.2 Submit Site Layout and Access Plan at least 5 days prior to proposed mobilization date.
- .1 Prepare Site Layout and Access Plan indicating proposed layout of construction zone, staging area, access routes, access facilities, Contractor parking areas and public areas.
- .2 Indicate location and dimensions in plan view drawing for proposed work areas, parking areas, fencing, gates, storage areas, access routes, access systems, office trailer locations, equipment layout, utility locations and other site layout features to describe Contractor's use of site.
- .3 Indicate proposed design, staging and layout of access systems to be used to access areas of work.
- .4 Indicate staging of work.
- .5 Indicate access routes, construction access roads.
- .6 Indicate methods to be used to improve construction access roads or construct work areas.
- .7 Site Layout and Access Plan to be signed and sealed by Contractor's Engineer.
- .8 AutoCAD drawings used for development of Contract Drawings available upon request.

.3 Access System - Shop Drawings
- .1 Submit digital copy of shop drawings a minimum of 5 days prior to commencing the installation of any access system
- .2 Include the following information:
  - .1 Indicate dimensions and layout
  - .2 Indicate material types and grade
  - .3 Indicate design loads
  - .4 Indicate design codes, where applicable
- .3 Have drawings signed and sealed by design and check engineers licensed to practice in the province of Ontario.

1.8 SECURITY

.1 Secure access to work areas in approved manner including; locking fenced off work areas and staging areas to prevent public access.

.2 Take appropriate security precautions to safeguard equipment, tools, and materials on site from vandalism and theft.

1.9 PARKING

.1 Parking to be restricted to designated parking areas and staging areas. Move or park vehicles on roadways or access routes only where approved by Departmental

Representative.

.2 Workers commuting to site to use indicated parking area.

.3 Equipment to be parked in staging area or work areas. Provide environmental protection for equipment that may leak fuel or oil when it is within 10m of water body.

.4 Parking in work areas adjacent to lock to be limited to vehicles making deliveries, service vehicles or vehicles carrying out work.

.5 Parking Prohibited on Kingston Mills Road.

.6 Provide and maintain access to project site.

1.10 PROTECTION OF TRAFFIC

.1 Protect traffic on public roadway to Section 01 35 30 – Traffic Control.

.2 Maintain public roadway and public parking by routinely cleaning to remove Construction debris in accordance with Section 01 74 11 - Cleaning.

.3 Provide flag person to watch for vehicles or pedestrians whenever vehicles or equipment cross a roadway or travel between Staging Areas and Construction Zones.

1.11 FIRE ROUTES

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

1.12 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.

1.13 TREE PROTECTION

.1 Protect trees not designated for removals as per Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

1.14 SNOW REMOVAL

.1 Snow removal from construction areas, staging areas, contractor parking areas, public parking areas, work areas and temporary and permanent access routes to

Section 01 74 11 - Cleaning.

.2 Maintain existing and temporary access routes, to site throughout construction season.

.3 Carry out snow removal when more than 5cm of snow fall occurs and/or more often as required to maintain access routes.

.4 Salt and/or sand access routes regularly to ensure roadway is passable at all times for both construction and emergency vehicles. Do not sand or salt grassy areas adjacent to access routes.

.5 Minimize salting in grassy areas to prevent damage.

.6 Provide supplementary maintenance on Kingston Mills Road in the vicinity of the work as required to maintain emergency and construction access.

1.15 REQUIREMENTS OF REGULATORY AGENCIES

.1 Obtain approvals from and pay fees to Federal or Provincial agencies for works as may be required by this Contract.

PART 2 - PRODUCTS

2.1 GRANULAR BASE

.1 Granular A: MTO Granular A in accordance with Section 31 05 16 – Aggregate Materials.

.2 Granular B Type II: MTO Granular B Type II in accordance with Section 31 05 16 – Aggregate Materials.

2.2 GEOTEXTILE FABRIC

.1 Geotextile fabric: to Section 31 32 19 - Geotextile.

PART 3 - EXECUTION

3.1 CONSTRUCTION FENCING

.1 Supply, install, and maintain for duration of work minimum 1.8m high welded-wire construction fence to prevent public access to construction zone and staging area where construction activities to occur or where

construction materials stored.

.2 Provide gates where required for access.

.3 Ensure each fence panel is staked into the ground with minimum 300mm long spikes or weighted with sandbags. Provide bracing to free ends.

.4 Respond to requests by Departmental Representative or PCA site staff to re-stand fallen fencing such that fencing is re-erected within 6 hours after normal work hours. Re-erect and further stabilize fallen fencing immediately during work hours.

.5 Provide secure coverings using fencing or other accepted method to prevent Public access to work areas during construction.

.6 Obtain Departmental Representative's approval on measures for "securing" fencing or stabilizing fencing before proceeding with work.

.7 Secure fence using methods accepted by Departmental Representative that do not damage site structures or site features.

.8 Do not drill into site structures or site features unless accepted by Departmental Representative in writing.

.9 Do not weld to steel components on-site to attach fencing.

.10 Immediately adjust fencing layout to suit changing conditions and address deficiencies.

.11 Remove fences in their entirety from site after work is completed. Make good any damage.

3.2 SCAFFOLDING

.1 Design, construct and maintain scaffolding in accordance with CSA Z797.
.1 Scaffolding to be subject to wind, rain, ice, snow and flooding.
.2 Scaffolding to cause no damage to heritage fabric of site such as; stone or other site features.
.3 Scaffolding to be designed, inspected and certified by Contractor's Engineer.

.2 Do not use lock chamber ladders to access work.

.3 Ensure transition area from stairs and ladders are safe and clear from obstructions and cross bracing.

.4 Ensure scaffolding setup to provide adequate height

and width for passage of workers and equipment through areas.
.1 Minimum height: 2m.
.2 Minimum width: 1m.

.5 Advance anchors only into joints of masonry walls using hardware and methodology approved by Departmental Representative. Do not advance anchors into stones to remain.
.1 Remove anchors from joints at end of work and fill holes with mortar to Section 04 43 04 – Repointing Stone Masonry.

.6 Protect masonry from damage at contact areas between scaffolding and masonry by using wood blocking.

.7 Scaffolding to remain in place in each staged area for duration of work including but not limited to preparation, inspection, heating, installation, and curing.

.8 Securely brace scaffolding to resist wind loads.

.9 Make periodic inspections of scaffolding as work progresses and immediately make good any damage or deficiencies.

.10 Immediately make changes to scaffolding required by Ministry of Labour officials.

.11 Do not load, or permit to be loaded, any part of work or temporary access structure with weight or force that endangers work or labourers.

3.3 SCAFFOLD STAIRCASE

.1 Design, construct and maintain scaffold staircases in accordance with CSA Z797.
.1 Scaffolding stairs to be subject to wind, rain, ice, snow and flooding.
.2 Scaffolding stairs to cause no damage to heritage fabric of site such as; stone or other site features.
.3 Scaffolding stairs to be designed, inspected and certified by Contractor's Engineer.

.2 Scaffold stairs to requirements for Scaffolding.

.3 Install scaffold staircase from coping level at top of wall to levels of lock where work takes place including at a minimum access to:
.1 Lock floors of all main lock chambers.
.2 Lock floor or lake bottom of upper wingwalls and stoplog gains work area.
.3 Lock floor or lake bottom of lower wingwalls and stoplog gains work area.
.4 Other work areas separated by Dewatering

Structures.

3.4 CONSTRUCTION TEMPORARY ACCESS ROUTES

.1 Construct and maintain temporary access routes to work and storage areas and work pads for construction activities.

.2 Improve temporary access routes and work pads to prevent damage to site structures and minimize damage to landscaping and trees during wet conditions.

.3 Install geotextile under temporary access route platform.
.1 Extend the edge of geotextile a minimum of 500mm beyond base of roadway platform.
.2 Lap joints a minimum of 600mm.

.4 Temporary Access Routes:
.1 Minimum 300mm of Granular B Type I compacted to 95% SPD
.2 Trenched silt fence along each side with filtration barrier at drainage outlet
.3 4m wide roadway platform with 2% cross fall.
.4 Embankments sloped at 3:1 beyond edge of roadway platforms
.5 Maximum slope: 10%

.5 Retain as much native vegetation as possible when constructing access roads, staging and parking areas.

3.5 ENCLOSURES

.1 Provide enclosures to Section 01 56 00 – Temporary Barriers and Enclosures.

3.6 BARRIERS

.1 Install barriers to Section 01 56 00 - Temporary Barriers and Enclosures.

3.7 ANCHORS

.1 If required, install anchors for scaffolding and barriers into masonry joints by method and using hardware approved by Departmental Representative.
.1 Do not drill into masonry stone except where accepted by Departmental Representative.
.2 Drill holes without damaging existing stone in accordance with Section 05 05 20 - Anchors.
.3 Remove anchors from joints at end of work and fill holes with mortar to Section 04 43 04 – Repointing Stone Masonry.

3.8 REMOVAL

.1 All material from the temporary roadway and temporary bearing assemblies shall be removed and disposed of off-site in accordance with Section 01 74 20 - Construction/Demolition Waste Management and Disposal.

3.9 REINSTATEMENT

.1 Reinstate all grassed areas affected by installation of temporary access route with sod.

.2 Water sod daily until establishment as confirmed by tug test. Allow for a minimum of 2 cuts with the first beginning no sooner than one week after laying and the 2 cuts being no less than one week apart.

.3 Reinstate existing access routes to original condition or better once temporary bridge and access road are removed.

.4 Reinstate site to existing condition or better. Perform site review with departmental representative prior to demobilization to obtain acceptance for reinstatement of site.

PART 1 – GENERAL

1.1 DESCRIPTION

.1 This section covers measurement of work for payment purposes, and scope of work included in pay items in Unit Price Table and Lump Sum Price Table.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Lump Sum Price Item - Work items not designated in Unit Price Table and not measured for payment to be paid as Lump Sum Price. These items include costs associated to perform work including but not limited to materials, equipment, personnel, overhead, etc.

.2 Unit Price Items - Items for which measurement to be made for payment using Unit Prices.

1.3 ACTION AND INFORMATION SUBMITTALS

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

.2 14 days following the award of the contract submit breakdown of Lump Sum price of Contract Amount in detail as directed by Departmental Representative. After approval by Departmental Representative cost breakdown will be used as basis for progress payments.

1.4 RELATED WORK

.1 Section 01 33 00 Submittal Procedures.

1.4 LUMPSUM PRICE TABLE

.1 Items included in Lump Sum Price are:

.1 Item No. L1 – Mobilization - Year 1
.2 Item No. L2 – Mobilization - Year 2
.3 Item No. L3 – Mobilization - Year 3
.4 Item No. L4 – Demobilization - Year 1
.5 Item No. L5 – Demobilization - Year 2
.6 Item No. L6 – Demobilization - Year 3
.7 Item No. L7 – General Work - Year 1
.8 Item No. L8 – General Work - Year 2
.9 Item No. L9 – General Work - Year 3
.10 Item No. L10 – Fees, Permits and Certificates
.11 Item No. L11 – Site Access - Year 1
.12 Item No. L12 – Site Access - Year 2
.13 Item No. L13 – Site Access - Year 3
.14 Item No. L14 – Construction Fence - Year 1
.15 Item No. L15 – Construction Fence - Year 2
.16 Item No. L16 – Construction Fence - Year 3

.17 Item No. L17 – Traffic Control - Year 1
.18 Item No. L18 – Traffic Control - Year 2
.19 Item No. L19 – Traffic Control - Year 3
.20 Item No. L20 – Environmental Procedures
.21 Item No. L21 – Quality Control - Year 1
.22 Item No. L22 – Quality Control - Year 2
.23 Item No. L23 – Quality Control - Year 3
.24 Item No. L24 – Connect and Set-up Utilities - Year 1
.25 Item No. L25 – Connect and Set-up Utilities - Year 2
.26 Item No. L26 – Connect and Set-up Utilities - Year 3
.27 Item No. L27 – Usage of Utilities - Year 1
.28 Item No. L28 – Usage of Utilities - Year 2
.29 Item No. L29 – Usage of Utilities - Year 3
.30 Item No. L30 – Heating Enclosures - Year 1
.31 Item No. L31 – Heating Enclosures - Year 2
.32 Item No. L32 – Heating Enclosures - Year 3
.33 Item No. L33 – Barricades and Enclosures - Year 1
.34 Item No. L34 – Barricades and Enclosures - Year 2
.35 Item No. L35 – Barricades and Enclosures - Year 3
.36 Item No. L36 – Document Existing Site Conditions
.37 Item No. L37 – Site Cleaning - Year 1
.38 Item No. L38 – Site Cleaning - Year 2
.39 Item No. L39 – Site Cleaning - Year 3
.40 Item No. L40 – Floor Debris Cleaning and Removal - Lock 46
.41 Item No. L41 – Floor Debris Cleaning and Removal - Lock 49
.42 Item No. L42 – Cleaning Lock Walls and Floors
.43 Item No. L43 – Clean Efflorescence Deposits - Exterior Monolith Face
.44 Item No. L44 – Snow Removal - Year 1
.45 Item No. L45 – Snow Removal - Year 2
.46 Item No. L46 – Snow Removal - Year 3
.47 Item No. L47 – Project Record Documents
.48 Item No. L48 – General Removals
.49 Item No. L49 – Reconstruct End Post (Lock 46 SW WW)
.50 Item No. L50 Metal Fabrications
.51 Item No. L51 Steel Raker Supports for Stop Logs / Cofferdam
.52 Item No. L52 Remove and Reinstate Electrical Utility - Lock 46
.53 Item No. L53 General Landscaping - Year 1
.54 Item No. L54 General Landscaping - Year 2
.55 Item No. L55 General Landscaping - Year 3 (Final Restoration)
.56 Item No. L56 Dewatering - Lock 46
.57 Item No. L57 Dewatering - Lock 47
.58 Item No. L58 Dewatering - Lock 48
.59 Item No. L59 Dewatering - Lock 49

1.5 UNIT PRICE TABLE

.1 Items included as Unit Price are:

.1 Item No. U1 - Concrete Removal - Horizontal Surface
.2 Item No. U2 - Concrete Removal - Vertical Surface
.3 Item No. U3 - Concrete Removal - Basin Wall
.4 Item No. U4 - Concrete Removal - Underwater
.5 Item No. U5 - Concrete Removal - Staircases
.6 Item No. U6 - Concrete Removal - Slab on Grade
.7 Item No. U7 - Concrete Removal - Sluice Tunnels
.8 Item No. U8 - Remove North Retaining Wall in Turning Basin
.9 Item No. U9 - Mill Concrete in Floor - Lock 47
.10 Item No. U10 - Mill Concrete in Floor – Lock 48
.11 Item No. U11 - Remove Pressure Relief Valves
.12 Item No. U12 - Remove Access Ladders
.13 Item No. U13 - Remove Stair Railings
.14 Item No. U14 - Remove Raised Wall and Monolith Railings
.15 Item No. U15 - Remove and Salvage Upper Anchorage for Mooring Lines
.16 Item No. U16 - Remove and Salvage Lower Anchorage for Mooring Lines
.17 Item No. U17 - Remove and Salvage Sluice Tunnel Valves and Frames
.18 Item No. U18 - Remove and Salvage Sluice Gate Winches and Salvage
.19 Item No. U19 - Remove and Salvage Masonry Cramps
.20 Item No. U20 - Remove and Salvage Pavers
.21 Item No. U21 - Remove Timber in Lock Floor
.22 Item No. U22 - Remove Asphalt
.23 Item No. U23 - Remove Trees
.24 Item No. U24 - Removal and Reinstallation of Lock Gates - Short
.25 Item No. U25 - Removal and Reinstallation of Lock Gates - Tall
.26 Item No. U26 - Water Blast Cleaning
.27 Item No. U27 - Water Blast Cleaning - Sluice Tunnels
.28 Item No. U28 - Galvanized Reinforcing Steel
.29 Item No. U29 - Galvanized Reinforcing Steel - Allowance (15M Bar)
.30 Item No. U30 - Galvanized Welded Wire Fabric
.31 Item No. U31 - Form Saver Coupler
.32 Item No. U32 - Cast-in-Place Concrete – Floors.
.33 Item No. U33 - Cast-in-Place Concrete - Walls
.34 Item No. U34 - Cast-in-Place Concrete - Sluice Tunnel Walls
.35 Item No. U35 - Cast-in-Place Concrete - Sluice Tunnel Soffit
.36 Item No. U36 - Cast-in-Place Concrete - Sluice Tunnel Floors
.37 Item No. U37 - Concrete Hand Patching - Sluice Tunnels

.38 Item No. U38 - Cast-in-Place Concrete - Turning Basin Retaining Wall (OPSD 3120.100)
.39 Item No. U39 - Concrete Repair - Formed – Staircases
.40 Item No. U40 - Mass Concrete over Bedrock - Lock 46
.41 Item No. U41 - Tremie Concrete - Formed - Lock 49
.42 Item No. U42 - Partial Depth Concrete Repairs - Horizontal
.43 Item No. U43 - Vertical Concrete Repairs (100-200mm)
.44 Item No. U44 - Vertical Proprietary Hand Patching (50mm)
.45 Item No. U45 - Vertical Proprietary Hand Patching (25mm)
.46 Item No. U46 - Basin Wall Repairs - Proprietary Hand Patching
.47 Item No. U47 - Concrete Seal for Basin Wall
.48 Item No. U48 - Concrete Slab-on-Grade
.49 Item No. U49 - PVC Waterstop
.50 Item No. U50 - Install Grout Tubes
.51 Item No. U51 - Install Deep Grout Tubes
.52 Item No. U52 - Install Grout Tubes - Sluice Tunnels
.53 Item No. U53 - Install Deep Grout Tubes - Sluice Tunnels
.54 Item No. U54 - Install Grout Tubes Underwater
.55 Item No. U55 - Install Deep Grout Tubes Underwater
.56 Item No. U56 - Install Deep Grout Tubes for Leaking Areas
.57 Item No. U57 - Install Deep Grout Tubes for Additional Leaking Areas
.58 Item No. U58 - Inject Grout in Walls
.59 Item No. U59 - Inject Grout - Sluice Tunnels

.60 Item No. U60 - Inject Grout in Walls - Underwater
.61 Item No. U61 - Additional Grout Injection
.62 Item No. U62 - Concrete Finish - Vertical Surfaces
.63 Item No. U63 - Concrete Finish - Horizontal Surfaces
.64 Item No. U64 - Raking Joints - Finish
.65 Item No. U65 - Raking Joints - Back
.66 Item No. U66 - Raking Joints - Deep Back
.67 Item No. U67 - Finish Pointing
.68 Item No. U68 - Back Pointing
.69 Item No. U69 - Deep Back Pointing
.70 Item No. U70 - Raking Joints - Finish - Sluice Tunnels
.71 Item No. U71 - Raking Joints - Back - Sluice Tunnels
.72 Item No. U72 - Raking Joints - Deep Back - Sluice Tunnels
.73 Item No. U73 - Finish Pointing - Sluice Tunnels

.74 Item No. U74 - Back Pointing - Sluice Tunnels
.75 Item No. U75 - Deep Back Pointing - Sluice Tunnels
.76 Item No. U76 - Underwater Joint Raking
.77 Item No. U77 - Underwater Pointing
.78 Item No. U78 - Stone Removal
.79 Item No. U79 - Stone Removal for Salvage
.80 Item No. U80 - Stone Removal for Dutchman Repairs
.81 Item No. U81 - Stone Removal - Sluice Tunnel Walls
.82 Item No. U82 - Stone Removal - Sluice Tunnel Soffit
.83 Item No. U83 - Stone Removal - Sluice Tunnel Floors
.84 Item No. U84 - Stone Removal - Staircases
.85 Item No. U85 - Stone Removal - Drainage for Chamber Floor
.86 Item No. U86 - Underwater Stone Removal for Dutchman Repairs
.87 Item No. U87 - Cut Stone - Full Dutchman
.88 Item No. U88 - Cut Stone - Full Dutchman - Special
.89 Item No. U89 - Cut Stone - Partial Dutchman
.90 Item No. U90 - Cut Stone - Full Stone
.91 Item No. U91 - Cut Stone - Full Stone - Special
.92 Item No. U92 - Install Stone - Full Dutchman
.93 Item No. U93 - Install Stone - Full Dutchman - Special
.94 Item No. U94 - Install Stone - Partial Dutchman
.95 Item No. U95 - Install Stone - Full Stone
.96 Item No. U96 - Install Stone - Full Stone - Special
.97 Item No. U97 - Install Stone - Underwater - Full Dutchman
.98 Item No. U98 - Install Stone - Underwater - Partial Dutchman
.99 Item No. U99 - Install Stone - Staircases
.100 Item No. U100 - Anchor Type B1
.101 Item No. U101 - Anchor Type B2
.102 Item No. U102 - Anchor Type B3 (not used)
.103 Item No. U103 - Anchor Type B4 (not used)
.104 Item No. U104 - Anchor Type B5
.105 Item No. U105 - Anchor Dowel Type D1
.106 Item No. U106 - Anchor Dowel Type D2 (not used)
.107 Item No. U107 - Anchor Dowel Type D3
.108 Item No. U108 - Anchor Dowel Type D4
.109 Item No. U109 - Anchor Dowel Type D5
.110 Item No. U110 - Anchor Dowel Type D6
.111 Item No. U111 - Anchor Dowel Type D7
.112 Item No. U112 - Anchor Dowel Type D8
.113 Item No. U113 - Anchor Dowel Type D9
.114 Item No. U114 - Supply and Install Pressure Relief Valves
.115 Item No. U115 - Supply and Install Access Ladders
.116 Item No. U116 - Supply and Install Stair Railings
.117 Item No. U117 - Supply and Install Raised Wall and Monolith Railings
.118 Item No. U118 - Supply and Install Upper Anchorage for Mooring Line

.119 Item No. U119 - Supply and Install Lower Anchorage for Mooring Line
.120 Item No. U120 - Reinstate Salvaged Sluice Tunnel Valves and Frames
.121 Item No. U121 - Reinstate Salvaged Sluice Gate Winches
.122 Item No. U122 - Reinstall Salvaged Masonry Cramps
.123 Item No. U123 - Replace Timbers in Lock Floor
.124 Item No. U124 - Penetrating Concrete Sealer
.125 Item No. U125 - Bedrock Removals
.126 Item No. U126 - Common Excavation
.127 Item No. U127 - Bedding - Sand
.128 Item No. U128 - Bedding - Granular
.129 Item No. U129 - Backfilling
.130 Item No. U130 - Rip-Rap
.131 Item No. U131 - Flagstone Pavers
.132 Item No. U132 - Flagstone (100mm thick) (Not Used)
.133 Item No. U133 - Flagstone (300mm thick)
.134 Item No. U134 - Reinstate Existing Pavers

1.6 UNIT PRICE ITEM DESCRIPTIONS

.1 Item No. U1 - Concrete Removal - Horizontal Surface:
.1 This item to be paid at unit price by cubic metre of concrete removed from horizontal surfaces. This item includes work described in Section 02 41 18 related to concrete removal.

.2 Item No. U2 - Concrete Removal - Vertical Surface:
.1 This item to be paid at unit price by cubic metre of concrete removed from vertical surfaces. This item includes work described in Section 02 41 18 related to concrete removal.

.3 Item No. U3 - Concrete Removal - Basin Wall:
.1 This item to be paid at unit price by cubic metre of concrete removed from the basin wall. This item includes work described in Section 02 41 18 related to concrete removal.

.4 Item No. U4 - Concrete Removal - Underwater:
.1 This item to be paid at unit price by cubic metre of concrete removed from underwater components using divers. This item includes work described in Section 02 41 18 related to concrete removal underwater and includes all diving related cost.

.5 Item No. U5 - Concrete Removal - Staircases:
.1 This item to be paid at unit price by cubic metre of concrete removed from the existing concrete staircases. This item includes work described in Section 02 41 18 related to concrete removal.

.6 Item No. U6 - Concrete Removal - Slab on Grade:
.1 This item to be paid at unit price by cubic metre

of concrete removed of the existing concrete slab on grade. This item includes work described in Section 02 41 18 related to concrete removal.

.7 Item No. U7 - Concrete Removal - Sluice Tunnels:
.1 This item to be paid at unit price by cubic metre of concrete removed from the sluice tunnel walls, floors and ceiling. This item includes all associated costs related to work inside the sluice tunnels. This item includes work described in Section 02 41 18 related to concrete removal.

.8 Item No. U8 - Remove North Retaining Wall in Turning Basin:
.1 This item to be paid at unit price by cubic metre of concrete removed from the existing north retaining wall of the turning basin. This item includes work described in Section 02 41 18 related to concrete removal.

.9 Item No. U9 – Mill Concrete in Floor – Lock 47:
.1 This item to be paid at unit price by cubic metre of concrete removed. This item includes work described in Section 02 41 18 related to concrete removal.

.10 Item No. U10 - Mill Concrete in Floor – Lock 48
.1 This item to be paid at unit price by cubic metre of concrete removed. This item includes work described in Section 02 41 18 related to concrete removal.

.11 Item No. U11 - Remove Pressure Relief Valves:
.1 This item to be paid at the unit price by each pressure relief valve removed. This item includes work described in Section 02 41 21.

.12 Item No. U12 - Remove Access Ladders
.1 This item to be paid at the unit price by each access ladder removed. This item includes work described in Section 02 41 21.

.13 Item No. U13 - Remove Stair Railings
Item No. U14 - Remove Raised Wall and Monolith Railings
.1 These items to be paid at unit price by linear metre of existing railing removed. This item includes work described in Section 02 41 21.

.14 Item No. U15 - Remove and Salvage Upper Anchorage for Mooring Lines
.15 Item No. U16 - Remove and Salvage Lower Anchorage for Mooring Lines
.1 These items to be paid at the unit price by each anchorage removed. This item includes work described in Section 02 41 21.

.16 Item No. U17 - Remove and Salvage Sluice Tunnel Valves and Frames

.1 This item to be paid at unit price by each valve and frame assembly removed, salvaged and delivered to PCA (one per sluice tunnel). This item includes work described in Section 02 41 21.

.17 Item No. U18 - Remove and Salvage Sluice Gate Winches and Salvage
.1 This item to be paid at unit price by each sluice gate winch removed and salvaged. This item includes work described in Section 02 41 21.

.18 Item No. U19 - Remove and Salvage Masonry Cramps
.1 This item to be paid at unit price by each cramp removed and salvaged. This item includes work described in Section 02 41 21.

.19 Item No. U20 - Remove and Salvage Pavers
.1 This item to be paid at unit price by square metre of existing pavers removed and salvaged for re-use. This item includes work described in Section 02 41 21.

.20 Item No. U21 - Remove Timber in Lock Floor
.1 This item to be paid at unit price by square metre of timber floor removed. This item includes work described in Section 02 41 21.

.21 Item No. U22 - Remove Asphalt
.1 This item to be paid at unit price by square metre of existing asphalt removed. This item includes work described in Section 02 41 21.

.22 Item No. U23 - Remove Trees
.1 This item to be paid at unit price by each Tree Removed and salvaged for re-use. This item includes work described in Section 02 41 21

.23 Item No. U24 - Removal and Reinstallation of Lock Gates – Short
.1 This item to be paid at the unit price by each short lock gate removed and reinstalled. This item includes work described in Section 02 42 01.

.24 Item No. U25 - Removal and Reinstallation of Lock Gates - Tall
.1 This item to be paid at the unit price by each tall lock gate removed and reinstalled. This item includes work described in Section 02 42 01.

.25 Item No. U26 - Water Blast Cleaning
.1 This item to be paid at unit price by square metre of concrete and stone surfaces which are specified to be water blast cleaned. This item includes work described in Section 03 00 99.

.26 Item No. U27 - Water Blast Cleaning - Sluice Tunnels
.1 This item to be paid at unit price by square metre

of concrete and stone surfaces which are specified to be water blast cleaned. This item includes all associated costs related to work inside the sluice tunnels. This item includes work described in Section 03 00 99.

.27 Item No. U28 - Galvanized Reinforcing Steel
.1 Galvanized reinforcing Steel to be paid at unit price by unit of tonnes of reinforcing steel installed. This item includes work described in Section 03 20 00 related to concrete reinforcing using reinforcing steel.

.28 Item No. U29 - Galvanized Reinforcing Steel - Allowance (15M Bar)
.1 allowance for additional galvanized reinforcing steel to be paid at unit price by unit of tonnes of reinforcing steel supplied to the site, installed and accepted into the work. This item includes work described in Section 03 20 00 related to concrete reinforcing using reinforcing steel.

.29 Item No. U30 - Galvanized Welded Wire Fabric
.1 Galvanized welded wire fabric to be paid at unit price by unit of square metres of fabric installed. This item includes work described in Section 03 20 00 related to concrete reinforcing.

.30 Item No. U31 - Form Saver Coupler
.1 Form to be paid at unit price by each coupler supplied, installed and accepted into the work. This item includes work described in Section 03 20 00 related to concrete reinforcing.

.31 Item No. U32 - Cast-in-Place Concrete – Floors.
.1 Cast-in-place Concrete in floors to be paid by unit price of cubic metres of concrete placed and accepted in-place. This item includes work described in Section 03 30 00.

.32 Item No. U33 - Cast-in-Place Concrete - Walls
.1 Cast-in-place Concrete in walls to be paid by unit price of cubic metres of concrete placed and accepted in-place. This item includes work described in Section 03 30 00.

.33 Item No. U34 - Cast-in-Place Concrete - Sluice Tunnel Walls
.1 Cast-in-place Concrete in the sluice tunnel walls to be paid by unit price of cubic metres of concrete placed and accepted in-place. This item includes work described in Section 03 30 00.

.34 Item No. U35 - Cast-in-Place Concrete - Sluice Tunnel Soffit
.1 Cast-in-place Concrete in the sluice tunnel

soffit to be paid by unit price of cubic metres of concrete placed and accepted in-place. This item includes work described in Section 03 30 00.

.35 Item No. U36 - Cast-in-Place Concrete - Sluice Tunnel Floors
.1 Cast-in-place Concrete in the sluice tunnel floors to be paid by unit price of cubic metres of concrete placed and accepted in-place. This item includes work described in Section 03 30 00.

.36 Item No. U37 - Concrete Hand Patching - Sluice Tunnels
.1 Concrete Hand Patching in sluice tunnels to be paid by unit price of cubic metres of concrete placed and accepted in-place. This item includes work described in Section 03 30 00.

.37 Item No. U38 - Cast-in-Place Concrete - Turning Basin Retaining Wall (OPSD 3120.100)
.1 Cast-in-place Concrete in turning basin retaining wall to be paid by unit price of cubic metres of concrete placed and accepted in-place. This item includes work described in Section 03 30 00.

.38 Item No. U39 - Concrete Repair - Formed – Staircases
.1 Formed surface concrete repairs on staircases to be paid by unit price of cubic metres of concrete placed and accepted in-place. This item includes work described in Section 03 30 00.

.39 Item No. U40 - Mass Concrete over Bedrock - Lock 46
.1 Mass Concrete over bedrock to be paid by unit price of cubic metres of concrete placed and accepted in-place. This item includes work described in Section 03 30 00.

.40 Item No. U41 - Tremie Concrete - Formed - Lock 49
.1 Tremie concrete to be paid by unit price of cubic metres of concrete placed and accepted in-place. This item includes work described in Section 03 30 00.

.41 Item No. U42 - Partial Depth Concrete Repairs - Horizontal
.1 Partial depth concrete repairs to horizontal surfaces to be paid by unit price of cubic metres of concrete placed and accepted in-place. This item includes work described in Section 03 30 00.

.42 Item No. U43 - Vertical Concrete Repairs (100-200mm)
.1 Formed vertical patches to be paid by unit price of metre cubed of concrete repairs placed and accepted in-place. This item includes work described in Section 03 30 00.

.43 Item No. U44 - Vertical Proprietary Hand Patching (50mm)

.44 Item No. U45 - Vertical Proprietary Hand Patching (25mm)
.1 Proprietary vertical hand patches to be paid by unit price of square metres of patch placed and accepted in-place. This item includes work described in Section 03 30 00.

.45 Item No. U46 - Basin Wall Repairs - Proprietary Hand Patching
.1 Proprietary hand patches to be paid by unit price of square metres of patch placed and accepted in-place. This item includes work described in Section 03 30 00.

.46 Item No. U47 - Concrete Seal for Basin Wall
.1 Concrete seal to be paid by unit price of cubic metres of concrete placed and accepted in-place. This item includes work described in Section 03 30 00.

.47 Item No. U48 - Concrete Slab-on-Grade
.1 Concrete seal to be paid by unit price of metres squared of concrete placed and accepted in-place. This item includes work described in Section 03 30 00.

.48 Item No. U49 - PVC Waterstop
.1 PVC waterstops to be paid by unit price of linear metre of waterstop installed and accepted in-place. This item includes work described in Section 03 30 00.

.49 Item No. U50 - Install Grout Tubes
Item No. U51 - Install Deep Grout Tubes
.1 Installing grout tubes to be paid by unit price of each grout tube installed and accepted in-place. These items include work described in Section 03 03 09.

.50 Item No. U52 - Install Grout Tubes - Sluice Tunnels
Item No. U53 - Install Deep Grout Tubes - Sluice Tunnels
.1 Installing grout tubes in sluice tunnels to be paid by unit price of each grout tube installed and accepted in-place. These items shall include all costs associated with work inside the sluice tunnels. These items include work described in Section 03 03 09.

.51 Item No. U54 - Install Grout Tubes Underwater
Item No. U55 - Install Deep Grout Tubes Underwater
.1 Installing underwater grout tubes to be paid by unit price of each grout tube installed and accepted in-place. These items include work described in Section 03 03 09.

.52 Item No. U56 - Install Deep Grout Tubes for Leaking Areas
Item No. U57 - Install Deep Grout Tubes for Additional Leaking Areas
.1 Installing deep grout tubes for leaking areas to be paid by unit price of each grout tube installed and accepted in-place. These items include work

described in Section 03 03 09.

.53 Item No. U58 - Inject Grout in Walls
.1 Injection grouting of voids in walls to be paid at unit price by unit of metre cubed of grout injected into wall. This item includes work described in Section 03 03 09 related to mixing and grout injection including costs of labour, plant, equipment, supplies, cost of water for mixes, and supply of pressurized grout.

.54 Item No. U59 - Inject Grout - Sluice Tunnels
.1 Injection grouting in sluice tunnels to be paid at unit price by unit of metre cubed of grout injected into the walls, floors and ceilings of the sluice tunnels. This item includes work described in Section 03 03 09 related to mixing and grout injection including costs of labour, plant, equipment, supplies, cost of water for mixes, and supply of pressurized grout. This item shall include all costs associated with work inside the sluice tunnels.

.55 Item No. U60 - Inject Grout in Walls - Underwater
.1 Underwater injection grouting of voids in walls to be paid at unit price by unit of metre cubed of grout injected into wall. This item includes work described in Section 03 03 09 related to underwater grouting including costs of labour, plant, equipment, supplies, cost of water for grout mixes, supply of pressurized grout and diving related cost.

.56 Item No. U61 – Additional Grout Injection:
.1 Additional injection grouting of actively leaking areas of walls to be paid at unit price by unit of metre cubed of grout injected into wall. This item includes work described in Section 03 03 09 related to mixing and grout injection including costs of labour, plant, equipment, supplies, cost of water for mixes, and supply of pressurized grout.

.57 Item No. U62 – Concrete Finish – Vertical Surfaces:
.1 Concrete finishing to be paid by unit price of square metre of concrete surface finished and accepted in place. These items include work described in Section 03 30 00.

.58 Item No. U63 – Concrete Finish – Horizontal Surfaces:
.1 Concrete finishing to be paid by unit price of square metre of concrete surface finished and accepted in place. These items include work described in Section 03 30 00.

.59 Item No. U64 - Raking Joints - Finish.
.1 Item to be paid at unit price by unit linear metre of joint mortar removed to depth of 35mm from masonry surface. This item includes work described in Section

04 43 04 required for joint raking.

.60 Item No. U65 - Raking Joints - Back.
.1 Item to be paid at unit price by unit linear metre of joint mortar removed to depth of 75mm from masonry surface. This item includes work described in Section 04 43 04 required for joint raking.

.61 Item No. U66 - Raking Joints - Deep Back.
.1 Item to be paid at unit price by unit linear metre of joint mortar removed to depth of 300mm from masonry surface. This item includes work described in Section 04 43 04 required for joint raking.

.62 Item No. U67 - Finish Pointing:
.1 Finish Pointing to be paid at unit price by unit linear metre of finish pointing installed. This item includes work described in Section 04 43 04 required for finish pointing. This item to be measured in linear metres calculated from neat dimensions indicated on drawings or authorized in writing by Departmental Representative.

.63 Item No. U68 - Back Pointing:
.1 Back Pointing to be paid at unit price by unit linear metre of back pointing installed. This item includes work described in Section 04 43 04 required for back pointing. This item to be measured in linear metres calculated from neat dimensions indicated on drawings or authorized in writing by Departmental Representative.

.64 Item No. U69 - Deep Back Pointing:
.1 Deep Back Pointing to be paid at unit price by unit linear metre of deep back pointing installed. This item includes work described in Section 04 43 04 required for back pointing. This item to be measured in linear metres calculated from neat dimensions indicated on drawings or authorized in writing by Departmental Representative.

.65 Item No. U70 - Raking Joints – Finish – Sluice Tunnels.
.1 Item to be paid at unit price by unit linear metre of joint mortar removed to depth of 35mm from masonry surface. This item includes all costs associated with work inside the sluice tunnels. This item includes work described in Section 04 43 04 required for joint raking.

.66 Item No. U71 -Raking Joints - Back – Sluice Tunnels.
.1 Item to be paid at unit price by unit linear metre of joint mortar removed to depth of 75mm from masonry surface. This item includes all costs associated with work inside the sluice tunnels. This item includes work described in Section 04 43 04 required for joint raking.

.67 Item No. U72 -Raking Joints - Deep Back – Sluice Tunnels.

.1 Item to be paid at unit price by unit linear metre of joint mortar removed to depth of 300mm from masonry surface. This item includes all costs associated with work inside the sluice tunnels. This item includes work described in Section 04 43 04 required for joint raking.

.68 Item No. U73 - Finish Pointing – Sluice Tunnels:

.1 Finish Pointing to be paid at unit price by unit linear metre of finish pointing installed. This item includes all costs associated with work inside the sluice tunnels. This item includes work described in Section 04 43 04 required for finish pointing. This item to be measured in linear metres calculated from neat dimensions indicated on drawings or authorized in writing by Departmental Representative.

.69 Item No. U74 - Back Pointing – Sluice Tunnels:

.1 Back Pointing to be paid at unit price by unit linear metre of back pointing installed. This item includes all costs associated with work inside the sluice tunnels. This item includes work described in Section 04 43 04 required for back pointing. This item to be measured in linear metres calculated from neat dimensions indicated on drawings or authorized in writing by Departmental Representative.

.70 Item No. U75 - Deep Back Pointing – Sluice Tunnels:

.1 Deep Back Pointing to be paid at unit price by unit linear metre of deep back pointing installed. This item includes all costs associated with work inside the sluice tunnels. This item includes work described in Section 04 43 04 required for back pointing. This item to be measured in linear metres calculated from neat dimensions indicated on drawings or authorized in writing by Departmental Representative.

.71 Item No. U76 – Underwater Joint Raking:

.1 Underwater joint raking to be paid at unit price by linear metre of joint raking performed to specified depth. This item includes work described in Section 04 43 04 required for underwater raking, including diving related expenses.

.72 Item No. U77 - Underwater Pointing:

.1 Underwater pointing to be paid at unit price by linear metre of underwater pointed joint. This item includes work described in Section 04 43 04 required for underwater pointing, including diving related expenses.

.73 Item No. U78 - Stone Removal
Item No. U79 - Stone Removal for Salvage

Item No. U80 - Stone Removal for Dutchman Repairs
Item No. U81 - Stone Removal - Sluice Tunnel Walls
Item No. U82 - Stone Removal - Sluice Tunnel Soffit
Item No. U83 - Stone Removal - Sluice Tunnel Floors
Item No. U84 - Stone Removal - Staircases
Item No. U85 - Stone Removal - Drainage for Chamber Floor
Item No. U86 - Underwater Stone Removal for Dutchman Repairs
.1 Above stone removal items to be paid at unit price by cubic metre of actual stone removal, not counting mortar or joints. This item includes work described in Section 04 43 05.

.74 Item No. U87 - Cut Stone - Full Dutchman
Item No. U88 - Cut Stone - Full Dutchman - Special
Item No. U89 - Cut Stone - Partial Dutchman
Item No. U90 - Cut Stone - Full Stone
Item No. U91 - Cut Stone - Full Stone - Special
.1 Above items for cut stone to be paid at unit price by cubic metre of stone that is supplied, cut, finished, delivered, and accepted into the work. Dimensions to be measured to centimetre accuracy and agreed upon with Departmental Representative. Includes work described in Section 04 43 06.

.75 Item No. U92 - Install Stone - Full Dutchman
Item No. U93 - Install Stone - Full Dutchman - Special
Item No. U94 - Install Stone - Partial Dutchman
Item No. U95 - Install Stone - Full Stone
Item No. U96 - Install Stone - Full Stone - Special
Item No. U97 - Install Stone - Underwater - Full Dutchman
Item No. U98 - Install Stone - Underwater - Partial Dutchman
Item No. U99 - Install Stone – Staircases:
.1 Installation of stone masonry to be paid at unit price by cubic metre of stone installed and accepted in wall. This item includes work described in Section 04 43 07 related to stone installations.

.78 Item No. U100 – Anchor Type B1,
Item No. U101 – Anchor Type B2,
Item No. U102 – Anchor Type B3 (Not used),
Item No. U103 – Anchor Type B4 (Not used),
Item No. U104 – Anchor Type B5,
Item No. U105 – Anchor Dowel Type D1,
Item No. U106 – Anchor Dowel Type D2 (Not used),
Item No. U107 – Anchor Dowel Type D3,
Item No. U108 – Anchor Dowel Type D4,
Item No. U109 – Anchor Dowel Type D5,
Item No. U112 – Anchor Dowel Type D8,
Item No. U113 – Anchor Dowel Type D9,
.1 Anchors to be measured and paid at unit price for each type of anchor supplied, installed and accepted in place including labour and materials. These

items include work described in Section 05 05 20 related to anchor and dowel installations.

.79 Item No. U110 – Anchor Dowel Type D6,
Item No. U111 – Anchor Dowel Type D7,
.1 Anchors for work in sluice tunnels to be measured and paid at unit price for each type of anchor supplied, installed and accepted in place including labour and materials. These items include work described in Section 05 05 20 related to anchor and dowel installations. These items include all associated costs related to work inside the sluice tunnels.

.80 Item No. U114 - Supply and Install Pressure Relief Valves
.1 Supply and installation of pressure relief valves in the lock floors is paid at unit price for each valve supplied, installed and accepted into the work. This item includes work described in Section 05 50 00.

.81 Item No. U115 - Supply and Install Access Ladders
.1 This item to be paid at unit price for each access ladder that supplied, installed and accepted into the work. This item includes work described in Section 05 50 00.

.82 Item No. U116 - Supply and Install Stair Railings
Item No. U117 - Supply and Install Raised Wall and Monolith Railings
.1 New railings to be paid at unit price for each linear metre of railing supplied, installed and accepted into the work. This item includes work described in Section 05 50 00.

.83 Item No. U118 - Supply and Install Upper Anchorage for Mooring Line
Item No. U119 - Supply and Install Lower Anchorage for Mooring Line
.1 Reset mooring line anchorages to be paid at unit price for each anchorage reset and accepted into the work. This item includes work described in Section 05 50 00.

.84 Item No. U120 - Reinstate Salvaged Sluice Tunnel Valves and Frames
Item No. U121 - Reinstate Salvaged Sluice Gate Winches
Item No. U122 - Reinstall Salvaged Masonry Cramps
.1 These items to be paid at unit price for each element that is refurbished, reinstalled and accepted into the work. This item includes work described in Section 05 50 00.

.85 Item No. U123 - Replace Timbers in Lock Floor
.1 This item to be paid at unit price by square metre of timber floor replaced and accepted into the work.

This item includes work described in Section 06 10 53.

.86 Item No. U124 - Penetrating Concrete Sealer
.1 This item to be paid at unit price by square metre of concrete sealer applied to surfaces which are specified to be sealed. This item includes work described in Section 07 19 00.

.87 Item No. U125 - Bedrock Removals
.1 Bedrock removal to be paid at unit price by cubic metre of rock material excavated. This item includes work described in Section 31 23 00.

.88 Item No. U126 - Common Excavation
.1 Common Excavation to be paid at unit price by cubic metre of common material excavated. This item includes work described in Section 31 23 15.

.89 Item No. U127 - Bedding – Sand
Item No. U128 - Bedding - Granular
.1 Bedding to be paid at unit price by tonne of material placed and compacted. This item includes work described in Section 31 23 15 related to sand and granular bedding.

.90 Item No. U129 - Backfilling
.1 Backfilling to be paid at unit price by tonne of granular material placed and compacted. This item includes work described in Section 31 23 15 related to backfilling with granular backfill.

.91 Item No. U130 - Rip-Rap
.1 Rip-Rap to be paid at unit price by tonnes of material supplied, placed and accepted into the work. This item includes work described in Section 31 37 00 related to Rip-Rap.

.92 Item No. U131 - Flagstone Pavers
Item No. U132 - Flagstone (100mm thick) (Not Used)
Item No. U133 - Flagstone (300mm thick)
.1 This item includes the supply and installation of flagstone pavers and is to be paid at unit price by square metre of stone installed and accepted in the work. This item includes work described in Section 04 43 07 related to stone installations.

.93 Item No. U134 - Reinstate Existing Pavers
.1 This item to be paid at unit price by square metre of stone reinstalled and accepted into the work. This item includes work described in Section 32 94 00.

PART 2 – PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 – EXECUTION

3.1 NOT USED

.1 Not used.

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, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Monday to Friday, inclusive, 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 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, Certificate of Substantial Performance and Certificate of Completion as defined times of completion are of essence of this contract.

1.3 ACTION AND INFORMATION SUBMITTALS

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

.2 Submit Master Plan Contract Bar (GANTT) Chart to Departmental Representative within 10 working days of Award of Contract 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 Stone supply lead time to be included in schedule.

1.4 RELATED WORK

.1 Section 01 11 00 - General Instructions

.2 Section 01 14 00 – Work Restrictions for critical dates

.3 Section 01 33 00 - Submittal Procedures.

1.5 PROJECT KEY DATES

.1 Identify critical dates in Construction Schedule.

.2 Refer to Section 01 11 00 - General Instructions and Section 01 14 00 – Work Restrictions for critical dates

1.6 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).

.2 Departmental Representative to review and return revised schedules within 5 working days.

.3 Revise impractical schedule and resubmit within 5 working days.

.4 Accepted revised schedule to become Master Plan and be used as baseline for updates.

1.7 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule respects submittal requirements and key project dates identified earlier, and identifies project milestones.

1.8 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule on weekly basis and with request for progress payment, 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.

.3 Discuss Project Schedule at regular site meetings with updates.

.4 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.

.5 Weather related delays with their remedial measures to be discussed and negotiated.

1.9 PROGRESS PAYMENT REQUEST

.1 Progress schedule is to accompany Request for Progress Payment. If project is behind schedule, Contractor is to provide measures to regain slippage.

PART 2 – PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 – EXECUTION

3.1 NOT USED

.1 Not used.

u

PART 1 – GENERAL

1.1 DESCRIPTION

.1 This section specifies general requirements and procedures for Contractor's submissions of shop drawings, product data and samples to Departmental Representative for review.

.2 Additional specific requirements for submissions are specified in individual sections of Divisions 01 to 35.

1.2 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 Work covered by this section not considered separately for payment when submittals are incidental to specific work items.

.3 If not covered elsewhere, payment for Engineering, inspection and testing to be included in Lump Sum Price:
.1 Item No. L21 - Quality Control – Year 1.
.2 Item No. L22 - Quality Control – Year 2.
.3 Item No. L23 - Quality Control – Year 3.

1.4 ADMINISTRATIVE

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

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

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

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

.5 Contractor to review submittals and stamp, sign and date submittals prior to submission to Departmental

Representative. This review represents that necessary requirements have been determined and verified, or to be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents.

.6 Submittals not stamped, signed, dated and identified as to specific project to be returned without being examined and considered rejected.

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

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

.9 Present calculation briefs containing all information required to support detailed design of structures as indicated in these specifications.

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

.11 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review and acceptance.

.12 Keep one reviewed and accepted copy of each submission on site.

.13 Submit two (2) hard copies of each submittal as well as an electronic copy in .pdf format. Forward PDF files through email or alternate means as directed by Departmental Representative.

1.5 SHOP DRAWINGS AND PRODUCT DATA

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

.2 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work.

.4 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 to be supplied and installed. Indicate cross references to design drawings and specifications.

.5 Allow 5 working days for Departmental Representative's review of each submission.

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

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

.8 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.

.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 design, installation, performance verification and decommissioning of temporary and permanent works, including load bearing structures duly stamped by a professional engineer (with Canadian related experience to items of work being designed) as specified in the respective Sections including:
.1 Design methodology including criteria, assumptions, and standards.
.2 Calculations.
.3 Details.

.6 Details of appropriate portions of Work as

applicable:

.1 Fabrication.
.2 Layout, showing dimensions, including identified field dimensions, and clearances.
.3 Setting or erection details.
.4 Capacities.
.5 Performance characteristics.
.6 Standards.
.7 Operating weight.
.8 Wiring diagrams.
.9 Single line and schematic diagrams.
.10 Relationship to adjacent work.

.10 After Departmental Representative's review and acceptance, distribute copies.

.11 Submit three hard copies and one electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

.12 Submit three hard copies and one electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings to not be prepared due to standardized manufacture of product. Clearly identify product to be used.

.13 Submit three hard copies and one electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accordance with specified requirements.
.2 Testing must have been within 3 years of specific work commencement.

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

.15 Submit electronic copies of manufacturer’s instructions for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

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

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

.18 Delete information not applicable to project.

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

.20 Verify field measurements and affected adjacent work are coordinated.

.21 Submit MSDS sheets as required in Section 01 35 29 - Health and Safety Requirements.

.22 Submit Product Technical Data Sheets (PTDS).

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

.24 The review of shop drawings by Departmental Representative is for sole purpose of ascertaining conformance with general concept.

.1 This review does not mean that the Departmental Representative approves detail design inherent in shop drawings, responsibility for which remains with Contractor submitting same, and such review does not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.

.2 The Contractor is responsible for ensuring dimensions are 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.

.25 Submittals include but are not limited to:
.1 Notice of Project
.2 Master Plan (Bar “GANTT” Chart)
.3 Project Schedule
.4 Contract Amount Breakdown
.5 Project Payment Schedule
.6 Site Layout Plan
.7 Site Access Plan
.8 Minutes of Meetings
.9 Copies of Orders, Directions, and Reports Issued by Agencies Having Authority
.10 Quality Control and Inspection Testing Plan
.11 Quality Control and Inspection Testing Reports
.12 Material Safety Data Sheets (MSDS)
.13 Materials and Equipment Technical Data Sheets
.14 Manufacturer’s Instructions, Guarantees, Warranties, and Product Data and Literature
.15 Survey Report of Existing Site Conditions
.16 Photos of Existing Site Conditions
.17 Traffic Control and Management Plan
.18 Site Specific Health and Safety Plan
.19 Site Specific Health and Safety Plan for Diving Operations
.20 Incident and Accident Reports
.21 Worksite Health and Safety Reports
.22 Workplace Safety and Insurance Board Experience Rating Report
.23 Hazardous Material Handling Plan
.24 Construction Safety Checklists
.25 Environmental Protection Plan
.26 Erosion, Sediment, and Dust Control Plan
.27 Work Area Plan
.28 Spill Control Plan
.29 Non-hazardous Waste Disposal Plan
.30 Air Pollution Control Plan
.31 Contaminant Prevention Plan
.32 Waste Water Management Plan
.33 Historical, Archaeological, Cultural Resources, Biological Resources and Wetlands Plan
.34 Pesticide Treatment Plan
.35 Water Quality Testing Reports
.36 Waste Numbers and Permits
.37 Hazardous Material Disposal Permits and Certificates
.38 Waste Reduction Workplan
.39 Snow Removal Plan
.40 Excavation Plan
.41 Shoring Shop Drawings
.42 Backfill Material Testing Report
.43 Flagstone Paving Plan
.44 Engineered Methodology and Work Sequence for Masonry Work
.45 Mason’s Resumes and Certificate
.46 Mortar Mix Design and Quality Control Test

Results
.47 Stone Technical Data Sheets
.48 Stone Dimension Table
.49 Stone Installation Procedures
.50 Grouting Plan
.51 Grouting Product Data
.52 List of Grouting Equipment
.53 Grouting Test Plan
.54 Grouting Logs
.55 Concrete Mix Design
.56 Shop Drawings for Reinforcement
.57 Shop Drawings for Formwork and Falsework
.58 Daily Temperature Logs
.59 Diving Plan
.60 Dewatering Plan
.61 Gate Survey Report
.62 Gate Removal Plan
.63 Gate Testing Plan
.64 Shop Drawings for Metal Fabrications
.65 Shop Drawings for New Pressure Relief Valves

1.6 SAMPLES

.1 "Samples" means examples of materials, equipment, quality, finishes, workmanship.

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

.3 If delivering samples to Departmental Representative's business address, courier must be prepaid.

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

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

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

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

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

.9 Samples to be submitted include but are not limited

to:
.1 Cut and finished Stone
.2 Mortar
.3 Grout
.4 Concrete
.5 Flagstone
.6 Bedding Material
.7 Backfill Material
.8 Samples of Materials, Equipment, Quality, Finishes, and Workmanship

1.7 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers Safety and Insurance Board Experience Report.

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

1.8 ELECTRONIC FILES

.1 When submissions are created electronically, the contractor is to make copies of all electronic records which are produced for the submissions listed in this section. This includes, but is not limited to, drawings, documents, and spreadsheet files.
.1 All files are to be properly labeled and placed in a well organized folder structure.
.2 The data is to be stored on a memory stick.
.3 The following are the preferred electronic file formats:
.1 General: Adobe Acrobat PDF, open, editable, unlocked.
.2 Drawings: Editable AutoCAD 2015 DWG upon request.
.3 Documents: Editable MS Word DOC upon request.
.4 Spreadsheet: Editable Excel upon request.
.5 Product Sheets: Manufacture’s Adobe Acrobat PDF file preferred or Scanned Adobe Acrobat PDF.
.4 Three identical memory sticks containing all electronic records each, are to be submitted before the Certificate of Final Completion.

1.9 PHOTOGRAPHIC DOCUMENTATION

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

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

.3 Frequency of photographic documentation: as directed by Departmental Representative.

PART 2 – PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 – EXECUTION

3.1 NOT USED

.1 Not Used.

PART 1 – GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA): Canada
.1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.

.2 National Building Code 2015 (NBC):
.1 NBC 2015, Division B, Part 8 Safety Measures at Construction and Demolition Sites.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS)

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

.5 Province of Ontario:
.1 Occupational Health and Safety Act Revised Statutes of Ontario 1990, Chapter O.1 as amended, and:
.1 Regulations for Construction Projects, O. Reg. 213/91 as amended.
.2 Regulations for Diving Operations, O. Reg. 629/94 as amended.
.2 Workplace Safety and Insurance Act, 1997.
.3 Municipal statutes and authorities.

1.2 RELATED WORK

.1 Section 01 33 00 – Submittal Procedures

1.3 ACTION AND INFORMATION SUBMITTALS

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

.2 Submit site-specific Health and Safety Plan and Fire Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
.1 Results of Site-specific safety hazard assessment, and measures and controls to be taken to address the anticipated hazards and risks.
.2 Results of safety and health or hazard analysis for site tasks and operations.
.3 Contractor's and Sub-contractor's Safety Communication Plan. Must include contact information for key contacts. Departmental Representative will provide contact information for other key government agencies.
.4 Name and contact information of Health and Safety coordinator.

.5 Contingency and emergency response plan.

.3 Submit separate site-specific Health and Safety Plan for Diving Operations, at least 7 days prior to commencement of diving work. Diving operations 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 Contractor's Safety Communication Plan must include contact information for 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.

.4 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 days after receipt of comments from Departmental Representative.

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

.6 Submit records of Contractor's Health and Safety meetings or daily tailgate meeting for diving operations when requested.

.7 Submit copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative monthly.

.8 Submit Construction Safety Checklists after completion.

.9 Submit copies of orders, or directions, or reports issued by health and safety inspectors having jurisdiction.

.10 Submit copies of incident and accident reports.

.11 Submit WHMIS MSDS - Material Safety Data Sheets to Departmental Representative.

.12 Submit Workplace Safety and Insurance Board (WSIB)-Experience Rating Report.

.13 Submit Hazardous Materials Handling plan describing

hazardous waste materials isolation, removal, handling, storage, transportation, disposal and staff training procedures to be followed.

.14 Submit required permits and proof that hazardous materials (such as lead-based paint) were disposed off-site in accordance with authority having jurisdiction.

1.4 FILING OF NOTICE

.1 File Notice of Project with Provincial authorities prior to commencement of Work.

.2 File a separate Notice of Project with Provincial authorities prior to commencement of work for diving operations.

.3 File other required notices in accordance with Acts and Regulations of Province of Ontario.

.4 Submit copies of Notice of Project to Departmental Representative.

.5 Keep copy of Notices of Project and other notices on site at all times.

.6 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout the life of the project.

1.5 SAFETY ASSESSMENT

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

1.6 MEETINGS

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

1.7 REGULATORY REQUIREMENTS

.1 Comply with the Acts and regulations of the Province of Ontario.

.2 Comply with specified standards and regulations to ensure safe operations at site.

1.8 PROJECT/SITE CONDITIONS

.1 Work at site to involve contact with:
.1 Silica in concrete.

.2 Lead-based paint.
.1 Confirmed in paint of the existing lock gates.
.2 Contractor to assume that all existing paint on-site contains lead.
.3 Pressure treated lumber (existing timber lock gates).
.4 Corroded metals.
.5 Benzene in fuel oil, paints and adhesives.
.6 Open water.
.7 Heights greater than 1200mm.
.8 Noxious weeds such as poison ivy and wild parsnip.
.9 Bees and other insects with potential allergy.
.10 Steep embankments and retaining walls may impede quick egress from dangers.
.11 Slippery conditions due to ice formation during winter months in and around bridge, dock, locks and sidewalks.
.12 Hazards related to working in a remote and natural area including insect, vegetation and wildlife related hazards.
.13 Possible tripping such as rocks, spalled concrete, potholes, roots and other natural features.
.14 Slip hazard due to steep embankments, uneven or loose soil and rocks.

.2 Hazards on-site include but are not limited to:
.1 Working near or under electrical wires, including underwater cables.
.2 Working around moving equipment.
.3 Working near or above water.
.4 Icy surfaces.
.5 Falling hazards.
.6 Extreme temperatures or weather conditions.
.7 Working near an operating swing bridge.

.3 More specifically hazards associated with working near the lock include but are not limited to:
.1 General hazard around dam structures:
.2 Leakage between and around stop logs may suck in a worker who may be in the water and hold him below the water level with such force that he cannot escape.

1.9 GENERAL REQUIREMENTS

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

.2 Site-specific Health and Safety Plan covers sub trades utilized on the project.

.3 Departmental Representative may respond in writing,

where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns either accepting or requesting improvements.

1.10 COMPLIANCE REQUIREMENTS

.1 Comply with Ontario Occupational Health and Safety Act,R.S.O. 1990 Chapter 0.1, as amended.

.2 Comply with Ontario Occupational Health and Safety Act, Regulation 629/94, for diving operations.

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

1.11 RESPONSIBILITY

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

.2 Comply with 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.

.3 Where applicable the Contractor to be designated "Constructor", as defined by Occupational Health and Safety Act for the Province of Ontario.

.4 Ensure a clear delineation in time and/or space between Parks Canada staff and Contractor's own forces such that Contractor shall maintain designation as "Constructor" as defined by the Occupational Health and Safety Act for the Province of Ontario.

1.12 UNFORESEEN HAZARDS

.1 Immediately stop work and advise Departmental Representative verbally and in writing should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of work.

.2 Follow procedures in place for Employees Right to Refuse Work as specified in the Occupational Health and Safety Act for the Province of Ontario.

1.13 HEALTH AND SAFETY SUPERVISOR

.1 Employ and assign to Work, a competent and authorized Health and Safety Supervisor. Health and Safety Supervisor must:

.1 Have site-related working experience specific to activities associated with similar Canal reconstruction projects.
.2 Have working knowledge of occupational safety and health regulations.
.3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
.4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
.5 Be on site during execution of Work and report directly to Site Supervisor.

1.14 POSTING OF DOCUMENTS

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

.2 Provide documents as follows and post on site:
.1 Contractor's Health and Safety Policy.
.2 Contractor's Name.
.3 Notice of Project.
.4 Name, trade, and employer of Health and Safety Coordinator.
.5 Ministry of Labour Orders and reports.
.6 Occupational Health and Safety Act and Regulations for Construction Projects for Province of Ontario.
.7 Address and phone number of nearest Ministry of Labour office.
.8 Material Safety Data Sheets.
.9 Written Emergency Response Plan.
.10 Site Specific Health and Safety Plan.
.11 Valid certificate of first-aid personnel on duty.
.12 WSIB "In Case of Injury At Work" poster.
.13 Location of toilet and cleanup facilities.
.14 Special site-specific handling or operational procedures.

.3 Comply with Provincial general posting requirements.

1.15 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 immediately corrected.

1.16 BLASTING

.1 Blasting or other use of explosives is not permitted on this project.

1.17 POWDER ACTUATED DEVICES

.1 Use powder actuated devices only after submittal of full justification for the requirement of their use and receipt of written permission from Departmental Representative.

1.18 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.

.2 Assign responsibility and obligation to Competent Supervisor to stop or start Work when, at Competent Supervisor’s discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative or his/her designate may also stop Work for health and safety considerations.

1.19 EQUIPMENT LOCK-OUT/TAG-OUT

.1 Coordinate and comply with Parks Canada/PWGSC multi lock lock-out/tag-out procedures for electrical and mechanical equipment on-site.

1.20 FIRE SAFETY REQUIREMENTS

.1 Comply with National Building Code of Canada 2015 (NBC) for fire safety in construction and National Fire Code of Canada 2015 (NFC) for fire prevention, firefighting and life safety in building in use.

PART 2 – PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 – EXECUTION

3.1 NOT USED

.1 Not used.

PART 1 - GENERAL

1.1 GENERAL

.1 This section includes the following wrk:
- .1 Traffic Control and Management Plan.
- .2 Informational and Warning Devices.
- .3 Protection and Control of Public Traffic.
- .4 Operational Requirements.
- .5 Road Closures (Swing Bridge Open).
- .6 Detours.

1.2 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment.

.2 Section 01 33 00 – Submittal Procedures

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 There will be no measurement of Traffic Control.

.3 Payment included in Lump Sum Price:
- .1 Item No. L17 - Traffic Control – Year 1.
- .2 Item No. L18 - Traffic Control – Year 2.
- .3 Item No. L19 - Traffic Control – Year 3.

1.4 REFERENCES

.1 Ensure that traffic control measures are in accordance with:
- .1 Manual of Uniform Traffic Control Devices (UTCD), Ministry of Transportation, Ontario and the Ontario Ministry of Labour.
- .2 Ontario Traffic Manual, Book 7: Temporary Conditions (2014).

1.5 ACTION AND INFORMATION SUBMITTALS

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

.2 Submit Traffic Control and Management Plan to Departmental Representative for acceptance prior to starting work.

.3 Traffic Control and Management Plan required for:
- .1 Initial site setup
- .2 Temporary lane reductions for roadside work.
- .3 Very short duration road closures with maximum

10-15 minute delays to traffic.
.4 Changes as required for work

1.6 SITE DESCRIPTION

.1 The Kingston Mills Lock Station is located off Kingston Mills Road, at Kingston Mills Ontario.

1.7 TRAFFIC RESTRICTIONS

.1 Park only in designated areas as indicated.

.2 Do not park on roadway, edge of roadway or any public parking areas.

.3 Short term (<24hrs), or very short term(<30min) lane closures of the public roadways may be helpful for operations such as the delivery of materials or access by specialized equipment.

.4 Very short duration daytime closures of road are permitted as follows:
.1 Maximum delay to public traffic: 10 to 15 minutes.
.2 Signs to be posted on each approach notifying public of maximum 10-15 minute delay.

1.8 TRAFFIC CONTROL AND MANAGEMENT PLAN

.1 Do not mobilize until Traffic Control and Management Plan (TCMP) for initial site setup and lane reductions is accepted by Departmental Representative.

.2 After TCMP accepted by Departmental Representative, submit TCMP bridge closures to local municipality for approval and permits with a copy to Departmental Representative.

.3 Indicate methods and implementation schedule, and include all signage, equipment and personnel to be used for traffic control.

.4 Traffic Control and Management Plan requiring road closures must be submitted at least four weeks prior to commencing work.
.1 Provide adequate time for local municipality to review plan and submit permit.
.2 Include Traffic Control and Management Plan and review time in construction schedule.

.5 Copies of approved Traffic Control and Management Plans and permits to be submitted to Departmental Representative and one copy to be kept on-site at all time.

.6 Notify public 2 weeks in advance of short term closures

of roadway or expected traffic delays due to construction activities.

1.9 PROTECTION OF PUBLIC TRAFFIC

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

.2 When working on travelled way:
.1 Place equipment in position to present minimum of interference and hazard to travelling public.
.2 Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.
.3 Do not leave equipment on travelled way longer than necessary for work.
.4 Do not leave equipment on travelled way overnight.

.3 Do not reduce lanes of roadway without written approval from Departmental Representative and local municipality.

.4 Do not close road without written approval from Departmental Representative and local municipality.

.5 Before re-routing traffic erect suitable signs and devices in accordance with instructions contained in UTCD manual and Ontario Traffic Manual, Book 7.

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

1.10 INFORMATIONAL AND WARNING DEVICES

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

.2 Provide adequate lumination to all detour/warning signs and temporary fencing blocking existing pedestrian or bike paths.

.3 Supply and erect signs, delineators, barricades and miscellaneous warning devices as specified in the UTCD and Ontario Traffic Manual Book 7.

.4 Place signs and other devices in locations recommended

in UTCD and Ontario Traffic Manual Book 7.

.5 Provide signs notifying public of upcoming traffic delays or road closures.

.6 Meet with Departmental Representative prior to commencement of Work to prepare list of signs and other devices required for project. All traffic signs and devices must conform to the approved Traffic Control and Management Plan. If the situation on site changes, revise list to approval of Departmental Representative and local municipality.

.7 Continually inspect and maintain traffic control devices in use:
.1 Check signs daily for legibility, damage, suitability and location.
.2 Clean repair or replace devices to ensure clarity and reflectance.
.3 Remove or cover signs which do not apply to conditions existing from day to day.

1.11 CONTROL OF PUBLIC TRAFFIC

.1 Provide competent flag persons, trained in accordance with Infrastructure Health & Safety Association (IHSA), and properly equipped as specified in, UTCD and Ontario Traffic Manual Book 7 in following situations:
.1 When public traffic is required to pass working vehicles or equipment which block all or part of travelled roadway.
.2 When it is necessary to institute one-way traffic system through construction area or other blockage where traffic volumes are heavy, approach speeds are high and traffic signal system is not in use.
.3 When workmen or equipment are employed on travelled way, over brow of hills, around sharp curves or at other locations where oncoming traffic would not otherwise have adequate warning.
.4 Where temporary protection is required while other traffic control devices are being erected or taken down.
.5 When transporting materials between staging area and work areas using travelled roadway.
.6 When accepting deliveries in which public roadway traffic will be disrupted or delayed.
.7 For emergency protection when other traffic control devices are not readily available.
.8 In situations where complete protection for workers, working equipment and public traffic is not provided by other traffic control devices.

.2 Maximum delay to public traffic by Flagmen due to contractor's operations: 15 minutes.

1.12 OPERATIONAL REQUIREMENTS

.1 Maintain existing conditions for traffic throughout period of contract, except when expressly required and in accordance with accepted Traffic Control and Management Plan.

.2 Maintain public access to all public parking areas not designated as semi-permanent or temporary.

.3 Set construction fencing back from roadway as indicated to minimize visual obstructions and allow for snow plowing operations.

.4 Install signs on gates and fences indicating public pedestrian access prohibited within limits of work areas.

.5 Notify public in advance of short term road closures.

.6 Respect local agency spring load reduction requirements for roads.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This Section describes requirements for protection of archeological and cultural resources and the environment that apply to the Work. These requirements apply to all Sections of this Specification, without limiting the conditions and approvals imposed by statute.
.1 Reference Basic Impact Assessment (BIA) provided with Contract Documents. Specific mitigation measures identified by the BIA have been included in this specification.

.2 Control work to provide effective archeological, cultural, environmental, waterway, and fish habitat protection. Departmental Representative and Parks Canada Agency (PCA) Environmental Authority will monitor mitigation measures and will identify whenever such measures are found to be ineffective. Change measures or work procedures as directed by Departmental Representative to ensure environmental, waterway, and fish habitat protection.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 No measurement of Environmental procedures.

.3 Payment included in Lump Sum Price:
.1 Item No. L20 - Environmental Procedures.
.1 Item includes work to protect archeological and cultural resources, and provide environmental protection including but not limited to; implementing mitigation measures from the site-specific Basic Impact Assessment (BIA), installation, maintenance, and removal of turbidity curtains, environmental testing, and other environmental procedures.

1.3 RELATED WORK

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 29 - Health and Safety Requirements.

.3 Section 01 74 20 - Construction/Demolition Waste Management and Disposal.

1.4 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).
1 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

.4 Changes to project scope of work not assessed under site-specific BIA will require review and acceptance by Client Department and may require issuing revised permit.

1.5 HERITAGE PROTECTION

.1 The Rideau Canal and Kingston Mills Lockstation are National Heritage Sites.

.2 Preserve heritage elements of site by executing Work without damage to site features or character defining elements.

.3 Notify Departmental Representative and PCA Environmental Authority immediately if heritage items are damaged.

.4 Employ minimal intervention approach for all Work.

.5 Access roads, staging areas, and work pads require review and approval.

.6 Damage to heritage elements will not be tolerated.

.7 Ensure appropriate supervision work, adequate training for workers, and other necessary precautions to protect existing structures.

.8 Notify Departmental Representative immediately where reasonable concern exists that damage may result from work.

.9 Contractor may propose alternative work methodologies to be accepted by Departmental Representative and PCA

Environmental Authority.

.10 Protect possible archeological and cultural resources by excavating only to limits indicated.
.1 Excavation beyond indicated limits requires acceptance by PCA Environmental Authority.

1.6 RELICS AND ANTIQUITIES

.1 Corner stones and their contents, buried artifacts, remains and evidence of ancient persons and peoples, commemorative plaques, and other objects of historic value and worth, remain property of the Crown. Protect and notify Departmental Representative immediately of discovery of such objects.

1.7 ARCHAEOLOGICAL AND CULTURAL REQUIREMENTS AND RESTRAINTS

.1 Site may contain possible cultural and archaeological resources.

.2 PCA Environmental Authority may monitor and record some or all aspects of excavations, site access routes, and disturbances to soil overburden due to equipment and general work operations.

.3 Cease Work immediately in affected Work area and notify Departmental Representative if cultural resources, suspected archeological resources, or character-defining elements are uncovered or damaged during Work.

.4 Do not resume work until directed by Departmental Representative.

.5 Proceed with other work and await further direction for work in affected area from Departmental Representative on how to proceed.

.6 Allow Departmental Representative and PCA Environmental Authority Representative full access to affected Work area and cooperate to provide reasonable facilities for such access.

1.8 ACTION AND INFORMATION SUBMITTALS

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

.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. The EMP will be submitted in writing prior implementation of project activities and must be accepted by Parks Canada and the Departmental

Representative. EMP sub-section submissions can staggered depending on availability of project details and activity start dates.

.3 Submit Environment Management Plan (EMP) to Departmental Representative who will co-ordinate review and acceptance by PCA Environmental Authority minimum of 10 working days prior to commencing site setup, construction activities, or delivery of materials to site.

.1 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

.1 A qualified environmental professional is typically an engineer, applied scientist or technologist who is registered and in good standing with an appropriate professional organization or who, through demonstrated experience and knowledge relevant to the particular matter, may be reasonably relied on to provide advice within their area of expertise. Such a professional could be an ecologist / biologist, forester, geoscientist, engineer, or technologist.

.2 PCA Environmental Authority will outline prescribed mitigation measures during construction start-up meeting.

.3 Environment Management Plan to detail frequency of monitoring and high-risk construction activities requiring environmental professional onsite.

.4 Environmental Management Plan to present comprehensive overview of known or potential environmental issues to be addressed during construction.

.5 Environmental Management Plan to be prepared in accordance with requirements of Federal, Provincial, and Municipal laws and regulations.

.6 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 in accordance with: http://www.dfo-mpo.gc.ca/pnw-ppe/measures-mesures/measures-mesurem-eng.html

.7 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: http://ceqg-rcqe.ca/en/index.html#void

.8 Notify Departmental Representative of proposed changes to project plans or schedules effecting Environmental Management Plan.

.9 Contractor to ensure on-site personal are aware of, and comply with prescribed mitigation measures in Environmental Management Plan.

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

.5 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.

.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.

.8 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.9 Non-Hazardous Solid Waste Disposal Plan: identifying methods and locations for solid waste disposal including clearing debris.

.10 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.

.11 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.

.12 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.

.13 Historical, Archaeological, Cultural Resources, Biological Resources, and Wetlands Plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources, and wetlands.

.14 Pesticide Treatment Plan: to be included and updated, as required.

.15 Dewatering Plan: Plan for design, installation, operation and removal of dewatering structures and dewatering systems, to be updated as required.

.5 Water Quality Testing Reports: to be submitted before start of work, daily during construction activities, and immediately after spills or when changes in water quality observed.

.6 Product Data: Submit manufacturer's instructions, printed product literature, data sheets and WHMIS MSDS sheets

1.9 DEFINITIONS

.1 Deleterious Material: substance that, if added to a waterway, could degrade water quality or impact fish, fish habitats, and aquatic wildlife. This includes, but is not limited to:

.1 Concrete dust.
.2 Soils (clay, silt, sand).
.3 Oil, diesel, or gasoline.
.4 Chipped or fresh concrete and admixtures.
.5 Alkali water resulting from fresh concrete or cementitious grout.
.6 Lead.
.7 Salt.
.8 Solvents.
.9 Grout.
.10 Paint.

.2 Dripline: location on ground surface directly beneath a theoretical line described by tips of outermost branches of trees.

.3 Barrier: fence consisting of approved material, supported by steel posts and being a minimum of 1.2 m high, without breaks or unsupported sections.

1.10 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 Rideau Canal 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.

.8 Submit copies of environmental orders and directions to Departmental Representative.

1.11 EXPLOSIVES

.1 Use of explosives is not permitted.

1.12 FIRES

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

1.13 TURBIDITY CONTROL, AND DISHCHARGED WATER

.1 Control turbidity of water released during work.

.2 Do not pump water and discharge directly into waterway.
.1 Send discharge to settling pond or filtration area before being released into waterway without releasing sediment or hazardous materials or causing additional erosion.
.2 Water from initial dewatering may be pumped directly into the waterway if turbidity of discharged

water is less than background turbidity levels observed upstream of work areas.

.3 Water from within 1 m of basin bottom or water with turbidity greater than background turbidity to be pumped to settling pond or sediment filtration system.

.4 Monitor water quality for suspended sediment levels exceeding identified requirements during in water activities.

.3 Provide marine grade turbidity curtain to enclose areas where sediments may enter waterway. Turbidity curtain to be fabricated for this Work, anchored or weighted down along its length to form continuous seal on basin bottom and marine structures with adequate flotation at water surface to prevent over spills of turbid water. Refer to Section 35 49 25 – Turbidity Curtain.

.4 Mechanical filtration of turbid water is also acceptable.

.5 Filter material will consider the grain size characteristics of the concrete sediment and shall be designed around the principals of maintaining sufficient hydraulic flow and prevention of particle movement through the material

.6 Provide sediment control during any in-water work to control turbidity levels. Controls to be implemented prior to commencing Work and to remain in place until all suspended sediments have settled.

.7 In-water work shall be performed in a manner that minimizes the disturbance of the watercourse bottom and dispersion of sediment.

.8 In event of significant sedimentation or escape of debris caused by construction activities, Contractor to immediately stop work, notify Departmental Representative, and take appropriate measures to confine work and modify Environmental Plan including installation of new environmental measures or additional turbidity curtains.

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

.10 Sediment, debris, and erosion control measures to be inspected daily to ensure that they are functioning properly and are maintained and upgraded as required.

.11 If sediment, debris, or erosion control measures are not functioning properly, no further work permitted until problem has been rectified and accepted by Departmental Representative and PCA Environmental

Authority. Consider setting up backup settling pond in case first pond fails to work to keep pumps operating continuously.

.12 Sediment, debris, and erosion control measures to be left in place until disturbed areas within work area have been stabilized and sediments in water have settled. Removal permitted only after written approval from Departmental Representative.

.13 Water containing a high level of silt or sediment will be treated by discharging to settling basins, vegetated areas, or sediment traps prior to release to streams. Water quality downstream of construction activities and turbidity curtain to not exceed recommended DFO and CCME guidelines on water quality for protection of aquatic life.

1.14 WORK ADJACENT TO WATERWAYS

.1 Do not release deleterious materials into waterway.

.2 Do not use salt as deicer or sand for traction within 30 m of canal.
.1 Where ice is safety concern, use environmentally acceptable deicing or traction materials accepted by Departmental Representative.
.2 No deicer or traction materials allowed to enter waterway.

.3 Ensure equipment and temporary access structures such as scaffolding placed in waterbodies are free of earth material, and excess, loose or leaking fuel, lubricants, coolant, and other deleterious material that could enter waterway.

.4 Do not use waterway beds for borrow material.

.5 Do not dump excavated fill, waste material, or debris in waterways.

.6 Stockpiles of excavated or fill materials to be stored, stabilized, and covered, no closer than 30 m from waterway. Runoff from excavated or fill material to be contained from entering waterway.

.7 Paint metal and wood surfaces in an environmentally safe way and take appropriate preventative and corrective actions.

1.15 WILDLIFE PROTECTION

.1 Water drawdown to occur either before or soon after boating navigation season and 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.

1.16 AQUATIC LIFE PROTECTION

.1 In water work to be completed before March 15, of any year to protect fish populations.

.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 Departmental Representative.
.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 project area.

.5 Invasive species to be euthanized rather than returned

to water system.

1.17 SPECIES AT RISK

.1 Potential species at risk in project areas include; Golden-winged Warbler, Eastern Whip-poor-will, Eastern Musk Turtle Blanding's Turtle.

.2 Provide training to all employees before beginning work on site on identifying species at risk and procedures to follow if species at risk is encountered.

.3 Stop work and contact Departmental Representative and PCA Environmental Authority on how to proceed if a species at risk does not or cannot leave site.

.4 Preform daily site sweeps before beginning work to ensure that there are no turtles in work area.

.5 Minimize disturbed areas and clearly mark Work space.

.6 If species at risk are observed or encountered, animal must not be harmed or harassed, stand back and allow animal to leave site.

1.18 INVASIVE SPECIES

.1 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.

.2 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.

.3 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.

.4 Conduct site assessment for invasive plant infestations prior to carrying out field activities.

.5 Use weed-free material for erosion control and stabilization ensuring that seed does not potentially contain invasive plants.

.6 Commercially purchased seeds should have a label that states following:
.1 Species.
.2 Purity: no less than 75% and preferably over 85%.
.3 Weed seed content: tag should state no invasive plants are present, only use certified weed-free seed.
.4 Germination of desired seed: germination should not be less 50% for most species with exceptions for some shrubs and forbs.

.7 Move only contaminate-free materials to non-infested areas to prevent spread of invasive plants.

.8 Familiarize workers with invasive species potentially present within work site areas including but not limited to; European Buckthorn, Japanese knotweed, and Zebra mussel.

.9 Properly dispose of any found invasive species to ensure no further propagation.

1.19 EROSION, SEDIMENT AND DUST PROTECTION

.1 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.

.2 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 an equivalent 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 erosion and sediment 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.

.13 Sediment control measures and exclusion fencing must be removed in a way that prevents the escape or re-suspension of sediments

1.20 PLANT AND TREE PROTECTION

.1 Protect plants, trees, and tree roots on site and adjacent properties to OPSS 801.

.2 Do not drive over tree roots.

.3 Limit clearing, grubbing, and tree-branch removal to areas of work or access indicated on accepted shop drawings.

.4 Provide barriers around trees which may be affected by work, including staging areas.
.1 Erect barriers at dripline within Work area.
.2 Barrier to consist of steel posts covered with plastic construction fence material, extending from grade level to a height of 1.2 metres.
.3 Maintain barriers in good repair throughout duration Work.
.4 Remove barriers upon completion of Work.
.5 Where these restrictions are not possible, seek acceptance of Departmental Representative for alternative solutions.

.5 Damage to trees due to Contractor's operations:
.1 Broken branches 25 mm or greater in diameter: cut back cleanly at break, or to within 10 mm of their base, if substantial portion of branch is damaged Departmental Representative will direct.
.2 Exposed roots 25 mm or larger: cut back cleanly to soil surface within five calendar days of exposure.
.3 Damaged bark: neatly trim back to uninjured bark, without causing further injury, within five calendar days of damage.

.6 Reduce soil displacement and compaction by using heavy machinery in designated areas, construction access roads, and on existing vehicle paths.

.7 Avoid using heavy machinery on saturated ground.

.8 Use equipment of low bearing weight and low pressure tires wherever possible.

.9 Prune trees close to tree trunk, make shallow undercut first, then follow with top cut. Do not use axe for pruning.

.10 Cut trees at ground level and do not leave pointed stumps.

.11 Pay special attention to fruit bearing shrubs.

.12 Clear vegetation by hand from unstable or erodible banks, where possible avoid using heavy machinery.

.13 Replace damaged lawn to pre-construction state with topsoil and sod in work zone.

.14 No vegetation clearing to occur between April 1st and August 31st.
.1 If vegetation clearing must take place during this period, an avian biologist must conduct a nest survey prior to removals to identify active migratory bird nests in area to be cleared.

.15 Provide an inventory of species removed, and a replanting plan using native species to be accepted by Departmental Representative and PCA Environmental Authority in cases of removing mature vegetation.

.16 Prepare suitable planting plan and erosion and sediment controls for acceptance by Departmental Representative when conducting grubbing.

.17 Use native species for tree planting and ground cover with mulch to prevent erosion and help seeds germinate.

.18 Keep site stabilized if there is less than four weeks remaining in growing season.

.19 Visual site inspections to be conducted in spring and fall for first two growing seasons following planting. If any plantings are found dead or failing, mitigation measures to be implemented to reduce risk of future failure and plants to be replaced and monitored accordingly.

.20 Trees, shrubs and vegetation which are to remain throughout construction should be properly identified and delineated.

.21 Where practical, the branches of the large trees should be trimmed back as the first option rather than cutting the entire tree.

.22 Disturbance of vegetation along the shoreline must be limited to what is required for the work.

.23 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 when required.

.24 Minimize clearing as much as possible to maintain riparian vegetative cover and windbreaks, where possible maintain vegetated buffer at shoreline and minimize clearing near water bodies. If buffers cannot be maintained, avoid grubbing of vegetation root mass in proximity to shorelines and stream banks.

.25 Grubbing should not be conducted unless a suitable planting plan and Erosion and Sediment Controls are in place. Discuss with EA officer for suitable plans.

.26 Vegetation should be selectively cut to allow a diversity of vegetation types to persist within the immediate area.

.27 In larger areas to be cleared attempts should be made to keep trees >15 cm DBH intact and instead remove lower limbs (< 2.5 m high).

.28 Cluster of young trees should be selectively cut to allow some to continue to grow maintaining diversity in age structure and genetics.

.29 Delineate areas to be avoided with flagging tape or temporary fences.

.30 Ensure appropriate handling procedures are followed for noxious weeds such as Giant Hogweed or Wild Parsnip.

.31 Root systems of trees identified to remain should be properly delineated and fenced off, so as to protect the root systems from being crushed and impacted by machinery.

.32 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.

.1 For areas of light-to-medium levels of traffic activity, a geotextile cloth shall be placed over the area of protection and covered with an 8 inch (at minimum) thick layer of mulch material.

.1 Pins or staples must be used to secure the geotextile material to the ground.

.2 For areas of medium-to-high levels of traffic activity, a geotextile cloth shall be placed over the area of protection and covered with an 8 inch (at minimum) thick layer of mulch material. The mulch material shall then by covered with 3/4 inch sheets of plywood.

.1 The plywood will break down over time, and shall be replaced periodically to retain its effectiveness.

.2 ¾ inch laminated large sheets of plywood are recommended for use.

.3 Overtime, mulch material can degrade, move, or wash away. Mulch must be replenished as necessary in order to maintain a layer of 8 inch thickness at all times.

.4 Mulch material should not be permitted to pile against the trunk(s) or root flare(s) the tree(s), as this may lead to unwanted bark rot and oxygen deprivation, subsequently leading to the death of the tree(s).

.5 Alternative methodology for soil-compaction prevention may be utilized (ex. blast mats), as reviewed and approved by PCA.

.33 Native grasses, shrubs, etc. should be planted to match existing species growing on the sites.

1.21 OPERATION AND MAINTENANCE OF EQUIPMENT

.1 Maintain machinery and equipment to be clean, free of leaks, and in optimal working condition.

.1 Ensure measures are in place to minimize impact of spills.

.2 Provide and use drip trays under all fuel-powered equipment and machinery to prevent discharge of oil, grease, antifreeze, or other materials into ground or waterways.

.3 Equipment and heavy machinery to meet or exceed applicable emission requirements.

.4 Any vehicle or equipment entering waterway to be free of fluid leaks and externally degreased.

.5 Clean equipment prior to entering waterway in designated area at least 30 m from waterway.

.6 Do not operate heavy equipment in waterway, except when operated from barge or after dewatering completed.

.7 Operate machinery from stable location.

.8 Only allow working end of machinery to directly enter water. Working end of machinery to be clean and free of leaks.

.1 Do not leave equipment in water during breaks.

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

.10 Designate a re-fueling depot with spill management equipment in place.

.11 Vehicle and equipment maintenance and refueling to be conducted over impermeable/absorptive material situated at a designated area that is located at least 30 m away from nearest waterway.
.1 If 30 m is not possible area should be reviewed by Departmental Representative.

.12 Store oils, lubricants, fuels, and chemicals in secure areas on impermeable pads.

.13 In case of fuel heaters to be located nearer than 30 m from canal, use large drip pan to contain possible leakage from heater or refueling operations. Absorptive material to be placed at bottom of drip pan for added measure.

.14 There shall be no discharge of chemicals and cleaning agents in or near aquatic habitats; all such substances shall be disposed of at a facility licensed to receive them.

1.22 REMOVED MATERIALS

.1 Unless otherwise specified, materials designated for removal become Contractor's property and removed from site.

1.23 HAZARDOUS MATERIALS

.1 Place materials defined as hazardous or toxic waste in designated containers.

.2 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Human Resources Development Canada, Labour Program.

.3 Store Hazardous Materials in secure areas on impermeable pads, provide berms if necessary.

1.24 CLEAN UP

.1 Clean up work area continuously as work progresses.

.2 At end of each work period, and more often if ordered by Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.

.3 Permit no amount of debris, trash, or garbage to accumulate on-site.

.4 Do not bury rubbish on site.

.5 Separate and recycle materials that can be recycled.

.6 Dispose of waste or volatile materials, such as mineral spirits, oil, or paint thinner by taking them to special designated waste facility. Do not dump these into waterways, storm, or sanitary sewers.

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

.8 Spills:
.1 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
.2 Report spills immediately to Departmental Representative, PCA Environmental Authority, and Ontario Ministry of Environment Spills Action Centre (Telephone No. 1-800-268-6060).
.3 Secure source of spill to stop flow of spill and isolate area of spill.
.4 Using appropriate safety precautions, collect liquid or solidify liquid with an inert, noncombustible material, or absorbent pads.
.5 Clean-up, remove, and dispose of contaminated materials in accordance with Federal requirements, MSDS, or as directed by Ontario Ministry of Environment.
.6 Be responsible for costs of cleaning up spills by method accepted by Departmental Representative.
.7 Submit documentation of remediation techniques and test results.

.9 Remove scaffolding, temporary protection, surplus materials, tools, plant, rubbish, and debris and dispose of them in an approved manner off-site at following times:
.1 By March 15 of any year for in-water work.
.2 At completion date of Work for all other areas.

.10 Remove debris on bed and restore area to original state upon completion of Work.

.11 Clean areas under contract to condition at least equal to that previously existing and to approval of Departmental Representative.

.12 Tools, equipment, temporary structures, used or maintained for purpose of this project must be removed from site after completion of project

1.25 CLEANING OF

.1 Departmental Representative will designate cleaning area and containment facilities for equipment and tools

CONCRETE EQUIPMENT

to limit water use and control runoff.

.2 Cleaning area to be no closer than 30 m from waterway to prevent contamination.

.3 Where no safe cleaning area is available, Contractor to provide settling pond for area where equipment to be cleaned.

.4 Alkali water, such as concrete wash water, to be contained, collected, and disposed off-site in accordance with Federal, Provincial, and local authority requirements.

.5 Use only trigger operated spray nozzles for water hoses.

1.26 DISPOSAL OF WASTE MATERIALS

.1 Waste subject to Ontario Environmental Protection Act to be transported with valid "Certificate of Approval for a Waste Management System" to site approved by Ontario Ministry of Environment to accept that waste.

.2 Obtain and submit Waste Generator Numbers, permits, manifests, and other paperwork necessary to comply.

.3 Recyclable material and waste to be removed from site in accordance with all federal, provincial and municipal regulations to licensed disposal facilities in accordance with Section 01 74 20 WASTE MANAGEMENT AND DISPOSAL and in accordance with regulations (i.e., O. Reg. 102/94 and O. Reg. 558/00, R.R.O. 1990, 347.

1.27 CONCRETE AND GROUTING ACTIVITIES

.1 Maintain isolation of all cast-in-place concrete and grouting from water 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 with pH reaching neutral levels.

.2 Avoid concrete and grouting activities during or immediately after wet weather conditions.

.3 Ensure use of concrete, sealants, and other compounds in accordance with appropriate Product Technical Data Sheet.

.4 Ensure Work involving cement or lime-containing materials will not deposit, directly or indirectly sediments, debris, concrete, concrete fines, wash, or contact water into or about watercourse.

.5 Remove dust, debris, unused aggregate and concrete rubble generated as result of concrete work and dispose

off-site ensuring material does not enter waterway.

.6 Place concrete and lime-containing debris debris into watertight container daily, or more frequently as directed.

.7 Isolate all work from waterway.

.8 A CO2 regulator, tank and diffuser hose will be kept onsite in the event of concrete spills. The system will be sized for concrete volumes used in Work area.

.9 Use of neutralizing acids is not permitted.

.10 Direct concrete wash water to a collection and treat to effectively remove all suspended solids, dissipate velocity and prevent deleterious substances from entering waterway.

.11 In event of a release of concrete or grout Notify Departmental Representative, PCA Environmental Authority and Ontario Ministry of Environment Spills Action Center (Tel: 1-800-268-6060) .
.1 Clean up and execute remediation immediately in accordance with provincial and federal regulatory requirements and accepted by PCA Environmental Authority.
.2 Install additional turbidity curtain or sediment barriers as necessary.
.3 Document remediation, testing, results to be submitted to Departmental Representative and PCA Environmental Authority.

.12 Maintain pH at discharge point into the watercourse, between 6.5 and 9.0.

1.28 AIR QUALITY AND NOISE CONTROL

.1 Minimize noise levels from construction activities by using proper muffling devices, in addition to appropriate timing and location of these activities to reduce or minimize effect of noise on nearby residents, recreationists, and wildlife.

.2 On- site vehicles to have a Drive Clean Emissions Report in accordance with O. Reg. 361/98: Motor Vehicles under the Environmental Protection Act, R.S.O.
.1 Departmental Representative or PCA Environmental Authority may stop vehicle if they believe vehicle is emitting excessive exhaust smoke or suspect emission control equipment has been tampered with.

.3 Keep a record of complaints and issues to monitor and mitigate public complaints.
.1 Contractor to address issues that arise.

.4 Comply with Municipal Noise By-Laws.

.5 Notify public of planned activities that may cause disturbances and schedule them to avoid sensitive time periods.

.6 Minimize idling of construction equipment and machinery.

.7 Use well maintained equipment and machinery fitted with fully function emission control systems, mufflers, exhaust baffles, and engine covers.

1.29 WATER QUALITY

.1 Do not exceed Ontario Drinking Water Quality Guidelines due to project activities.

.2 Ensure that sediment settling basins are of adequate size to allow for excess sediment run-off and erosion.

.3 Place only washed and clean material free of fine particulate matter in or near water where previously planned or authorized.

.4 Snow containing salt or sand may not be dumped or allowed to melt into waterway.

.5 Water quality to be maintained in accordance with Canadian Council of Ministers of the Environment Canadian Water Quality Guidelines for the Protection of Aquatic Life.

.6 Record pH measurements of water inside and outside containment area.

.7 Water with pH > 9 cannot be released directly into the watercourse, such water must be treated prior to release.

.8 Water with pH $\geq$ 12.5 is treated as a hazardous waste in accordance with Ontario Regulation 347 of the Environmental Protection Act and water must be removed from site.

.9 Monitor water for: unacceptable levels of suspended sediments and turbidity in accordance with Section 35 49 25 – Turbidity Curtain.

.10 Submit weekly water quality reports.

.11 Stop work in immediate area in the event pH, sedimentation or turbidity exceed identified thresholds and implement mitigation measures accepted by Departmental Representative.

.12 Store chemicals and materials in dry storage to prevent infiltration of leachate into water table or surface run-off.

1.30 FLOODS, EXTREME WEATHER, AND ICE FORMATION

.1 Design project worksite to withstand variable weather conditions.

.2 Minimize risk of inundation due to wet weather by grading, providing drainage and covering or protecting surfaces.

.3 Stabilize work area against impact of high flow and heavy rainfall events at the end of each workday.

.4 Restrict construction activities and stabilize excavations during wet weather to reduce surface run-off from exposed Work areas.

1.31 BIA MITIGATION MEASURE SUMMARY

.1 Inform the Departmental Representative and PCA's Environmental Authority (Environmental Officer, Rideau Canal in Smith Falls) 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 to Parks Canada an Environmental Management Plan (EMP) that outlines all the measures to be implemented by the contractor on the project site to eliminate or reduce environmental effects.

.3 It is required that an environmental professional(s) 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 a qualified environmental professional must be onsite. The EMP will include a list of key project activities and identify the actual and potential environmental impacts associated with each activity.

.4 Parks Canada Environmental Authority (Environmental Officer, Rideau Waterway) will outline all the following mitigation measures in a construction start-up meeting with the contractor, to ensure awareness and understanding of these measures.

.5 Ensure that all on-site personnel are aware of, and comply with, these mitigation measures.

.6 Should conditions at the work site indicate that there are negative impacts to fish, fish habitat, wildlife, cultural or visitor experience resources, all works shall cease until the problem has been corrected and Parks Canada's Environmental Authority staff have been consulted. The Parks Canada 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 Rideau Canal 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.

.8 All machinery and equipment shall be clean, free of leaks, in optimal working condition.

.9 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.

.10 Maintain equipment to avoid leakage of fuels and liquids. Ensure measures are in place to minimize impacts of accidental spills.

.11 Operate machinery from stable location.

.12 Only the working end of machinery shall directly enter the water. The working end of machinery will be clean and maintained free of leaks. 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.

.13 Spill control and emergency plans will be in place prior to initiation of construction; an emergency spill kit shall be kept on-site and employed immediately should a spill occur.

.14 In the event of a spill, Parks Canada and the Ontario Spill Action Centre (1-800-268-6060) shall be notified immediately; remediation will be conducted immediately to 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.

.15 Store all oils, lubricants, fuels and chemicals in secure areas on impermeable pads.

.16 Re-fueling of equipment and maintenance shall be conducted off slopes and away from water bodies on

impermeable pads to allow full containment of spills.

.17 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.

.18 Drip trays shall be placed under fuel-powered equipment.

.19 There shall be no discharge of chemicals and cleaning agents in or near aquatic habitats; all such substances shall be disposed of at a facility licensed to receive them.

.20 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.

Erosion and Sediment control

.21 Submission of an Erosion and Sediment Control Plan, as part of the EMP, demonstrating:
.1 A focus on erosion control primarily and sediment control secondary;
.2 Erosion and sediment controls will be tailored to the type of sediment found onsite (e.g. if clay is present, additional controls are necessary).
.3 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;
.4 Drainage areas and patterns based on pre-construction topography and construction design;
.5 The EMP will have as a principal to reduce the amount of sediment laden water produced. A focus on separating offsite and infiltrating water into the construction site from construction activities and sediment sources.
.6 How clean storm run-on will be diverted around the site and away from exposed areas;
.7 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;
.8 Consideration of project schedule in selecting, designing and laying out environmental controls;
.9 Consideration of seasonal requirements (for longer-term projects); select and design controls and practices for controlling erosion and sedimentation including shutdown periods.

.22 The size of particles present in the sediment is a key consideration for selecting the appropriate

sediment treatment option(s):
.1 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.
.2 If the sediment consists of silt and/or clay, 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.
.3 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.

.23 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. If erosion and sediment control measures are not functioning, the sediment and/or erosion problem must be addressed to the satisfaction of Parks Canada.

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

.25 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.

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

.27 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.

.28 Sediment control measures and exclusion fencing must be removed in a way that prevents the escape or re-suspension of sediments.

.29 A turbidity curtain will be maintained in the water around all working areas during construction to contain and control the suspension of fines. If water levels/conditions do not permit the flotation of a turbidity curtain, other measures as approved will be implemented.

.30 Turbidity curtains should be placed as close to the coffer dam as possible to minimize area of potential

impact of sedimentation.

.31 Turbidity curtains should not be used as a primary or secondary 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.

.32 The contractor will provide a marine grade turbidity curtain - Medium Duty Turbidity Curtain Specification US DOT Type 2 - 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.

.33 Flow dissipaters and/or filter bags, or equivalent, shall be placed at water discharge points to prevent erosion and sediment release.

.34 Silt or debris that has accumulated around the temporary cofferdams shall be removed prior to their withdrawal. All cofferdam material will be removed from the watercourse upon decommissioning.

.35 Fine materials such as limestone-based aggregates, unwashed rocks or materials that have the possibility of being suspended or transported downstream will not be used.

.36 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.

.37 The contractor will maintain a standby supply of pre-fabricated sediment fence barriers, or an equivalent ready-to install sediment control devices.

.38 Avoid activities that could lead to erosion during excessively wet weather conditions; monitor forecasts for heavy rainfall watches & warnings.

.39 Environmental protection measures shall be checked after each extreme weather event.

Fish & Fish Habitat

.40 Although this project is planned to take place in the fall; if it is delayed for any reason, no in-water work can occur between March 15th and June 30th of any year to protect fish populations during their spawning and nursery periods. Should work be required within this window, additional permissions and

mitigation measures may be required based on site-specific characteristics.

.41 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.

.42 Monitor water quality for unacceptable suspended sediment levels during in water activities. CCME Canadian Water Quality Guidelines for the Protection of Aquatic Life - Total Particulate Matter - will form the baseline for water and streambed quality monitoring and assessment.

.43 Only clean material free of fine particulate matter shall be placed in or near water where it has been previously planned and authorized.

.44 Any stockpiled materials shall be stored and stabilized a safe distance away from any watercourse, drainage course or swales to prevent erosion and subsequent entry into the water body OR removed from the site, in accordance with all federal, municipal and provincial regulations.

.45 Should conditions at the work site indicate that there are negative impacts to fish or their habitat, all work shall cease until the problem has been corrected and Parks Canada EA staff has been consulted.

.46 Follow the Ontario Clean Equipment Protocol for Industry - Inspecting and cleaning equipment for the purposes of invasive species prevention.

Concrete

.47 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.

.48 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.

.49 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.

.50 Concrete debris and dust generated as a result of various concrete work shall be removed in a way that will ensure material does not enter the waterway. All debris including unused aggregate/concrete rubble shall be completely removed and area restored to original state upon completion of work.

.51 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.

.52 In the event of a release of concrete or grout, 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 federal regulatory requirements AND to the satisfaction of Parks Canada; documentation of remediation, testing and results will be provided to Parks Canada.

.53 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.

.54 Geotextile or membranes (filter fabric) will consider the grain size characteristics of concrete sediment and shall be designed around the principals of maintaining sufficient hydraulic flow and prevention of particle movement through the material.

.55 Additional Environmental Mitigation Measures For concrete pours in a wet environment or in contact with a water body:

.1 Ensure concrete forms are tight and no flow is occurring.

.2 Isolate area with curtain or impermeable material specified for concrete particulates; ensure fish exclusion is followed.

.3 Isolated area should be the minimum size required to complete task.

.4 A CO_2 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.

.5 Workers shall be familiar with the use of the system.

.6 Use of neutralizing acids is not permitted.

.7 pH monitoring conducted immediately downstream of the isolated concrete pour.

Wildlife

.56 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.

.57 The EMP must demonstrate procedures for avoiding disturbance/harm to wildlife and nesting birds.

.58 Should conditions at the work site indicate that there are unforeseen negative impacts to wildlife, all works shall cease and Parks Canada EA Officer should be contacted immediately. The Rideau Canal has the right to require that work be altered or ceased immediately.

Vegetation Removal

.59 Disturbance of vegetation must be limited to what is required for allowing reasonable completion of the project with minimal environmental impact.

.60 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.

.61 Trees, shrubs and vegetation which are to remain throughout construction should be properly identified and delineated.

.62 Where practical, the branches of the large trees should be trimmed back as the first option rather than cutting the entire tree.

.63 When feasible, alter riparian vegetation by hand. If machinery must be used, operate machinery on land and in a manner that minimizes disturbance to the banks of the water body.

.64 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 when required.

.65 Grubbing should not be conducted unless a suitable planting plan and Erosion and Sediment Controls are in place. Discuss with EA officer for suitable plans.

.66 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.

.67 If over half of a tree needs pruning, in most circumstances it will be best to cut it down instead of pruning. Cut trees off at ground level and do not leave pointed stumps.

.68 Native species are to be used for tree planting and/or ground cover with mulch to prevent erosion and to help seeds germinate.

.69 If there is insufficient time (at least four weeks) in the growing season remaining for the seeds to germinate, or at risk of germinating and being damaged by frost, the site shall 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. Frost can occur as early as August 31st and late as June 25th.

.70 Root systems of trees identified to remain should be properly delineated and fenced off, so as to protect the root systems from being crushed and impacted by machinery.

.71 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.

.1 For areas of light-to-medium levels of traffic activity, a geotextile cloth shall be placed over the area of protection and covered with an 8 inch (at minimum) thick layer of mulch material.
Pins or staples must be used to secure the geotextile material to the ground.

.2 For areas of medium-to-high levels of traffic activity, a geotextile cloth shall be placed over the area of protection and covered with an 8 inch (at minimum) thick layer of mulch material. The mulch material shall then by covered with 3/4 inch sheets of plywood.

.1 The plywood will break down over time, and shall be replaced periodically to retain its effectiveness.

.2 ¾ inch laminated large sheets of plywood are recommended for use.

.3 Overtime, mulch material can degrade, move, or wash away. Mulch must be replenished as necessary in order to maintain a layer of 8 inch thickness at all times.

.4 Mulch material should not be permitted to pile against the trunk(s) or root flare(s) the

tree(s), as this may lead to unwanted bark rot and oxygen deprivation, subsequently leading to the death of the tree(s).

.72 Alternative methodology for soil-compaction prevention may be utilized (ex. blast mats), as reviewed and approved by PCA.

.73 The success of all vegetative plantings shall be assessed through visual site inspections conducted at least once each spring and each fall for the first two growing seasons following planting. If at any time during the monitoring period any plantings are found dead or failing, mitigation measures shall be implemented to reduce the risk of future failure and the plants shall be replaced and monitored accordingly.

.74 Native grasses, shrubs, etc. should be planted to match existing species growing on the sites.

Invasive Species

.75 To reduce the risk of introducing invasive species, all equipment must be thoroughly cleaned prior to coming to the site. Any machinery that appears to have not been cleaned will not be permitted on site. For additional information or guidance on how to properly clean equipment, see the Clean Equipment Protocol for Industry developed by the Ontario Invasive Plant Council and found here: http://www.ontarioinvasiveplants.ca/wp-content/uploads/2016/07/Clean-Equipment-Protocol_June2016_D3_WEB-1.pdf

.76 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.:
.1 Vessels/equipment should be drained of standing water.
.2 Vessels/equipment should ideally be cleaned with hot water (>50 °C) at high pressure water (>250 psi).
.3 Vessels/equipment should be dried for 2 – 7 days in sunlight before transported between waterbodies.
.4 Cleaning of vessels/equipment should be conducted away from waterbodies at a recommended distance of at least 30 m from the shoreline.

.77 Mud, dirt and vegetation should be cleaned from clothing and footwear prior to entering the work site, and prior to leaving the work site.

.78 Should an invasive species be encountered (or at least suspected) not identified in this BIA, a photo and report of the specimen should be sent to Parks Canada's EA Officer.

.79 Use weed-free material (i.e. sand, gravel, etc.) for erosion control and stabilization.

.80 Use weed-free seed and confirm that seed mix to be used for revegetation purposes does not (potentially) contain invasive plants.

.81 Seed purchased commercially should have a label that states the following:
.1 Species;
.2 Purity: Most seed should be no less than 75% pure and preferably over 85% pure. The rest is inert matter, weed seed, or other seed;
.3 Weed seed content: The tag should state NO invasive plants are present. Only certified weed-free seed should be used; and
.4 Germination of desired seed: Germination generally should not be less than 50% for most species, although some shrubs and forbs will have lower percentages.

.82 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.

.83 If removal of invasive species occurs, individuals will be disposed of appropriately, offsite to ensure no further propagation.

.84 Workers should familiarize themselves with invasive species identified in this BIA that are potentially present within the work sit areas.

Species at Risk

.85 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;

.86 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 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

.87 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.

.88 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.

.89 Should any suspected species at risk – snakes or 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. diately and contact EA staff on how to proceed. Additional measures to avoid impacts may be required before work can restart. Stand back and allow the animal to leave the site.

.90 Minimize the disturbed area; clearly mark the work space.

.91 Park on roads or disturbed areas only.

Noise/Air

.92 Adhere to local noise by-laws. Notify residents of planned activities that may cause disturbance and schedule them to avoid sensitive time periods.

.93 Monitor and mitigate public complaints by keeping a record of complaints and addressing any issues raised by the public.

.94 All on-site vehicles are expected to have a Drive Clean Emissions Report in compliance with O. Reg. 361/98: Motor Vehicles under the Environmental Protection Act, R.S.O. 1990, c. E.19. EA Officers 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.

.95 Use well - maintained heavy equipment and machinery, fitted with fully functional emission control systems/muffler/exhaust baffles, engine covers, etc.

.96 Machines shall not be left to unnecessarily idle in order to avoid emissions.

Cultural Resources

.97 Document the existing features that will be impacted by the project prior to their removal and rehabilitation.

.98 Any removals where profiles, sizes, or materials finishes are to be replicated, the material being removed must be documented and templated accurately.

.99 All removals are to be done in conformance with the drawings and specification documents.

.100 Any modification to the proposed scope of work and/or conservation measures must be submitted to CRM for review and approval for compliance with the Standards and Guidelines for the Conservation of Historic Places in Canada.

.101 Ensure plans are clear and concise. Review plans and specifications to ensure all information is appropriately coordinated and aligned with the Standards and Guidelines for the Conservation of Historic Places in Canada. Finally ensure plans are updated during work to ensure accurate tracking of the type and extent of repairs.

.102 If an opportunity arises to address or correct past repairs that are no longer considered best conservation practice or that seriously impact heritage value, CRM advice should be sought to determine whether it makes sense to address this as a part of this project.

.103 Ensure that all personnel working on site undergo a heritage induction to clearly identify the value of the place and how to avoid inadvertent impacts.

.104 Identify heritage components in the project area to ensure that inadvertent impacts do not occur (Ref. SoHV).

.105 If, in the course of work, a cultural resource or character-defining element is damaged, the project lead should take photos and consult with CRM or BH advisors immediately for advice on how to proceed.

.106 When removing work for the purposes of replacement or repair, it is possible to uncover unanticipated materials or construction that may have historic significance or provide important evidence of previous construction techniques or materials. If unanticipated material or construction is discovered during work, the project lead should stop the work, take photos, and consult with CRM or BH immediately for advice on how to proceed.

.107 When temporary structures and machinery are installed

on a site, the contractor must safeguard the character-defining elements of the site (including landscape features). The contractor should bear in mind that at National Historic Sites, the recommended practice is to employ a minimal intervention approach, as defined in the Standards and Guidelines for the Conservation of Historic Places in Canada.

Archeological Resources

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

Waste Disposal

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

.110 Waste generated will be disposed according to regulations (i.e., O. Reg. 102/94 and O. Reg. 558/00, R.R.O. 1990, 347).

Floods/Extreme or Inclement Weather/Ice Formation

.111 Undertake construction under normal weather conditions, to the extent possible, and design the project worksite to withstand variable weather conditions.

.112 Apply wet weather restrictions on construction activities to reduce surface run-off from exposed work areas and to minimize the risk of inundation.

.113 The work area shall be stabilized against the impacts of high flow/heavy rainfall events at the end of each workday.

.114 Work shall be suspended and the work area stabilized when there is a high probability of a rainfall event.

PART 2 - MATERIALS

2.1 NOT USED .1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED .1 Not Used.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 Departmental Representative will carry out Quality Assurance Inspections and Testing for the purposes of verifying Contractor's Quality Control Procedures and verifying that Work of Contractor, sub-contractors and suppliers is executed in accordance with Contract Documents.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 Departmental Representative may engage independent Inspection and Testing Agencies for purpose of Quality Assurance.

.2 Employment of Quality Assurance Inspection and Testing Agencies by Departmental Representative does not relax Contractor's responsibility to carry out Quality Control Testing and Inspection and execute work in accordance with Contract Documents.

1.3 ACCESS TO WORK

.1 Allow Departmental Representative and Quality Assurance Agencies access to work whenever and wherever it is in progress.

.2 Provide equipment required for access and execution of Quality Assurance Inspection and Testing such as, but not limited to; scaffolding, ladders, heating and lights.

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

1.4 PROCEDURES

.1 Notify Departmental Representative 48 hours in advance of work requiring inspection or testing.

.2 Submit samples and/or materials required for testing as listed in specifications. Submit with reasonable promptness, in orderly sequence and sufficiently in advance so as 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 TESTING BY DEPARTMENTAL REPRESENTATIVE

.1 Departmental Representative will perform inspection/testing on a random basis for auditing purposes.

.2 Correct defects and irregularities as advised by Departmental Representative at no cost. Pay costs for retesting and reinspection.

.3 If Contractor covers or permits to be covered Work that has been designated for inspections before these are 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 will authorize payment of the cost of examination and replacement.

1.6 REJECTED WORK

.1 Remove defective work whenever found, either through Contractor's Quality Control procedures or through Departmental Representative's Quality Assurance procedures.

.2 Notify Departmental Representative of proposed corrective action for acceptance prior to executing corrective action.

.3 Remove and replace or re-execute work in accordance with Contract Documents.

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 Contractor responsible for all Quality Control. Quality Assurance by Departmental Representative does not relax Contractor's responsibility to carry out Quality Control.

1.2 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment.

.2 Section 01 33 00 – Submittal Procedures

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 There will be no measurement of Quality Control.

.3 Payment included in Lump Sum Price:
.1 Item No. L21 - Quality Control – Year 1.
.2 Item No. L22 - Quality Control – Year 2.
.3 Item No. L23 - Quality Control – Year 3.

1.4 INDEPENDENT INSPECTION AGENCIES

.1 Contractor to engage independent Inspection and Testing Agencies for purpose of Quality Control to verify all work including work of sub-contractors and suppliers is in accordance with Contract Documents.

1.5 ACCESS TO WORK

.1 Allow Quality Control Testing Agency and Departmental Representative full access to work whenever and wherever it is in progress.

.2 Provide equipment required for access and executing inspection and testing by appointed agencies such as but not limited to; scaffolding, ladders, heating and lighting.

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

1.6 PROCEDURES

.1 Carry out quality control inspection and testing program as specified and in accordance with accepted quality assurance inspection and testing plan.

.2 Notify Departmental Representative in advance of Quality Control activities.

.3 Submit samples and/or materials required for testing as listed in specifications. Submit with reasonable promptness, in orderly sequence and sufficiently in advance so as to not cause delays in work.

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

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

1.7 ACTION AND INFORMATION SUBMITTALS

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

.2 Prepare and submit Quality Control Inspection and Testing Plan describing:
.1 quality control inspection and testing to be carried out to industry standards, or as specified in individual sections for each stage of work.
.2 procedure for quality control and inspection.
.3 quantity of testing.
.4 a proposed schedule of testing.

.3 Submit Quality Control Inspection and Test reports to Departmental Representative immediately and propose corrective action if required.

1.8 REPORTS

.1 Submit electronic copies of inspection and test reports to Departmental Representative.

1.9 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.

1.10 INSPECTION AND TESTING BY QUALITY CONTROL AGENCIES

.1 Ensure Quality Control Inspection and Testing Agencies carry out quality control inspection and testing program in accordance with accepted Quality Control Plan.

.2 Correct defects and irregularities immediately as advised by Quality Control and Inspection Agencies and Departmental Representative.

.3 Pay costs for retesting and re-inspection.

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

.5 Departmental Representative may order part of work to be re-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 will authorize payment of the cost of examination and replacement.

1.11 REJECTED WORK

.1 Notify Departmental Representative if defective work is found through Contractor's Quality Control procedures.

.2 Notify Departmental Representative of proposed corrective action for acceptance prior to executing corrective action.

.3 Remove and replace or re-execute work in accordance with Contract Documents.

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section includes the following work:
- .1 Connection and setup of temporary utilities.
- .2 Monthly usage of temporary utilities.
- .3 Heating of enclosures.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 No measurements of temporary utilities will be taken.

.3 Payment related to connection and setup of temporary utilities to be included in Lump Sum Item:
- .1 Item No. L24 - Connect and Setup Utilities –Year 1.
- .2 Item No. L25 - Connect and Setup Utilities –Year 2.
- .3 Item No. L26 - Connect and Setup Utilities –Year 3.

.4 Payment related to the monthly costs of using temporary utilities to be included in Lump Sum Item:
- .1 Item No. L27 - Usage of Utilities – Year 1.
- .2 Item No. L28 - Usage of Utilities – Year 2.
- .3 Item No. L29 - Usage of Utilities – Year 3.

.5 Payment related to the space heating of enclosures to be included in Lump Sum Item:
- .1 Item No. L30 - Heating Enclosures – Year 1.
- .2 Item No. L31 - Heating Enclosures – Year 2.
- .3 Item No. L32 - Heating Enclosures – Year 3.

1.3 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment.

.2 Section 01 33 00 – Submittal Procedures

.3 Section 01 56 00 – Temporary Barriers and Enclosures

.4 Section 35 20 22 – Dewatering

1.4 ACTION AND INFORMATION SUBMITTALS

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

1.5 INSTALLATION AND REMOVAL

.1 Provide temporary utilities and controls in order to execute work expeditiously.

.2 Remove temporary utilities and controls from site after work.

1.6 DEWATERING

.1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water in accordance with Section 35 20 22 - Dewatering.

1.7 WATER SUPPLY

.1 Provide supply of potable water.

.2 Arrange for delivery and storage of potable water to site.

1.8 TEMPORARY HEATING OFFICES

.1 Provide and pay for heating for offices.

1.9 HEATING AND VENTILATION OF ENCLOSURES

.1 Provide temporary heating required during construction period, including watch, maintenance and fuel.

.2 Construction heaters used inside enclosures must be indirect fired heating equipment. Solid fuel salamanders are not permitted.

.3 Provide temporary heat and ventilation in enclosed areas as required to:
.1 Facilitate progress of Work.
.2 Protect Work and products against dampness and cold.
.3 Prevent moisture condensation on surfaces.
.4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
.5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Maintain temperatures of minimum 10°C in areas where construction is in progress and inside enclosures.

.5 Ventilating:
.1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
.3 Dispose of exhaust materials in manner that results in no harmful exposure to persons.

.4 Safely ventilate storage spaces containing hazardous or volatile materials.
.5 Ventilate temporary sanitary facilities.
.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.6 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Departmental Representative.

.7 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
.1 Conform with applicable codes and standards.
.2 Enforce safe practices.
.3 Prevent abuse of services.
.4 Prevent damage to finishes.
.5 Vent direct-fired combustion units to outside.

.8 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.10 TEMPORARY POWER AND LIGHT

.1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools.

.2 Arrange for connection with appropriate utility company. Pay all costs for installation, maintenance and removal.

.3 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all work areas is not less than the requirements stated in: Canada Occupational Health and Safety Regulations SOR/86-304 part VI.

1.11 TEMPORARY COMMUNICATION FACILITIES

.1 Provide and pay for temporary telephones, telephone lines, data lines and data hardware for use of Departmental Representative and own use.
.1 Wireless data may be provided through secure, shared wireless router.
.2 Wireless data may also be used for video monitoring hardware.

1.12 FIRE PROTECTION

.1 Provide and maintain temporary fire protection equipment during performance of Work required by 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

.1 Not Used.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specifies requirements for designing, supplying, installing, inspecting, maintaining, and removing:
- .1 Temporary barriers.
- .2 Housing and containment systems.
- .3 Heating and ventilating workspaces.
- .4 Lighting of workspaces.

.2 Intent: housing, heating and ventilating must be sufficient to:
- .1 ensure safe working environment.
- .2 facilitate progress of work in an efficient manner.
- .3 protect areas adjacent to work during procedures which may damage surrounding areas.
- .4 protect work and products against dampness and cold.
- .5 provide ambient temperatures and humidity levels for storage, installation and curing of materials.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 There will be no measurement of Temporary Barriers and Enclosures.

.3 Payment will be included in Lump Sum Price:
- .1 Item No. L33 - Barricades and Enclosures –Year 1.
- .2 Item No. L34 - Barricades and Enclosures –Year 2.
- .3 Item No. L35 - Barricades and Enclosures –Year 3.

1.3 RELATED WORK

.1 Section 01 20 01 – Site Access

.2 Section 01 22 01 – Measurement and Payment

.3 Section 01 33 00 – Submittal Procedures

.4 Section 01 35 29 – Health and Safety Requirements

.5 Section 01 51 00 – Temporary Utilities.

.5 Section 01 35 46 – Archaeological, Cultural and Environmental Procedures

1.4 REFERENCES

.1 Province of Ontario.
.1 Occupational Health and Safety Act and Regulations for Construction Projects, R.S.O. 1990 as amended, O. Reg. 213/91 as amended.
.2 Air Pollution - Local Air Quality (O. Reg. 419/05)

.2 Canadian Standards Association (CSA International)
.1 CSA-O121-08(R2013), Douglas Fir Plywood.

1.5 ACTION AND INFORMATION SUBMITTALS

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

.2 Shop drawings showing:
.1 Type and construction of housing and enclosures, connections with scaffolding, stability system and method of sealing and egress.
.2 Ventilation fan location and capacity.
.3 Heater numbers, types, locations, and capacities. Size of drip trays provided with all liquid-fuelled heaters.
.4 Number and location of fire extinguishers associated with heating equipment.
.5 Number, type, strength, of all lighting provided within enclosure.
.6 Temporary connections to existing stone masonry of the lock structure are not allowed.
.7 Staging plan and schedule.

.3 Provide inspection report from Contractor’s Engineer for installed housing and enclosures.

.4 Provide weekly written record of temperature and humidity within enclosures.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Subject to approval by Departmental Representative as to type, materials and detail: Use:
.1 New materials;
.2 Salvaged/recycled materials in good condition; or,
.3 Prefabricated portable components in good, safe condition.

PART 3 - EXECUTION

3.1 GENERAL

.1 Carry out all work to:
.1 Ontario Occupational Health and Safety Act and Regulations.
.2 Approved Site-Specific Safety Plan.
.3 Approved Site-Specific Environmental Protection Plan.

3.2 BARRIERS

.1 Design, install, maintain and remove barriers around site to secure hazardous areas including but not limited to:
.1 Barriers to be installed along all edges of canal walls.
.2 Barriers to be installed around excavations.
.3 Barrier systems to be designed, inspected and certified by Contractor's Engineer.

.2 Install barrier anchors into joints of lock walls by method and using hardware approved by Departmental Representative.

3.3 SCAFFOLDING

.1 Install scaffolding to Section 01 20 01 - Site Access.

3.4 ENCLOSURES

.1 Provide strong and durable housing and containment enclosures for portions of work to be isolated, protected, heated, or ventilated during Work.
.1 Housing to be strong enough to withstand rain, wind and snow loads.
.2 Tarps to be overlapped and sealed to prevent opening and to ensure waterproofing.
.3 Housing to be insulated against cold.
.4 Electrical wiring, lights, and other equipment located inside enclosure: explosion-proof type. Illumination shall be sufficient for safe execution of the work.

.2 Design, install maintain and remove enclosures as required for containment of dust and debris during operations or to provide heated enclosures during cold
.1 Enclosures will be subjected to wind, rain, ice, snow and flooding.
.2 Enclosures to be designed, inspected and certified by Contractor's Engineer.

.3 Enclosures to remain in place until removal accepted by Departmental Representative.

.4 Routinely maintain and immediately repair enclosure.

3.5 HEATING

.1 Provide temporary heating required during construction period, including watch person attendance, maintenance, and fuel. Payment for heating as specified in section 01 51 00 – Temporary Utilities.

.2 Be responsible for damage to work due to failure in providing adequate heat and protection during construction.

.3 Fire protection requirements: to Section 01 35 29 – Health and Safety Requirements.

.4 Use only indirect fired heating equipment of types acceptable to Departmental Representative.

.5 Heating fuel: Do not re-fuel inside lock chamber or water body.

.6 Fuel Storage: to requirements of Fire Commissioner of Canada and Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

.7 Provide and maintain temporary fire protection equipment during performance of work commensurate with fuel source selected.

.8 Ensure that heating requirements are met by providing, at optimum efficiency of equipment, a capacity of 125% of heat requirement and a sufficient number of standby heaters ready for use at the site.

.9 Provide fans to circulate heating throughout enclosure. Circulate heat from top to bottom of enclosures. Do not direct fan onto masonry surfaces.

.10 Modify heating system if unable to achieve required temperatures consistently to meet heating requirements.

.11 Immediately replace equipment that fails to perform consistently and meet heating requirements.

.12 Vent exhausts of heating equipment outside of housing, well clear of combustible materials and fresh air intake.

3.6 VENTILATING EQUIPMENT

.1 Intent of ventilation:
.1 To ensure required air temperature and quality in all parts of enclosure.
.2 To enhance health and safety of workers.

.2 Depending upon configuration of enclosure, it may be necessary to install both a mechanical supply and exhaust ventilation system to effect adequate air changes within confined space. Locate air-moving devices in a manner that assures that airflow is not restricted or short circuited and is supplied in proper direction and does not interfere with work.

.3 Ventilate storage spaces containing hazardous or volatile materials.

.4 Ventilation system must vent to downstream side of the lock or to take advantage of prevailing winds.

3.7 LIGHTING

.1 Provide electric lighting within enclosures to provide adequate lighting for safe work environment.

3.8 QUALITY CONTROL AND WATCHKEEPING

.1 Provide and post at approved locations within housing, two maximum/minimum thermometers per 10 square metres of plan area or two per 50 square metres of wall elevation within housing. One thermometer to be at bottom and one at top of enclosure within this area. In areas of poor heat circulation, add extra thermometers as directed.

.2 Ensure continuity of protection and heating by providing watchkeeper to make periodic checks at all times including when work is not in progress, nights, weekends and holidays.

.3 Watchkeeper's qualifications to be sufficient to perform such duties as:
.1 Maintain strict supervision of operation of temporary heating and ventilating equipment and enclosures.
.2 Enforce safe practices.
.3 Prevent abuse of services.
.4 Prevent damage to finishes due to miss-use of heating and ventilating equipment.
.5 Undertake preventive maintenance and re-fueling.
.6 Complete emergency repairs of minor complexity.
.7 Place standby items in service.

.4 Record maximum and minimum temperature at each thermometer on daily basis, and re-setting thermometers as necessary.
.1 Make temperature records available to Departmental Representative on a daily basis.
.2 Provide certified written records to Departmental Representative on a weekly basis.

.3 During curing, measure and record humidity and time of application of water.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section consists of the following work:
- .1 Field engineering survey services to measure and stake site.
- .2 Layout and work.
- .3 Recording existing conditions.

1.2 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment.

.2 Section 01 33 00 – Submittal Procedures

.3 Section 01 78 39 – Project Record Documents.

.4 Section 02 42 01 – Removal and Reinstatement of Timber Lock Gates.

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 There will be no measurement of Examination and Preparation.

.3 Payment included in Lump Sum Price:
- .1 Item No. L36 - Document Existing Site Conditions.

1.4 REFERENCES

.1 Known survey control points indicated.

1.5 QUALIFICATIONS OF SURVEYOR

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

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

.5 Surveyor to replace control points in accordance with original survey control.

.6 Elevations for water levels were provided from the source using Canadian Geodetic Vertical Datum of 1928 (CGVD28).

.7 Elevations on new drawings use Canadian Geodetic Vertical Datum of 2013 (CGVD13) or CGVD28 as indicated.

.8 Elevations on reference drawings use CGVD28 unless otherwise indicated.

1.7 SURVEY REQUIREMENTS

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

.2 Stake for grading, fill and topsoil placement and landscaping features.

.3 Survey Lock Gate elevations and points of importance on gates.

1.8 EXISTING SERVICES

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

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

1.9 LOCATION OF EQUIPMENT AND FIXTURES

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

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

.3 Inform Departmental Representative of impending installation and obtain approval for actual location.

.4 Submit shop drawings to indicate relative position

of various services and equipment when required by Departmental Representative.

1.10 RECORDS

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

.2 Maintain project record drawings in accordance with Section 01 78 39 – Project Record Documents.

1.11 ACTION AND INFORMATION SUBMITTALS

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

.2 Submit Survey report including: name and address of Surveyor to Departmental Representative, record of existing site conditions, and lock gate survey results.

.3 Submit documentation to verify accuracy of field engineering work on request of Departmental Representative.

.4 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

1.12 EXISTING SITE CONDITION AND PHOTOS

.1 Survey and record existing site conditions.

.2 Provide survey report of existing conditions prior to mobilizing and starting work.

.3 Provide photos of existing conditions of sufficient quantity to record all site features that may be affected by work. Submit photos in JPG photo or other accepted file format.

.4 Survey and inspect lock gates in accordance with Section 02 42 01 – Removal and Reinstatement of Timber Lock Gates.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specifies requirements for cleaning during the project including:
.1 Initial cleaning and removal of debris from floors of locks 46 and 49.
.2 Progressive cleaning.
.3 Final cleaning
.4 Cleaning of lock walls and lock floors (including sluice tunnels).
.5 Cleaning thick efflorescence deposits/staining from the back face of the east walls and monoliths of the flight locks.
.6 Snow removal

1.2 RELATED SECTIONS

.1 Section 01 74 20 – Waste Management and Disposal

.2 Section 01 35 46 – Archaeological, Cultural and Environmental Procedures

1.3 HERITAGE PROTECTION

.1 The Kingston Mills Lockstation is a National Heritage Site.

.2 Preserve heritage fabric of site by executing repointing without damage to masonry joint edges, adjacent stones or other site features.

.3 Damage to stones will not be tolerated.

.4 Ensure appropriate supervision work, adequate training for workers, and other necessary precautions to protect existing masonry structures.

.5 Notify Departmental Representative immediately where reasonable concern exists that damage will result from work.

.6 Contractor may propose alternative work methodologies to be accepted by Departmental Representative.

1.4 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 There will be no measurement for payment for cleaning.2 Payment included in Lump Sum Price:
.1 Item No. L37 - Site Cleaning – Year 1.
.2 Item No. L38 - Site Cleaning – Year 2.
.3 Item No. L39 - Site Cleaning – Year 3.
.4 Item No. L40 – Floor Debris Cleaning and Removal – Lock 46.
.5 Item No. L41 – Floor Debris Cleaning and Removal – Lock 49.
.6 Item No. L42 - Cleaning Lock Walls and Floors.
.7 Item No. L43 – Clean Efflorescence Deposits – Back Face of Walls and Monoliths.
.8 Item No. L44 - Snow Removal – Year 1.
.9 Item No. L45 - Snow Removal – Year 2.
.10 Item No. L46 - Snow Removal – Year 3.

1.5 ACTION AND INFORMATION SUBMITTALS

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

.2 Submit Snow Removal Plan including icing salt and grit materials datasheets and snow removal, salting and grit placement procedures for review concerns related to Health and Safety or Environmental Protection.

.3 Submit technical datasheet for pressure washer.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Icing Salt and Grit: To be environmentally approved by appropriate agency.

2.2 EQUIPMENT

.1 Pressure Washer: with wide spray nozzle and configurable to apply low pressure, maximum 2700 KPa measured at nozzle tip.

PART 3 - EXECUTION

3.1 PROGRESSIVE CLEANING

.1 Maintain Work site in tidy condition, free from accumulation of waste products and debris.

.2 Clean up work area as work progresses. At end of each

work day, and more often if ordered by Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.

.3 Do not burn waste materials on site.

.4 Do not bury waste materials on site or incorporate into work.

.5 Do not allow waste to become buried in snow.

.6 Clear snow and ice from access to Work, bank/pile snow in designated areas only.

.7 Keep public roadway clean and routinely remove sediment and debris from roadway caused by construction activities.

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

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

.10 Provide and use clearly marked separate bins for recycling.

.11 Identify storage areas for waste and recycling in Site Layout Plan.

.12 Do not allow waste to fall into or blow into canal or water body. Place light waste, that may blow away, immediately into closed containers.

.13 Separate and process construction and demolition waste to Section 01 74 20 – Waste Management and Disposal.

.14 Remove waste material and debris from site and deposit in waste container at end of each work day.

.15 Dispose of waste materials and debris off site.

.16 Dispose of recyclable materials to recycling centre. Do not dispose of recyclable materials as waste materials.

.17 Clean interior areas prior to start of finish work, and maintain areas free of dust and other contaminants during finishing operations.

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

.19 Provide adequate ventilation during use of volatile

or noxious substances.

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

.21 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate canal system.

3.2 LOCK 46 and 49 -INITIAL FLOOR CLEANING

.1 Upon completion of dewatering of lock 46 and 49, contractor shall clean the lock floors of all material deposits, including, but not limited to:
.1 Zebra mussels,
.2 Sediment, gravel and larger stones
.2 Organic materials
.3 Concrete debris
.4 Any foreign materials, rubbish or debris.

.2 All removed material shall be disposed of off-site in accordance with approved disposal procedures.

.3 Floor of Lock 46:
.1 The floor of lock 46 is an uneven exposed bedrock surface. The surface shall be cleaned free of any significant accumulation of loose material (other than gravel type particles less than 25mm in diameter) in all crevices and joints. The final cleaned surfaces shall appear clean and free of any particles when viewed from a distance of 6 meters in daylight.

3.3 CLEANING LOCK WALLS AND LOCK FLOOR

.1 As soon as possible at start of work for each year, dewater lock for work of that year and setup access systems to allow access to floor of lock chamber and scaffolding to allow access to lock walls for inspection.

.2 Clean lock walls and lock floor of zebra mussels, dirt, marine vegetation and debris, to allow for inspection of walls and execution of work. Remove from site prior to inspection. This cleaning includes removal of debris which accumulates within and outside of the sluice tunnel outlets.

.3 Routinely clean walls, including walls to be repaired in marine environment by divers.

.4 Routinely completely clean and sweep lock floor between stoplog gains and extending 1 m beyond timber stoplog sill.

.5 Pressure wash walls and floor in temperatures above freezing and when freezing temperatures are not

expected within 24 hours.

.6 Use low pressure washer (Max 2700 KPa), using wide spray nozzle, an adequate distance (300 mm) from surface and in constant sweeping motion to ensure no damage to stone or mortar in joints.

.7 Do not pressure wash difficult to clean areas by focusing nozzle in one area to prevent "boring" into stone or mortar joint.

.8 Use natural fibre hand brushes to manually finish cleaning, or where pressure washing not practical or effective.

.9 Carry out test patch by cleaning an area of two meters squared, designated by Departmental Representative, to allow for evaluation of cleaning method by Departmental Representative before continuing cleaning.

.10 Remove debris and waste material from bottom of lock continuously. Keep bottom of lock clean so work is not interfered with.

.11 It is recommended to remove majority of debris and waste from bottom of lock before winter freeze up.

.12 Dispose waste and debris off-site to an accepted waste disposal site.

3.4 EFFLORESCENCE DEPOSIT CLEANING

.1 Procedure for removal of heavy efflorescence deposits on the exterior wall face of the flight lock monolith.

- .1 Use wide chisel to gently remove efflorescence deposits without causing any damage to stone masonry.
- .2 Pressure wash wall to remove remaining efflorescence deposits. Begin with very low pressure and increase gradually until efflorescence is removed. Maximum pressure shall not exceed 13500 kPa.
- .3 Contractor shall construct a 2m x 2m mock up cleaning area for review and acceptance by the Departmental Representative. Contractor shall not proceed with cleaning until mock-up is approved.

3.5 CLEANING AT END OF EACH CONSTRUCTION SEASON AND FINAL CLEANING

.1 When work is substantially complete, , or at the end of each construction season, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris, and leave Work clean and suitable for occupancy.

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

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

.5 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.6 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, walls, signs, benches, and floors.

.7 Clean lighting reflectors, lamps, lenses, and other lighting surfaces.

.8 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

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

.10 Remove dirt and other disfiguration from exterior surfaces.

.11 Sweep and wash clean paved areas.

.12 Sweep, brush, and wash lock floor and walls. Remove all debris and dirt from lock.

.13 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

.14 Upon completion remove scaffolding, temporary protection and surplus materials. Make good defects noted at this stage.

.15 Clean areas under contract to a condition at least equal to that previously existing and to approval of Departmental Representative.

3.6 SNOW REMOVAL

.1 Remove snow and ice from within construction zone and Contractor staging area to allow execution of work.

.3 Carry out snow removal when more than 5cm of snow fall occurs and/or more often as required to maintain access

routes.

.2 Remove snow and ice from: work areas, storage areas, parking areas, construction access roads, access systems, scaffolding, hoarding and public parking beside Lock Master's Building.

.3 Municipality responsible for snow removal on Kingston Mills Road.

.4 Remove snow that may contain deleterious materials from within 30 m of lock or water body.

.5 Do not allow snow to fall into or dump snow directly lock or water body.

.6 Salt and/or sand access routes regularly to ensure roadway is passable at all times for both construction and emergency vehicles. Do not sand or salt grassy areas adjacent to access routes. Minimize salting in grassy areas to prevent damage. Apply salt and grit for traction in accordance with Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

.7 Keep work areas and access to work areas, including bottom of lock, scaffolding, walkways, stairs, ladders, construction access paths, and parking areas free of snow and ice for the duration of work.

PART 1 - GENERAL

1.1 WASTE MANAGEMENT GOALS

.1 Minimize amount of non-hazardous solid waste generated by project and accomplish maximum source reduction, reuse and recycling of solid waste produced by CRD activities.

.2 Protect environment and prevent environmental pollution damage.

.3 Work to be in accordance with Section 01 35 46 – Archeological, Cultural and Environmental Procedures.

1.2 RELATED WORK

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 35 46 – Archeological, Cultural and Environmental Procedures

1.3 REFERENCES

.1 Definitions:

.1 Approved/Authorized recycling facility: waste recycler approved by applicable provincial authority or other users of material for recycling approved by the Departmental Representative.

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

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

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

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

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

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

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

.9 Source Separation: act of keeping different types of waste materials separate beginning from the

point they became waste.
.10 Waste Reduction Workplan (WRW)
.11 Waste Source Separation Program (WSSP)

1.4 ACTION AND INFORMATION SUBMITTALS

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

.2 Submit a waste reduction workplan (WRW) indicating the materials and quantities of material that will be recycled and diverted from landfill.

.3 Submit a Waste Source Separation Program (WSSP) description.

.4 Prepare and submit on monthly basis, throughout project or at intervals agreed to by Departmental Representative the following:
.1 Receipts, scale tickets, waybills, and/or waste disposal receipts that show quantities and types of materials reused, recycled, or disposed of.
.2 Written monthly summary report detailing cumulative amounts of waste materials reused, recycled and landfilled, and brief status of ongoing waste management activities.

.5 Submit proof that all waste is being disposed of at a licensed land fill site or waste transfer site. A copy of the disposal/waste transfer site's license and a letter verifying that said landfill site will accept the waste must be supplied to Departmental Representative prior to removal of waste from the demolition site.

.6 Submit prior to final payment the following:
.1 Provide receipts, scale tickets, waybills, waste disposal receipts that confirm quantities and types of materials reused, recycled or disposed of and destination.

1.5 USE OF SITE AND FACILITIES

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

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

.5 Support affected structures as required to perform the Work.

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

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

.8 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated processing facilities.
.1 On-site source separation is recommended.
.2 Remove co-mingled materials to off site processing facility for separation.
.3 Obtain waybills, receipts and/or scale tickets for separated materials removed from site.
.4 Materials reused on-site are considered to be diverted from landfill and as such are to be included in all reporting.

1.7 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste, volatile materials, mineral spirits, oil, paint thinner, into waterways, storm, or sanitary sewers.

.3 Carefully deconstruct and source separate materials/equipment and divert, from Demolition and Construction waste destined for landfill to maximum extent possible. Target for this project is 30% diversion from landfill. Reuse, recycle, compost, anaerobic digest or sell material for reuse except where indicated otherwise. On site sales are not permitted.

.4 Source separate waste and maintain waste audits in accordance with the Environmental Protection Act, Ontario Regulation 102/94 and Ontario Regulation 103/94.
.1 Provide facilities for collection, handling and storage of source separated wastes.
.2 Source separate the following waste:
.1 Portland cement concrete.
.2 Wood, not including painted or treated or

laminated wood.
.3 Steel.
.4 Electrical wiring.

.5 Keep records of construction waste including:
.1 Number and size of bins.
.2 Waste type of each bin.
.3 Total tonnage generated.
.4 Tonnage reused or recycled.
.5 Reused or recycled waste destination.

.5 Remove materials on-site as Work progresses.

.6 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in the waste audit.

1.8 WASTE PROCESSING SITES

.1 Province of: Ontario.
.1 Ministry of Environment and Energy, 135 St. Clair Avenue West, Toronto, ON, M4V 1P5.
.2 Telephone: 800-565-4923 or 416-323-4321.
.3 Fax: 416-323-4682.

.2 Recycling Council of Ontario: 215 Spadina Avenue, #407, Toronto, ON, M5T 2C7.
.1 Telephone: 416-657-2797
.2 Fax: 416-960-8053
.3 Email: rco@rco.on.ca.
.4 Internet: http://www.rco.on.ca/.

1.9 SCHEDULING

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 APPROVAL

.1 Do Work in compliance with WRW and WSSP.

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

3.2 CLEANING

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

.2 Cleaning at End of Each Construction Season and Final Cleaning:
.1 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 20 - Construction/Demolition Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
.2 Source separate materials to be reused/recycled into specified sort areas.

3.3 DIVERSION OF MATERIALS

.1 On-site sale of salvaged recovered reusable recyclable materials is not permitted.

3.4 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Government Chief Responsibility for the Environment. General

Province	Address	Inquiries	Fax
Ontario	Ministry of	416-323-4321	416-323-4682

Environment and Energy 135 St Clair Avenue West Toronto, ON M4V 1P5	(800) 565-4923
Environment Canada Toronto, ON	(416) 739-4826

END OF SECTION

PART 1 - GENERAL

1.1 RECORD DRAWINGS

.1 Maintain project record drawings and record accurately all deviations from the Contract documents. Record information concurrently with construction progress. Keep work visible until required information is recorded.

.2 Record changes in red ink. Mark ongoing changes on one set of prints. Then, at completion of project and before final inspection, neatly transfer notations to second set of prints. Submit both sets to Departmental Representative.

1.2 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment.

.2 Section 01 33 00 – Submittal Procedures

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 There will be no measurement for payment under this section.

.3 Payment included under lump sum price:
.1 Item No. L47 - Project Record Documents.

1.4 ACTION AND INFORMATION SUBMITTALS

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

1.5 INFORMATION TO BE RECORDED

.1 Record the following information:
.1 Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvement.
.2 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the structure.
.3 Field changes of dimension and detail.
.4 Changes made by Change Order or Field Order.
.5 Details not on original Contract Drawings.
.6 References to related shop drawings and modifications.
.7 Additional Requirements: as specified in individual specification sections.

1.6 REVIEW

.1 Be prepared to review As-Built Drawings with Departmental Representative at least weekly, to ensure that level of detail being recorded is acceptable. Be advised that during periods of high activity, Departmental Representative may review As-Built Drawings even more frequently than weekly.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

PART 1 – GENERAL

1.1 DESCRIPTION

.1 This section covers the requirements for concrete removals.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 Payment to be included at the unit prices for the following items:

.1 Item No. U1 - Concrete Removal – Horizontal Surface.

.2 Item No. U2 - Concrete Removal – Vertical Surface.

.3 Item No. U3 - Concrete Removal – Basin Wall.

.4 Item No. U4 - Concrete Removal – Underwater.

.5 Item No. U5 - Concrete Removal – Staircases.

.6 Item No. U6 - Concrete Removal – Slab on Grade.

Item No. U7 - Concrete Removal – Sluice Tunnels.

.1 Payment under the above item shall include all costs associated with work inside the sluice tunnels and includes, but is not limited to; mobilization, access, enclosures, ventilation, scaffolding/work platforms and shoring of existing masonry elements. This item also includes costs of any engineering design associated with any measures required to carry out the work.

.7 Item No. U8 - Remove North Retaining Wall in Turning Basin.

.8 Item No. U9 - Mill Concrete in Floor – Lock 47.

.9 Item No. U10 - Mill Concrete in Floor – Lock 48.

1.3 PROTECTION

.1 Do not impede operation and normal use of the structure.

.2 Provide access system, temporary dust screens, covers, railings, supports, sediment traps, dust controlling operation, effluent collection system during saw-cutting and all other protection and provisions as required for conformance with OPG General Conditions and Requirements.

.3 Access and carry out Services in a safe manner.

1.4 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment.

PART 2 – PRODUCTS

.1 Not Used.

PART 3 – EXECUTION

3.1 REMOVALS AND DISPOSAL

.1 Concrete removal sequence shall be in conformance with any work restrictions as detailed in Contract.

.2 Remove all concrete elements to limit specified in contract to permit new construction.

.3 Deteriorated masonry within limits of concrete removals to be removed within these items.

.4 Sound and solid masonry encountered within limits of concrete removals shall be confirmed by Departmental Representative prior to any removal.

.5 Specified removal areas are based on past surveys and visual observations. The locations and size of repair areas are approximate only and shall be confirmed by Departmental Representative once access to removal areas is provided by Contractor.

.6 Dispose of removed materials off site.

3.2 EQUIPMENT

.1 Jack hammers or chipping hammers only

.2 No use of hoe ram (mechanical breaker) equipment permitted

3.3 METHODOLOGY OF REMOVALS

.1 Provide access for Departmental Representative to mark up the removal areas.

.2 All reinforcing steel shall be preserved and protected, unless specified otherwise.

.3 Obtain Departmental Representative’s review and acceptance of removals as they progress. Assume in price that repeated mobilization to the same area will be required as it is inspected and removals progress. Do not demobilize from removal areas until Departmental Representative has reviewed and accepted the removals.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not Used.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specifies requirements for removal, inventory, transportation and temporary storage for reinstatement.

.2 Items requiring removal and disposal include, but are not limited to, the following:
- .1 All existing lock chamber ladders.
- .2 Existing railings as specified.
- .3 Pressure relief valves.
- .4 Deteriorated timber in lock 49 chamber floor.
- .5 Existing electrical cables, conduit and anchorage located at the upstream gate recess of lock 46.

.3 Items requiring removal, inventory, transportation and temporary storage include, but are not limited to, the following:
- .1 Gate (crab) winches
- .2 Sluice tunnel valve (rack and pinion) winches including connection rods, and counterweights.
- .3 Bollards
- .4 Mooring line anchorage assemblies (upper and lower)
  - .1 Mooring lines and anchorages are to only be removed where required (i.e. where damaged, or where interfering with other work)
- .5 Vent covers for sluice tunnels
- .6 Existing railing posts not designated for removal and disposal.
- .7 Accessories such as: masonry cramps, signs, sign/accessory posts, barbeques, garbage containers, benches, information plaques, remains of timber gate bumpers, etc.

.4 The existing sluice tunnel valves and frames require removal, inventory, recording of dimensions, transportation to and from Parks Canada shop and reinstallation.

.5 Removal of all trees, stumps and root balls designated for removal.

.6 Removal and salvage of all existing flagstone. Departmental Representative shall indicate which flagstones are not suitable for re-use and these shall be removed from site by the Contactor.

.7 Existing electrical utility cable and conduits at the downstream gate recess to be temporarily removed from

lock 46 in order to complete the specified work.

1.2 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment.

.2 Section 01 35 46 – Archaeological, Cultural and Environmental Procedures

.3 Section 02 83 10 – Lead-Base Paint Abatement – Minimum Protection

.4 Section 04 43 04 – Repointing Stone Masonry

.5 Section 05 05 00 Metal Fabrications

.6 Section 06 10 53 - Rough Carpentry

.7 Section 32 94 00 – General Landscaping

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 Unless specified under a unit price item, payment shall be included in Lump Sum Price table under the following items:
.1 Item No. L48 - General Removals.
.1 Removals under this item will include all items not specifically referenced in the Unit price items. Including but not limited to lock hardware, benches, barbeques, lifesaving stations, gate winches, etc.

.3 Payment to be included in Unit Price table under the following items:
.1 Item No. U11 - Remove Pressure Relief Valves.
.2 Item NO. U12 – Remove Access Ladders.
.3 Item No. U13 – Remove Stair Railings. Tunnel Valves and Frames.
.4 Item No. U14 - Remove Raised Wall Monolith Railings.
.5 Item No. U15 – Remove and Salvage Upper Anchorage for Mooring Lines.
.6 Item No. U16 – Remove and Salvage Lower Anchorage for Mooring Lines.
.7 Item No. U17 - Remove and Salvage Sluice Tunnel Valves and Frames.
.8 Item No. U18 – Remove and Salvage Sluice Gate Winches.
.9 Item No. U19 - Remove and Salvage Masonry Cramps.
.10 Item No. U20 - Remove and Salvage Pavers.
.11 Item No. U21 - Remove Timber in Lock Floor.
.12 Item No. U22 - Remove Asphalt.

.13 Item No. U23 – Removal Trees.

.4 Assume existing paint contains lead. Removal of paint, where required, to be in accordance with Section 02 83 10 – Lead-Base Paint Abatement – Minimum Protection. No measurement of payment for this work as it is deemed to be included in the applicable removal item.

1.4 PROTECTION

.1 Protect existing structures or parts of structures designated to remain in-place or items where Departmental Representative has accepted methods of protection rather than removal.

.2 In event of damage, make repairs and replacements by methods accepted by Departmental Representative, and at no additional cost.

.3 Protect all exposed electrical wiring and conduits during the concrete excavation, forming, heating and placement of concrete.

.4 Protect roots and trees designated to remain in-place from damage as directed in Section 32 94 00 – General Landscaping and Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

PART 2 - PRODUCTS

.1 Not applicable.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Inspect site and verify with Departmental Representative objects designated to be removed and objects to be preserved.

.2 Based on Contractor's accepted Site Layout Plan, some items designated to be removed may be allowed remain in-place if adequately protected by methods accepted by Departmental Representative.

.3 Notify utility authorities and carry out utility locates before starting excavation, clearing and grubbing.

3.2 GENERAL

.1 Do not disturb adjacent work designated to remain in place.

3.3 PRESSURE RELIEF VALVES

.1 Sawcut concrete chamber floor around pressure relief valves.

.2 Remove pressure relief valves and surrounding concrete in lock floor.

3.4 LADDERS

.1 Remove and dispose of existing lock chamber ladders.

.2 Remove existing anchors using procedure accepted by Departmental Representative.

.3 Clean and patch anchor holes that are not to be re-used using masonry mortar to Section 04 43 04 – Repointing Stone Masonry.

3.5 RAILINGS

.1 Remove and dispose of existing railings on back face of walls and monoliths and on stairs.

.2 Salvage ornamental posts at stairs for re-use with new railing.

.2 Remove existing anchors using procedure accepted by Departmental Representative.

.3 Clean and patch anchor holes that are not to be re-used using masonry mortar to Section 04 43 04 – Repointing Stone Masonry.

3.6 ANCHORAGES OF MOORING LINES

.1 Where upper or lower anchors for mooring lines are damaged or are embedded into stones designated for repair or replacement, remove existing anchors using procedure accepted by Departmental Representative.

.2 Where stone is not being removed, clean and patch anchor holes that are not to be re-used using masonry mortar to Section 04 43 04 – Repointing Stone Masonry.

.3 Salvage and store or protect mooring lines for the duration of the construction season.

.4 Reinstate anchorages for mooring lines prior to the commencement of the operating season in accordance with Section 05 05 00 Metal Fabrications.

3.7 SLUICE TUNNEL VALVES AND FRAMES

.1 Contractor shall measure and record all pertinent dimensions of each sluice tunnel valve-frame assembly that is to be removed. Departmental Representative shall witness the measurement taking and verify the recorded dimensions.

.2 Removed valve-frame assemblies shall be delivered by the contractor to Parks Canada's Gate Fabrication Shop in Smith Falls, Ontario.

.3 Upon completion of refurbishment, valve-frame assemblies shall be picked up and transported back to the site and installed by the Contractor.

3.8 SLUICE GATE WINCHES

.1 Contractor shall measure and record all pertinent dimensions and the location of the sluice gate winches. Departmental Representative shall witness the measurement taking and verify the recorded dimensions.

.2 Remove the winches from site and return to site after they have been refurbished by the contractor as described in section 05 05 00 Metal Fabrications.

3.9 CRAMPS

.1 Where cramps are embedded into stones designated for repair or replacement remove existing cramps using procedure accepted by Departmental Representative.

.2 Salvage and store cramps.

.3 Reinstate cramps prior to the commencement of the operating season in accordance with Section 05 05 00 Metal Fabrications.

3.10 PAVERS

.1 Remove existing pavers where indicated by the contract drawings or as required to carry out the work.

.2 Salvage and store pavers as accepted by Departmental Representative.

.3 Reinstate pavers prior to the commencement of the operating season in accordance with Section 32 94 00 General Landscaping.

3.11 LOCK FLOORS

.1 Once dewatering and cleaning of the Lock 49 Chamber Floor are complete inspect the timber floor with the Departmental Representative and designate repair areas.

.2 Remove upper layer of timber planks in designated areas.

.3 Reinstate these areas in accordance with Section 06 10 53 Rough Carpentry.

3.12 ASPHALT

.1 Departmental Representative to designate extents of asphalt removals on site.

.2 Remove asphalt and dispose of off-site.

3.6 TREES

.1 Remove and dispose off-site, trees, stumps and root balls designated for removal.

.2 Remove trees, stumps and root balls, without causing damage to other structures or site features, using methods accepted by Departmental Representative.

.3 Trees designated to remain shall be protected in accordance with 01 34 46 – Archeological, Cultural and Environmental Procedures.

3.4 SALVAGE

.1 Carefully dismantle materials designated for salvage and stockpile at locations designated by Departmental Representative.

3.7 DISPOSAL OF MATERIALS

.1 Dispose of materials not designated for salvage or reuse in work off-site.

PART 1 – GENERAL

1.1 DESCRIPTION

.1 This section covers the removal, temporary vertical on-site storage and re-installation of specified lock gates to allow for access to the masonry of the hollow quoin of the gate recess walls. The following work is included; site survey, inspection, preparation, removal, storage, protection, installation, adjustment and testing.

.1 The following gates are required to be removed, stored and reinstalled:
- .1 Lock 46 Upper Gates (Short)
- .2 Lock 48 Lower Gates (Tall)
- .3 Lock 49 Lower Gates (Tall)

.2 This section also covers the requirements related to the the permanent removal, disposal and reinstallation of new lock gates (by Parks Canada).

.1 The following gates will be replaced during this contract:
- .1 Lock 46 Lower Gates (Tall) (Scheduled Spring 2019)
- .2 Lock 47 Lower Gates (Tall) (Scheduled Spring 2020)

.2 Parks Canada Agency (PCA) will be responsible for the fabrication of the new lock gates, including any required inspections and measurements required for the construction of the new gates. Contractor shall accommodate Parks Canada in carrying out this work. At onset of project, Contractor shall coordinate with Parks Canada regarding the timing of the proposed gate replacements. Construction of new gates can take several months.

.3 PCA will be responsible for the removal of existing and installation of new lock gates. The contractor will co-ordinate with PCA and accommodate all operations related to the replacement of the lock gates.

1.2 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment.

.2 Section 01 33 00 – Submittal Procedures

.3 Section 01 74 11 – Cleaning

.4 Section 02 83 10 – Lead-Base Paint Abatement – Minimum Protection

.5 Section 05 50 00 – Metal Fabrications

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 Work described in this section to be measured and paid for under the following unit price items:
.1 Item No. U24 – Removal and Reinstatement of Lock Gates - Short.
.2 Item No. U25 – Removal and Reinstatement of Lock Gates - Tall.

.3 Measurement for payment shall be for each gate leaf removed, temporarily stored and reinstated.

.4 The existing paint on the lock gates contains lead. Removal of paint, where required, to be in accordance with Section 02 83 10 – Lead-Base Paint Abatement – Minimum Protection. No measurement of payment for this work as it is deemed to be included in the specific removal item.

1.4 GATE SHOP MEETING

.1 Departmental Representative to organize meeting with Parks Canada's in-house gate fabrication staff and contractor prior to Gate Survey and preparation of Gate Removal Plan.

.2 Meeting to be held at Parks Canada's Gate Fabrication Shop in Smith Falls, Ontario.

1.5 SITE SURVEY AND INSPECTION

.1 After dewatering lock, clean areas around footbox at bottom of heel posts and gate contact areas around hollow quoin and along front edge of gate sill in accordance with Section 01 74 11 – Cleaning.

.2 Perform survey and inspection with Departmental Representative of existing lock walls, quoins, gate sill, gates and gate components to record dimensions and existing condition of each component.
.1 Take overall photos of gates and photos of details and defects which may affect gate removal and re-installation.

.3 Submit Gate Survey Report to Departmental Representative including but not limited to:

.1 Overall dimensions and condition of gates.
.2 Dimensions and condition of gate timber components such as; walkway, swing beam, steps, mitre post, heel post, top rail, bottom rail, rails, munions and planking.
.3 Rough dimensions and condition of gate steel components such as; spiders, anchors, collars, anchor plate heads, wedge keys, bridle, screw rods, tee plates, footbox, gate pivot, gate valves, gate valve crab, rack and pinion mechanism, lifting rods, counterweights and railings.
.4 Dimensions and condition of walls at contact surfaces such as; mitre, heel, hollow quoin and sill and general area of gates such as; wall, quoin, pier and floor.
.5 Condition of gate accessories such as; winches, chains, sheave blocks, snub pulleys.
.6 Drawings indicating dimensions.
.7 Photos of defects observed. Submit raw JPG files or other accepted format.

.4 Use data from gate survey, check drawings and obtain other data needed to develop Gate Removal Plan including; estimation of gate weight, gate preparation requirements, hoisting points, bracing points, partial disassembly options, vertical gate storage supports and gate securement, etc.

.5 Take pictures and document measurements of gate components exposed during and after disassembly and removal such as; heelbox, gudgeon, crosstail, brass rods (at collar) and hollow quoin.

1.6 ACTION AND INFORMATION SUBMITTALS

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

.2 Gate Survey Report as described above.

.3 Gate Removal Plan: to include:
.1 Details describing materials and procedures for preparation, removal, vertical on-site storage, protection, re-installation, adjustment and testing of existing gates.
.2 Gate Removal Plan to be signed and sealed by Engineer registered or licensed in Province of Ontario, Canada.
.3 Describe in detail work sequence and schedule.
.4 Calculate weight of gates or gate components to be lifted.
.5 Show lifting points and support points for removal, handling, storage, transportation, erection and adjustment.
.6 Show temporary bracing details and attachment

details for bracing.
.7 Describe in detail methods and equipment to be used to adjust gate to ensure same water-tightness, especially at quoin where new stone installed.

1.7 LEAD PAINT

.1 Contractor is advised that the paint on all existing gates contains lead.

PART 2 – PRODUCTS

2.1 LUBRICATION

.1 Grease: NLGI grade 2 to 5 high pressure grease, eco-certified, non-toxic, rapidly bio-degradable, insoluble in water with anti-corrosion properties or corrosion inhibitors and a minimum operational temperature range of -30°C to +100°C.
.1 Subject to environmental acceptance.

PART 3 – EXECUTION

3.1 SURVEY AND INSPECTION

.1 Survey existing gate dimensions, inspect condition of gate components and submit Gate Survey Report for acceptance prior to preparing Gate Removal Plan.

3.2 GATE REMOVAL PLAN

.1 Prepare and submit detailed Gate Removal Plan 10 days prior to gate removal.

3.3 GATE LIFTING AND REMOVAL

.1 Remove gate in accordance with accepted Gate Removal Plan.

.2 Disassemble walkway and remove separately to make gate removal easier.

.3 Removal of gate requires support of gate while mitre post collar is disassembled.

.4 Use gate lifting points and lifting methods that do not cause damage to gate components.
.1 Use extra rubber padding on nylon strapping.
.2 Do not use chains or wires.

.5 Supply cranes suitable for site conditions and of sufficient size to lift gates and gate components from existing position to vertical storage position inside adjacent lock chambers.

.6 Construct temporary gravel pad if required for crane operations.

.7 Clean all steel components using manual tools and brushes for inspection by Departmental Representative prior to storage.

.8 Fix in-place or remove and store by accepted methods any components that are loose or may come loose during lifting such as gate bridle and gudgeon.

.9 Exercise care to prevent bending or twisting of gate during lifting and handling of gates. Gates to remain in vertical position at all times during removal, storage and reinstallation operations.

.10 Provide extra bracing to prevent bending and twisting if required.

3.4 STORAGE AND PROTECTION

.1 All required measures for storage and protection of the lock gates shall be designed by contractors engineer and shall be included in the Gate Removal Plan.

.2 Gates shall be stored inside existing lock chambers away from construction activities. Contractor to stage work inside lock chambers to accommodate gate storage. The following are suggested storage locations for the gates specified for removal (alternate storage locations outside lock chambers must be approved by Departmental Representative and detailed in the Gate Removal Plan):

.1 Lock 46 Upper Gates (Short) to be stored inside the Lock 46 chamber.

.2 Lock 48 Lower Gates (Tall) to be stored inside the Lock 48 chamber.

.3 Lock 49 Lower Gates (Tall) to be stored inside the Lock 49 chamber.

.3 The precise storage location of the lock gates inside the specified lock chambers will be approved by the Departmental Representative.

.4 Store lock gates in a vertical position inside adjacent lock chambers with all components and accessories elevated off the chamber floor so that they remain dry and ventilated and away from construction activities.

.5 Each gate pair shall be stored together (one in front

of the other) against a lock chamber wall. The support structure below the gates shall be constructed so that the gates are supported in a stable position and slightly inclined towards the chamber wall. Timber blocking shall be provided between the wall and the gates.

.6 The gates shall be secured to the chamber walls to prevent shifting or overturning of the gates. Restraining devices which are anchored into the masonry joints of the chamber wall may be used.

.7 Protect gates, components and accessories with plastic sheeting/tarps.

.8 Do not allow excess rain or snow to accumulate on gates or plastic sheeting.

.9 Protect items from nicks, scratches and damaged during storage.

3.5 STEEL REPAIRS OR FABRICATION

.1 Install steel components removed or repair steel components damaged by Contractor during work to Section 05 50 00 – Metal Fabrications and in accordance with accepted shop drawings.

.2 Shop paint replacement steel components in accordance with Section 05 50 00 – Metal Fabrications and in accordance with accepted shop drawings.

3.6 TIMBER REPAIRS OR FABRICATION

.1 Repair or fabricate timber components damaged by Contractor to match existing and in accordance with accepted shop drawings.

.2 Shop paint replacement timber components with two coats of solid colour stain to match existing colour and approved by Departmental Representative.

.3 Prepare timber surfaces for painting in accordance with manufacturer's recommendations.

.4 Connect timber members using bolts, nuts, metal connector plates, split rings and shear plates to match existing.

3.7 INSTALLATION

.1 Install lock gates in accordance with accepted Gate Removal Plan.

.2 Make good any Contractor damage to gate contact areas such as gate sill and quoins.

.3 Use only lifting points and attachment methods described in the approved Gate Removal Plan.

.4 Immediately before installation, clean footbox, gate pivot, heel, collar and heel post with hand tools and lubricate with accepted grease.

.5 Install new gates at required location with crane of appropriate capacity.

.6 When gate is correctly resting on pintle, install collar into spider.

.7 Re-assemble all remaining gate components using new galvanized steel hardware.

3.8 ADJUSTMENT OF GATES

.1 Adjust gate in accordance with accepted Gate Removal Plan.

.2 Only minor adjustments are possible at collar during installation.

.3 Adjust gate position and lock collar into spider using wedge keys and set screws.

.4 Install using new galvanized steel hardware, painted in accordance with Section 05 50 00 – Metal Fabrications.

.5 Make good any Contractor damage to timber gate at contact areas in mitre, heel and sill prior to installation.

.6 Operate gate dry and make adjustments to timber heel post if required as directed by Departmental Representative.

.7 Test water tightness of gates in wet condition by performing successive filling and emptying cycles of area between stoplog cofferdam and gate (Lock 46) or upstream lock chamber (Lock 47 and 48).
.1 Inject epoxy resin in joints between beams where severe leaks are present.

3.9 SECURITY

.1 Immediately install and use padlocks and chains on all gate crab winches at start of work to prevent any unauthorized opening of the lock gates.

3.10 FIELD REPAIRS PAINTING

.1 After installation and adjustment, repair damaged timber components using methods accepted by Departmental Representative.

.2 After installation and adjustment, repair damaged steel components using repair methods accepted by Departmental Representative.

.3 Touch-up damaged paint on steel components in accordance with Section 05 50 00 – Metal Fabrications.

.4 Touch-up damaged timber components with two coats of solid colour stain to match existing colour and approved by Departmental Representative.

PART 1 – GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 35 29 – Health and Safety Requirements.

.3 Section 01 35 46 – Environmental Procedures

.4 Section 01 74 20 – Construction/Demolition Waste Management and Disposal

1.2 REFERENCES

.1 Department of Justice Canada
.1 Canadian Environmental Protection Act, 1999 (CEPA).

.2 Health Canada
.1 Workplace Hazardous Materials Information System (WHMIS), Material Safety Data Sheets (MSDS).

1.3 DEFINITIONS

.1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.

.2 Action level: employee exposure, without regard to use of respirators, to airborne concentration of lead of 50 micrograms per cubic meter of air (50 ug/mü) calculated as 8-hour time-weighted average (TWA). Minimum precautions for lead abatement are based on airborne lead concentrations less than 0.05 milligrams per cubic meter of air for removal of lead based paint by methods noted in paragraph 1.1.

.3 Lead dust: wipe sampling on vertical surfaces and/or horizontal surfaces, dust and debris is considered to be lead contaminated if it contains more than 40 micrograms of lead in dust per square foot.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Provide proof satisfactory to Departmental Representative that suitable arrangements have been made to dispose of lead based paint waste in accordance with requirements of authority having jurisdiction.

.3 Quality Control:
.1 Provide Departmental Representative necessary permits for transportation and disposal of lead based paint waste and proof that lead based paint waste has been received and properly disposed.
.2 Provide proof satisfactory to Departmental Representative that employees have had instruction on hazards of lead exposure, respirator use, dress, and aspects of work procedures and protective measures.

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial/Territorial and local requirements pertaining to lead paint, provided that in case of conflict among those requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at time work is performed.

.2 Health and Safety:
.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 in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.

.3 Disposal of lead waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of lead waste in sealed double thickness 6 ml bags or leak proof drums. Label containers with appropriate warning labels.

.4 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.7 EXISTING CONDITIONS

.1 Reports and information pertaining to lead based paint to be handled, removed, or otherwise disturbed and disposed of during this Project are bound into this specification.

.2 Notify Departmental Representative of lead based paint discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Departmental Representative.

1.8 SCHEDULING

.1 Inform sub trades of presence of lead-containing materials identified in Existing Conditions.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Lead waste containers: metal or fibre type acceptable to dump operator with tightly fitting covers and 0.15 mm thickness sealable polyethylene liners.
.1 Label containers with pre-printed bilingual cautionary Warning Lead clearly visible when ready for removal to disposal site.

PART 3 – EXECUTION

3.1 PREPARATION

.1 Do not start work until:
.1 Arrangements have been made for disposal of waste.
.2 Tools, equipment, and materials waste containers are on site.
.3 Notifications have been completed and preparatory steps have been taken.

3.2 LEAD ABATEMENT

.1 Removal of lead-containing coatings with a chemical gel or paste and fibrous laminated cloth wrap; or removal equipped with HEPA filters; or removal with using power tools non-powered hand tool, other than manual scraping and sanding.

.2 Remove lead based paint in small sections and pack as it is being removed in sealable 0.15 mm plastic bags and place in labelled containers for transport.

.3 Seal filled containers. Clean external surfaces thoroughly by wet sponging. Remove from immediate working area to staging area. Clean external surfaces thoroughly again by wet sponging. Wash containers thoroughly pending removal to outside. Ensure containers are removed by workers who have entered from uncontaminated areas dressed in clean coveralls.

3.3 INSPECTION

.1 Perform inspection to confirm compliance with specification and governing authority requirements. Deviations from these requirements not approved in writing by Departmental Representative will result in work stoppage, at no cost to Owner.

.2 Departmental Representative will inspect work for:
.1 Adherence to specific procedures and materials.
.2 Final cleanliness and completion.
.3 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

3.4 FINAL CLEANUP

.1 Following cleaning and when lead wipe surfaces sampling are below acceptable concentrations, proceed with final cleanup.

.2 Remove polyethylene sheet by rolling it away from walls to centre of work area. Vacuum visible lead containing particles observed during cleanup, immediately, using HEPA vacuum.

.3 Place polyethylene sheets, tape, cleaning material, clothing, and contaminated waste in plastic bags and sealed labelled waste containers for transport.

.4 Conduct final check to ensure no dust or debris remains on surfaces as result of dismantling operations.

END OF SECTION

PART 1 – GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for water blast cleaning of all masonry and concrete surfaces (horizontal, vertical and overhead) which are to receive new concrete or grout.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 Work covered by this section will be paid for under payment items included in Unit Price Table:
1. Item No. U26 - Water Blast Cleaning
2. Item No. U27 - Water Blast Cleaning – Sluice Tunnels

1.3 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment

.2 Section 01 33 00 - Submittal Procedures

1.4 ACTION AND INFORMATION SUBMITTALS

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

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Water for blast cleaning shall be imported potable water.

2.2 EQUIPMENT

.1 Equipment used for water blast cleaning shall be capable of providing varying water pressures to suit the cleaning needs at a particular location.

.2 Maximum permitted water pressure is 13,700kPa (2000 psi).

PART 3 – EXECUTION

3.1 MOCK-UP

.1 Contractor to provide a mock-up area (1m x 1m) for approval by Departmental Representative before proceeding with water blast cleaning.

.2 Contractor shall only use water pressure which is sufficient to clean the surfaces to the specification requirements and to the Departmental Representatives approval. Maximum allowable water pressure (13700 kPa / 2000 psi) shall only be used if deemed required by the Departmental Representative.

3.2 TEMPERATURE

.1 Water blast cleaning shall only be carried out when the temperature of the surface being cleaned is above freezing and will remain for at least 48 hours after the cleaning is complete.

3.3 CLEANING REQUIREMENTS

.1 Surfaces shall be cleaned free of all loose material, scale, organic deposits and any other foreign material.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section covers requirements for pressure grouting to fill voids behind new and existing stones, deep voids in joints, grouting into rubble masonry core behind face stones and grouting of dowels and anchors.

.2 This work includes but is not limited to:
.1 Pre-cleaning grouting holes with compressed air blown into tubes.
.2 Course-by-course grout injections into grout tubes from bottom upwards for stone replacement and Dutchman replacements.
.3 Course-by-course grout injections into grout tubes from top downwards for partial Dutchman.
.4 Deep grout injections at stone replacement and Dutchman replacements
.5 Deep grout injections in areas of visible water leakage
.6 Sealing and clean-up of unforeseen grout leaks and spills.
.7 Cleaning grout tubes and vent tubes in courses immediately above courses completed at end of each work day.
.8 Additional grout injection into areas which were observed to be actively leaking after the initial grouting program has been completed. Based on the current suggested construction staging, the timing of this additional grouting shall be as follows:
.1 Beginning of 3rd year of construction, Contractor and Departmental Representative shall witness the lock filling and draining and identify all leaking areas which require additional grout injection.
.2 End of 3rd year of construction Locks to be filled and drained before end of construction period in-order to identify any leaking areas which will require further grout injection.
.9 Grouting at dowels and anchors where specified.

1.2 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment

.2 Section 01 33 00 – Submittal Procedures

.3 Section 01 35 46 – Archaeological, Cultural and Environmental Procedures

.4 Section 04 43 04 - Repointing Stone Masonry

.5 Section 35 49 25 – Turbidity Curtain

1.3 REFERENCES

.1 Canadian Standards Association (CSA Group).
- .1 CSA-A179, Mortar and Grout for Unit Masonry.
- .2 CSA-A3000-13, Cementitious materials compendium.

.2 American Society for Testing and Materials (ASTM):
- .1 ASTM C109 / C109M - 16a, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
- .2 ASTM C666 / C666M – 15, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
- .3 ASTM C827 / C827M – 16, Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures
- .4 ASTM C942 – 15, Standard Test Method for Compressive Strength of Grouts for Preplaced-Aggregate Concrete in the Laboratory
- .5 ASTM C1107 / C1107M – 17, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink)

.3 Corps of Engineers Spec.(USACE):
- .1 USACE CRD – C621, Corps of Engineers Specification for Non-Shrink Grout

1.4 ACTION AND INFORMATION SUBMITTALS

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

.2 Submit grouting plan including; qualifications, shop drawings, description of methodology, Product Data, Samples, mix design, Quality Control Testing Plan, and Test Results at least 14 days before beginning grouting work.

.3 Submit Product data for:
- .1 Injection Grout.
- .2 Grout mixing equipment.
- .3 Grout Pump(s).
- .4 All other accessories used for the grouting operation.

.3 Submit test results weekly from testing executed in accordance with Quality Control Plan.

1.5 QUALITY CONTROL

.1 Contractor to test grout to CSA-179 and submit test results to Departmental Representative.

.2 Hire third party grouting expert to design mix,

supervise pressure grouting operations, and keep grout logs.

1.6 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 Work described in this section to be measured and paid for under:
- .1 Item No. U50 – Install Grout Tubes.
- .2 Item No. U51 – Install Deep Grout Tubes.
- .3 Item No. U52 – Install Grout Tubes – Sluice Tunnels.
- .4 Item No. U53 – Install Deep Grout Tubes – Sluice Tunnels
- .5 Item No. U54 – Install Grout Tubes Underwater.
- .6 Item No. U55 – Install Deep Grout Tubes Underwater
- .7 Item No. U56 – Install Deep Grout Tubes for Leaking Areas.
- .8 Item No. U57 – Install Deep Grout Tubes for Additional Leaking Areas
- .9 Item No. U58 – Inject Grout in Walls.
- .10 Item No. U59 – Inject Grout – Sluice Tunnels.
- .11 Item No. U60 – Underwater - Grout in Walls.
- .12 Item No. U61 – Additional Grout Injection.

.3 Grout injection and underwater grouting to be paid by amount of material injected and accepted in-place and shall be measured in cubic meters.
- .1 Approvals of measurements of grout actually placed, will be made by Departmental Representative.
- .2 Amount of grout spilled and/or leaked-out will be estimated and agreed upon jointly with Contractor and Departmental Representative, and deducted from daily measurements.
- .3 If required, clean flow meter such that readings and accuracy are not hindered. Use a pump that will not cause flow meter to perceive flow while no grout is being injected.
- .4 Installation of grout tubes and deep grout tubes, (both above water and underwater) shall be paid for by each grout tube installed and accepted in-place.

.3 No other work described in this section will be considered separately for payment. Work includes, but is not limited to, inspecting and sealing joints, cracks, voids and shattered stones before and during grouting, cleaning of masonry due to spills, and access to the work.

.4 All grout for dowels and anchors shall be paid under the above items for grout injection (including grout

placed underwater and inside the sluice tunnels).

.5 Payment under all items requiring work inside the sluice tunnels shall include all costs associated with the work and includes, but is not limited to; mobilization, access, enclosures, ventilation, scaffolding/work platforms and shoring of existing masonry elements. This item also includes costs of any engineering design associated with any measures required to carry out the work.

.6 Payment for the additional grout injection shall include all required costs to perform the work, including, but not limited to, re-mobilization, access and egress, demobilization, etc.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.

.2 Compressive Strength: as per ASTM C942, 35 MPa at 28 days minimum.

.3 Consistency: to be as follows:
- .1 Fluid: to ASTM C827. Time of efflux through flow cone (ASTM C939), under 30s.
- .2 Flowable: to ASTM C827. Flow table, 5 drops in 3s, (ASTM C109, applicable portion) 125 to 145%.
- .3 Plastic: to ASTM C827. Flow table, 5 drops in 3s, (ASTM C109, applicable portions) 100 to 125 %.
- .4 Dry pack to manufacturer's requirements.
- .5 Volume change: Grade C as per ASTM C1107
- .6 Maximum expansion 0.4% as per CRD – C621, Specification for Non-Shrink Grout
- .7 Addition of Aggregate: as per manufacturer where placed without pumping.

.4 Freeze Thaw Resistance: as per ASTM C666, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing, Procedure A, 500 cycles, Durability factor to be at least 80%.

.5 Introduce anti-washout additives in all applications where application will be exposed to free water during installation and hardening.

2.2 JOINT AND CRACK SEALERS

.1 Grouting pads: Cloth rags soaked with water reactive hydrophobic polyurethane.

.2 Hydraulic Cement: quick-setting hydraulic cement for plugging leaks.

PART 3 - EXECUTION

3.1 PRE-INJECTION EVALUATION

.1 Conduct visual assessment of masonry to be injected with grout. Map extent and size of visible surface cracks, mortar joint delamination, multi-course stone cracks, shattered stones or other visible surface damage which may have an effect on grout confinement or leakage.

3.2 GROUTING, GENERAL

.1 Do not allow pressure buildup within wall in excess of 69 kPa (10 psi) during grout injections.

.2 Mix grout on site and free from segregation, clumping and bleeding.

.3 Pump grout into its final location within 20 minutes of mixing.

.4 Injection point must be less than 30 m from grout agitator and pump agitator. Return line must be less than 5 m from injection point.

.5 Install pressure gauge at each injection hole being grouted.

.6 Seal leaks and clean spills immediately as they occur.

.7 Remove grout immediately from locations which have not been designated to receive grout, and clean surface with clean water, rags and non-abrasive natural bristle brushes before grout stains stones and hardens.

.8 Establish head losses through grout lines and header for various flows before grouting operation, to determine effective grouting pressure near hole.

.9 Keep grout log by recording grout flow, pressure and cumulative flow. Provide paper records to Departmental Representative at end of every working day. Mark grout hole number, zone, volume of grout take, mix, and remarks on a standardized "Grouting Log" form.

.10 Mix in small batches when directed by Departmental Representative.

3.3 SEQUENCE OF WORK

.1 Anticipated sequence of preparatory grout injection works:
- .1 Commence work as early as possible.
- .2 Identify, label and prepare sections to carry out grouting in stages.
- .3 Inspect the masonry, and seal potential leak locations.
- .4 Wait for pointing to harden and cure before injecting grout, as to not damage the masonry or the recently added pointing and mortar.
- .5 Identify and label grout and vent tubes for current section.
- .6 Clean grout tubes and vent tubes and remove water with compressed air, proceeding from top to bottom.
- .7 Mix and inject grout.
- .8 Shut off vent tubes.
- .9 Immediately clean grout spills or leaks.

3.4 PREPARATION

.1 Insert grout tubes and repoint joints in accordance with Section 04 43 04 – Repointing Stone Masonry.

.2 Clean grout tubes with compressed air immediately prior to grout injection.
- .1 Inject compressed air at 690 kPa (100 psi) for ten (10) seconds maximum into each hole.
- .2 Clean tubes expected to be injected during current work day.
- .3 Once grout injection operations have been terminated for current day, clean tubes expected to be used on following day.
- .4 Do not allow pressure buildup within wall in excess of 69 kPa (10 psi) during compressed air cleaning.

3.5 HEATING

.1 Heat in accordance with section 04 43 04 – Repointing Stone Masonry.

3.6 MATERIAL STORAGE

.1 Store material in accordance with Section 04 43 04 - Repointing Stone Masonry.

3.7 EQUIPMENT

.1 Provide following for grouting work:

.1 Portable mixer(s) suitable for specified grout.
.2 One standby mixer on site.
.3 Pressure grout pump capable of delivering grout to every grout hole. Gravity grouting not permitted.
.4 Delivery and return lines between pump, grout hole and holding tank.
.5 One multiple hole grouting header per mixer.
.6 Manometer to display actual injection pressure and a shut-off/recirculating valve, at every grout hole being injected.
.7 Grout plant to be capable of operating smoothly at injection pressures.

.2 Submit list of equipment for mixing and injecting grout in all stages of work

.3 Maintain grouting equipment to ensure continuous, effective performance during grouting.

.4 Maintain grouting equipment and grout lines in good operating order.

.5 Use circulating grout lines 35 mm in diameter or larger. Provide valves in the header and piping so that all or part of the grout can be injected into the hole, or returned to mixer (or grout agitator) and recirculated.

.6 Keep grouting equipment on site until Departmental Representative authorizes its removal.

.7 Provide following equipment and perform following tests for grout quality control on site as directed by Departmental Representative:
.1 Marsh funnel to measure grout viscosity.
.2 Baroid mud balance to measure grout density.
.3 Graduated burette to measure stability.
.4 Thermometer in each mixer.

.8 Grout tubes and vent tubes to be capable of being shut-off, clamped, or tied-off after grout hole has met refusal. Venting tubes to be capable of being shut-off once clean grout starts flowing.

3.8 MONITORING

.1 Provide minimum two experienced laborers dedicated to monitoring, immediately sealing and cleaning grout leaks and spills during pressure grouting operations.

.2 Monitor structure to ensure that grouting operation does not damage structure or deposit grout in locations where it would hinder performance of structure or mar its appearance.

.3 Provide laborers with adequate quantity of empty

buckets, rags, clean water and natural fiber brushes.

.4 Place buckets under grout tubes and vent tubes where grout flow expected or occurs.

.5 Seal leaks immediately which occur during grouting using fast setting hydraulic cement and grouting pads.

.6 Shut-off tubes to stop flow where pumping is completed.

3.9 GROUT INJECTION

.1 Immediately prior to grout injection (within 10 minutes) spray masonry wall surface lightly with water to prevent grout adhesion. Keep water hose and brush ready during injection for cleaning any grout spills or leaks from masonry surfaces.

.2 Grouting to proceed using stage-up grouting method, starting from base of structure to top. Begin injection along bottom course. Once course has been completed within section, grouting can then start on next stone course above.

.3 Inject grout in lifts limited to two courses of stone in one section per 24 hour period.

.4 Remove and replace high strength hydraulic cement used to plug leaks, with mortar after grout sets.

.5 When pressure begins to rise beyond 69 kPa (10 psi), rate of flow is to be reduced in order to maintain the pressure at or just below 69 kPa (10 psi).

.6 Refusal criteria - stop grout injection into grouting tube if following conditions occur:
- .1 Hole absorbs grout at rate of flow less than 1.5 litres/minute for a continuous period of 10 minutes.
- .2 Hole absorbs grout at rate between 6 and 1.5 litres/minute for more than 20 minutes.
- .3 Grout begins flowing out of adjacent tubes in the course immediately above tube being injected.
- .4 Departmental Representative directs grouting to stop.

.7 Upon completion of grouting in each tube, shut-off, clamp, or tie-off grout tube until grout has hardened.

.8 Inject grout into venting tube if tube does not produce grout outflow once refusal has occurred in grout tube laterally next to venting tube.

.9 Venting tubes do not need to be grouted. Shut-off tubes only after undiluted grout flows freely out through

it. Flowing grout is to be collected in appropriate containers and properly disposed of.

.1 Connecting tube is defined as a grout tube adjacent to the one being injected, and through which grout flows out at free-flow rate.

3.10 UNDERWATER GROUTING

.1 Underwater grouting may be pumped from work boat or from land.

.2 Provide daily schedule and allow Departmental Representative to oversee underwater grouting.

.3 Allow Departmental Representative to watch video feed from diver's helmet camera in real time.

.4 Venting tubes for underwater grouting will be used to vent water from voids.

.5 Tie-off venting tubes once clean grout starts to come through tubes.

.6 Install turbidity curtain as close as possible to work area in accordance with Section 01 35 46 – Archaeological, Cultural and Environmental Procedures and Section 35 49 25 – Turbidity Curtain.

3.11 WALL CLEAN-UP

.1 Clean-up immediately spillage of grout to prevent staining.

.2 Clean spills on masonry surface continuously during injection by immediately flushing grout from masonry surface with water on exterior of wall. Immediately following completion of injection process, remove remaining surface stains using water and stiff, natural bristle brush.

3.12 CURING

.1 The minimum grout curing period is 28 days after injection.

3.13 REMOVING GROUT TUBES

.1 After grout has cured, remove grout tubes by stretching and cutting tube as close as possible to back pointing mortar face.

.2 Fill joint with mortar by finish pointing to hide area where grout tubes were removed.

3.14 FINAL CLEANING

.1 Clean exposed surfaces by washing with stiff fibre brush, clean water and low pressure wash.

PART 1 - GENERAL

1.1 RELATED WORK

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 35 46- Archaeological, Cultural and Environmental Procedures

.3 Section 01 74 20 – Waste Management and Disposal

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 No measurement will be made under this Section. Include costs in concrete items of work for which concrete formwork, falsework and accessories are required.

1.3 REFERENCES

.1 Canadian Standards Association (CSA)
.1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
.2 CSA-O86-14(R2014), Engineering Design in Wood.
.3 CSA O121-08(R2013), Douglas Fir Plywood.
.4 CSA O153-13, Poplar Plywood.
.5 CSA S269.1-16, Falsework and Formwork.

1.4 ACTION AND INFORMATION SUBMITTALS

.1 Submit shop drawings for formwork and falsework in accordance with Section 01 33 00 - Submittal Procedures.

.2 Indicate method and schedule of construction, shoring, stripping, arrangement of joints, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings. Comply with CSA-S269.1 for formwork drawings.

.3 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.

.4 Each shop drawing submission shall bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.

1.5 REQUIREMENTS OF REGULATORY AGENCIES

.1 Conform to municipal, provincial and national codes relating to design and construction of formwork and falsework.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 To Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

.2 Separate and recycle waste material in accordance with Section 01 74 20 – Waste Management and Disposal.

.3 Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOC's.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Formwork materials: wood and wood product formwork materials to CSA O153 and CSA O86.1.

.2 Sheathing: use only Douglas Fir concrete forming plywood, factory coated to CSA O121-08.
.1 Minimum 19mm thick.

.3 Form ties: Form ties are not permitted. No formwork anchorages of any kind are permitted through new concrete work into existing lock wall components. All concrete formwork to be supported with falsework.

.4 Form release agent: non-toxic, biodegradable, low VOC.

.5 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 15 sq.mm/s to 24 sq.mm/s at 40°C, flashpoint minimum 150°C, open cup.

.6 Falsework materials: to CSA S269.1.

PART 3 - EXECUTION

3.1 FABRICATION AND ERECTION

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

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

.3 Fabricate and erect formwork in accordance with

CSA-S269 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.

.4 Align form joints and make watertight.

.5 Do not use chamfers at construction joints between adjacent and flush concrete surfaces. Butt joints shall be employed in these areas.

.6 20 mm chamfer strips shall be used on all external corners, unless specified otherwise.

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

.8 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.

.9 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

.10 Formed concrete repairs in sluice tunnels shall have curved formwork matching the geometry of the sluice tunnels.

3.2 FORM RELEASE AGENT

.1 Apply form release agent to formwork and corner chamfers in accordance with manufacturer’s instructions prior to placing formwork accessories and reinforcement.

.2 Surface preparation:
.1 Protect adjacent surfaces not designated to receive concrete form release.
.2 Clean and prepare surfaces to receive form release in accordance with manufacturer's instructions.
.3 Clean form surfaces thoroughly prior to application.

.3 Application:
.1 Apply concrete form release in accordance with manufacturer's instructions.

3.3 REMOVAL AND RESHORING

.1 Leave formwork in place for seven (7) days after placing concrete.

.2 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.3 Re-use formwork and falsework subject to requirements of CSA-A23.1.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for concrete reinforcement as described by the drawings and the specifications.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 Work covered by this section to be paid for under payment items included in Unit Price Table:
- .1 Item No. U28 - Galvanized Reinforcing Steel.
- .2 Item No. U29 - Galvanized Reinforcing Steel – Allowance (15M Bar)
- .3 Item No. U30 - Galvanized Welded Wire Fabric.
- .4 Item No. U31 - Form Saver Coupler

.3 Welded wire fabric measured in square meters of material installed and accepted in-place.

.4 Reinforcing steel measured in tonnes of reinforcing steel installed and accepted in-place.

.5 Contractor to provide additional reinforcing steel allowance which may be incorporated into the work as directed by the Departmental Representative, including cutting, bending, treating cuts and installation.

1.3 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment.

.2 Section 01 33 00 - Submittal Procedures

.3 Section 01 45 02 - Quality Control

.4 Section 01 74 20 - Waste Management and Disposal

1.4 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .2 CAN/CSA-A23.3-04(R2010), Design of Concrete Structures.
- .3 CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
- .4 CSA W186-M1990(R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.5 CSA G164-18, Hot dip galvanizing of irregularly shaped articles

.2 Reinforcing Steel Institute of Canada (RSIC)
.1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

.3 American Society for Testing and Materials International (ASTM)
.1 ASTM A276/A276M –17, Standard Specification for Stainless Steel Bars and Shapes
.2 ASTM A955M/A955M–18, Deformed and Plain Stainless Steel Bars for Concrete Reinforcement
.3 ASTM A1064 / A1064M -16a Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete

1.5 ACTION AND INFORMATION 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 Indicate placing of reinforcement and:
.1 Bar bending details.
.2 Lists.
.3 Quantities of reinforcement.
.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
.5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
.2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.
.3 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.
.1 Provide type 'B' tension lap splices unless otherwise indicated.

1.6 QUALITY ASSURANCE

.1 Submit in accordance with Section 01 45 02 - Quality Control.
.1 Mill Test Report: provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 2 weeks prior to beginning reinforcing work.
.2 Upon request submit in writing to Departmental Representative proposed source of reinforcement.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Substitute different size bars only if permitted in writing by Departmental Representative.

.2 Reinforcing steel: billet steel, grade 400W, deformed bars to CSA-G30.18, unless indicated otherwise.

.3 Cold-drawn annealed steel wire ties: to A1064 / A1064M.

.5 Deformed steel wire for concrete reinforcement: to ASTM A1064 / A1064M.

.6 Welded Wire Fabric: to ASTM A1064 / A1064M.

.7 Stainless steel reinforcing bars: to ASTM A276 and ASTM A955M, minimum Grade 420.

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

.8 Mechanical splices: subject to approval of Departmental Representative.

.9 Galvanising: to CSA G164-18. All reinforcing steel to be hot-dip-galvanized. All welded wire fabric to be hot-dip-galvanized.

2.2 FABRICATION

.1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.

.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.

PART 3 - EXECUTION

3.1 FIELD BENDING

.1 Do not field bend or field weld reinforcement except

where indicated or authorized by Departmental Representative.

.2 When field bending is authorized, bend without heat, applying slow and steady pressure.

.3 Replace bars, which develop cracks or splits

3.2 PLACING REINFORCEMENT

.1 Place reinforcing steel as indicated on placing drawings in accordance with CSA-A23.1/A23.2.

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

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

3.3 FIELD TOUCH UP

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

3.4 CLEANING

.1 Progress Cleaning: Leave Work area clean at end of each day.

.2 Final Cleaning and End of each Constructin season Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Waste Management: separate waste materials in accordance with Section 01 74 20 - Waste Management and Disposal.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for concrete placed, as described by the drawings and the specifications.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 Work covered by this section to be paid for under payment items included in Unit Price Table:

.1 Item No. U32 - Cast-in-place Concrete - Floors.
Item No. U33 - Cast-in-place Concrete – Walls.
Item No. U34 - Cast-in-place Concrete – Sluice Tunnel Walls.
Item No. U35 - Cast-in-place Concrete – Sluice Tunnel Soffit.
Item No. U36 - Cast-in-place Concrete – Sluice Tunnel Floors.
Item No. U37 - Concrete Hand Patching – Sluice Tunnel.

.1 Payment under the above items shall include all costs associated with work inside the sluice tunnels and includes, but is not limited to; mobilization, access, enclosures, ventilation, scaffolding/work platforms and shoring of existing masonry elements. This item also includes costs of any engineering design associated with any measures required to carry out the work.

.2 Item No. U38 - Cast-in-place Concrete – Turning Basin Retaining Wall (OPSD 3120.100).

.3 Item No. U39 - Concrete Patches – Formed Staircases

.4 Item No. U40 - Mass Concrete Over Bedrock – Lock 46

.5 Item No. U41 - Tremie Concrete – Formed – Lock 49

.6 Item No. U42 - Partial Depth Concrete Repairs – Horizontal.

.7 Item No. U43 - Vertical Concrete Repairs (100-200mm)

.8 Item No. U44 - Vertical Proprietary Hand Patching (50mm)

.9 Item No. U45 - Vertical Proprietary Hand Patching (25mm)

.10 Item No. U46 - Basin Wall Repairs – Proprietary Hand Patching.

.11 Item No. U47 - Concrete Seal for Basin Wall.

.12 Item No. U48 – Concrete Slab-on-Grade

.13 Item No. U49 - PVC Waterstop
.14 Item No. U62 - Concrete Finishing – Vertical Surfaces
.19 Item No. U63 - Concrete Finishing – Horizontal Surfaces

.3 Work covered by this section to be paid for under payment items included in Lump Sum Price Table:
.1 Item No. L49 - Reconstruct End Post (Lock 46 SWW)

.4 Cast-in-place concrete to be measured in cubic metres calculated from neat dimensions indicated on drawings or authorized in writing by Departmental Representative. No concrete placed beyond dimensions indicated to be measured or paid for.

.5 No deductions to be made for volume of concrete displaced by reinforcing steel.

.6 Include bonding agent in unit price of concrete.

.7 Include installation of embedded items in unit price of concrete.

.8 Include in the unit prices of concrete work described in Section 03 10 00 – Concrete Forming and Accessories.

.9 Temporary enclosures and heating included for payment under Section 01 56 00 – Temporary Barriers and Enclosures.

.10 Item No. U38 - Tremie Concrete – Formed – Lock 49 includes supply and placement of specified liners, grout ports, formwork, dowel installation and all costs associated with diving operations. Rip-rap for repair to be paid under separate unit item.

.11 Concrete finishing items for walls and floors shall be measured by square meter of concrete finished and shall include all costs associated with producing the specified concrete finishes.

.12 All finishing of concrete for all Items of work that include use of concrete for which there is no designated specific finishing item is part of the Item for concrete work.

1.3 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment.

.2 Section 01 33 00 – Submittal Procedures.

.3 Section 01 35 29 – Health and Safety Requirements.

.4 Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

.5 Section 01 56 00 – Temporary Barriers and Enclosures.

.6 Section 01 74 20 – Waste Management and Disposal.

.7 section 03 00 99 – Water Blast Cleaning.

.8 Section 03 10 00 – Concrete Forming and Accessories

1.4 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .3 CSA-A23.3-14, Design of Concrete Structures.

.2 American Society for Testing and Materials International (ASTM)
- .1 ASTM C157 / C157M – 17, Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete
- .2 ASTM C260/C260M-10a(2016) Standard Specification for Air-Entraining Admixtures for Concrete
- .3 ASTM C494 / C494M – 17, Standard Specification for Chemical Admixtures for Concrete
- .4 ASTM C666 / C666M – 15, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing
- .5 ASTM C672 / C672M – 12, Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals
- .6 ASTM C882 / C882M - 13a, Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete By Slant Shear
- .7 ASTM C942 – 15, Standard Test Method for Compressive Strength of Grouts for Preplaced-Aggregate Concrete in the Laboratory
- .8 ASTM C1059/C1059M-13, Standard Specification for Latex Agents for Bonding Fresh To Hardened Concrete

1.5 ACTION AND INFORMATION SUBMITTALS

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

.2 At least 2 weeks prior to beginning Work, submit to Departmental Representative concrete mix design and product data of curing compound.

.3 Submit all mixes required for all applications on this project.

1.6 CONSTRUCTION QUALITY CONTROL

.1 Submit valid and recognized certificate from plant delivering concrete to Departmental Representative a minimum 2 weeks prior to starting concrete work.

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

1.7 DELIVERY, STORAGE AND HANDLING

.1 Concrete hauling time: maximum allowable time limit for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.

.1 Modifications to maximum time limit must be agreed by the Departmental Representative and concrete producer as described in CSA A23.1.

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

.2 Concrete delivery from plant to CSA A23.1.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20 – Waste Management and Disposal.

.2 Ensure emptied containers are sealed and stored safely.

.3 Divert unused concrete materials from landfill to approved facility, as reviewed by Departmental Representative.

.4 Provide appropriate area on job site where concrete trucks can be safely washed.

.5 Divert admixtures and additive materials from landfill to approved official hazardous material collections site as reviewed by Departmental Representative.

.6 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

PART 2 - PRODUCTS

2.1 APPROVALS

.1 Concrete mixes to be accepted by the Departmental Representative.

2.2 MATERIALS

.1 General:
- .1 Do not use calcium chloride or compounds, or admixtures containing calcium chloride.
- .2 Use consistent concrete ingredients, uniformly proportioned from batch to batch.

.2 Cement: to CSA-A3001, Type GU.

.3 Supplementary cementing materials: with 20% to 30% hydraulic slag, by mass of total cementitious materials to CSA-A3001.

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

.5 Aggregates: to CSA-A23.1/A23.2 hard, dense, well graded aggregates of normal mass-density, approved by the Departmental Representative both as to quality and source:
- .1 Contractor shall utilize the aggregate for concrete from pre-approved for any given year source of aggregate by Ontario Ministry of Transportation.
- .2 Aggregates to be free from materials identified as having deleterious reactions with cement and shall be free of any and all minerals associated with alkali aggregate reactivity.

.6 Admixtures:
- .1 Air entraining admixture: to ASTM C260.
- .2 Chemical admixture: to ASTM C494/C494M, Specification for Chemical Admixtures for Concrete.
- .3 Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.

.7 Curing compounds and other curing materials: to CSA-A23.1/A23.2.Curing compound will be only allowed in locations and applications where wet curing is not possible.

.8 Bonding agent: Fine Sand cement slurry or commercial compatible bonding agent to to ASTM C1059.

.9 Other concrete materials: to CSA-A23.1/A23.2.

2.3 CONCRETE MIX

.1 Proportion concrete mix in accordance with CSA-A23.1/A23.2 to meet following requirements:
- .1 Class C-1 exposure concrete
- .2 Slump at chute: 80±30 mm prior to addition of superplastisizer
- .3 Producing compressive strength in excess of 35 Mpa
- .4 Air entrainment plastic: 5-8 % for 19 mm aggregate and 6 to 10% for 13 mm aggregate
- .5 Minimum air voids in hardened concrete 3%
- .6 Superplasticizer, water reducing and set retarders as per concrete supplier to allow pumpability and disposal in plastc sate within two hours.
- .7 Anti-washout additives for all concrete that may come in contact with ground water or reservoir water.

.2 Weigh aggregates, cement, water and admixture separately when batching. No alternative method of measuring will be permitted.

.3 Truck delivered pre-mixed proprietary self levelling (consolidating) concrete (SCC) concrete utilizing proprietary additives commonly recognized in industry under names of Advacast, Adjelia or Lisa, producing concrete characteristics exceeding these of Ready Mix Concrete

.4 Pre-packaged Self-Levelling Concrete: An alternative concrete mix in form of prepackaged self leveling concrete will be acceptable, provided that hardened characteristics, including but not limited to Freeze-thaw resistance, air content in hardened matrix, compressive strength and long-term performance of such material are equivalent or better to the cast-in-place concrete.

.5 Concrete polymer patching material (top surfaces walkways, concrete staircases and other locations where proprietary cementitious patching materials will be utilized in lieu of concrete).
- .1 Compressive Strength: as per ASTM C942, 40 MPa at 28 days
- .2 Utilize product composed of:
  - .1 Proprietary mix of cement and silica sand
  - .2 Polymer Latex Fluid
  - .3 Hardening accelerator admixture and freezing resisting admixture for low temperature application
  - .4 Migration corrosion inhibitor
  - .5 All components to be chloride free.
- .3 Slant/Shear Bond Strength: as per ASTM C882-13a, Standard test method for Bond Strength of Epoxy-Resin system used with Concrete, min. 12 MPa

.4 Linear Shrinkage: as per ASTM C157-08, Standard test method for length of Hydrated Hydraulic Cement Mortar:
.1 Maximum allowable expansion of 0.075% at 24 hours, dry cured
.2 Net 0.03% shrinkage at 28 days, wet cured

.5 Scaling resistance: as per ASTM C672-12, Standard Test Method for Scaling Resistnace of Concrete Exposed to De-icing Chemicals:
.1 Less than 0.5 kg/m2 mass loss after 50 cycles without visually noticeable surface degradation

.6 Direct bond/pull out strength as per ASTM C666, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing, Procedure A, 500 cyclese, Durability factor to be at least 80%.

.7 Freeze Thaw Resistance: as per ASTM C666, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing, Procedure A, 500 cycles, Durability factor to be at least 80%.

2.4 FORMWORK MATERIAL

.1 In accordance with Section 03 10 00 – Concrete Forming and Accessories.

PART 3 - EXECUTION

3.1 GENERAL

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

.2 Ensure reinforcing steel, and other necessary items are in-place, clean and undamaged.

.3 Notify the Departmental Representative at least 2 working days in advance of proposed concrete placement.

.4 Use proper and timely placing, finishing and curing practices.

.5 Implement CSA sanctioned hot and cold weather concrete methodology.

3.2 PREPARATION

.1 Provide Departmental Representative 48 hours notice prior to concrete pour.

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

.3 Protect previous work from staining.

.4 All stone or concrete surfaces against which concrete is to be cast shall be cleaned by water blast cleaning in accordance with section 03 00 99 – Water Blast Cleaning.

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

.6 Obtain Departmental Representative's approval of reinforcing material, position, and placement prior to placing concrete.

3.3 CONSTRUCTION

.1 Concrete mix may need to be modified to suit the method of placement and location. Submit method of placement and mix design to the Departmental Representative for approval.

.2 Concrete Substrate: For concrete placed when air temperature is at or below 5°C, pre-heat existing concrete substrate for a minimum period of 3 days, at a temperature of not less than 15°C but not more than 27°C at concrete substrate surfaces, prior to placing concrete. A minimum substrate temperature of 5°C is required 36 hours prior to placing concrete, and must be maintained until the concrete is placed.

3.4 FORMWORK

.1 Construct mortar-tight formwork in accordance with Section 03 10 00 – Concrete Forming and Accessories. Maintain tolerances of finished concrete work as specified in CSA-A23.1/A23.2.

.2 Where forms appear to be unsatisfactory stop work until defects corrected.

.3 Strip forms to CSA-A23.1/A23.2.

.4 Design forms and falsework to accommodate all construction loads.

3.5 PLACING

.1 Place concrete continuously from start to finish:

CONCRETE

.1 At such rates as to permit satisfactory placing and compaction - plan the work and use such methods and performance rates as to allow no cold joints and/or honeycomb;
.2 During clement weather or with protection;
.3 During daylight hours;
.4 Without unscheduled construction joints.

.2 When pumping of concrete is authorized by Departmental Representative:
.1 Arrange equipment so that no vibrations result which might damage freshly placed concrete. Use reversible pumps.
.2 Operate pump so that a continuous stream of concrete without air pockets is produced.
.3 When pumping is discontinued and concrete remaining in pipe line is to be used, void pipe line in a manner that prevents contamination of concrete or separation of ingredients.

.3 Do not commence placing concrete until the Departmental Representative has inspected and approved forms, falsework, reinforcing steel, conveying, spreading consolidation and finishing equipment, and curing and protective methods.

.4 Structural items:
.1 Do not place load upon finished structural items or any portions thereof until authorized by Departmental Representative.
.2 Except as approved by Departmental Representative on the basis of tests, the minimum time to be 7 days.

3.6 INSERTS

.1 Cast in sleeves, ties, anchors, reinforcement, joint fillers and other inserts required to be built-in.

3.7 FINISHING

.1 Initial finishing to CSA-A23.1/A23.2 clause 22.3 screed unformed surfaces true to grade and free of surface irregularities exceeding 5 mm under a 3 m straightedge placed in any direction on the plane surface.

.2 Final finishing: float and trowel to CSA A23.1 clause 22.4.

.3 Use smooth-form finish for formed surfaces. A sack-rubbed finish is also to be applied in accordance with CSA A23.1.

.4 Do not overwork the concrete. Finish to provide surface texture compatible and complimentary to surrounding

structural elements.

3.8 PROTECTION AND CURING

.1 For concrete placed when air temperature is at or below 5°C, in addition to cold weather requirements of CSA-A23.1:

.1 Protect concrete by windproof shelter of canvas or other material to allow free circulation of inside air around fresh concrete. At no point let walls of shelter or any point of shelter touch formwork or concrete surface. Supply approved heating equipment. Equipment to be capable of keeping inside air at a constant temperature sufficiently high to maintain concrete at following curing temperatures:

.1 For an initial 3 days, at a temperature of not less than 15°C and not more than 27°C at concrete surfaces.

.2 Cure at not less than 10°C for an extra 4 days.

.2 Keep concrete surfaces moist continuously while protected.

.3 Reduce temperature at a rate not exceeding 10 degrees Celsius per day until outside temperature has been reached.

.2 For concrete placed when the air temperature is at or above 25°C, provide the hot weather protection and protection from drying required by Clause 21.2 of CSA-A23.1. Ensure concrete temperatures at placing meet the requirements of Table 15: take suitable control measures when mixing ingredients.

.3 Unformed surfaces: cure with burlap and water. Carefully place two layers of damp burlap on the surface of the concrete. Overlap each strip by at least 75 mm and secure against displacement by wind. Maintain burlap in place and keep thoroughly wet for 7 days after day of placing.

.4 Formed surfaces: if formwork is left in place for 7 days or more, no additional curing will be required. If formwork is removed in less than 7 days, cure in manner specified for unformed surfaces for remainder of seven day period.

.5 During curing period uncover only such areas that are immediately needed for finish treatment. Recover and continue curing.

3.9 BONDING AGENT

.1 Apply two coats of bonding agent on all concrete surface against which new concrete will; be placed. Utilize spays for location where formwork and

reinforcing steel impeded the access.

.2 Follow the manufacturer's instructions for application.

3.10 FIELD QUALITY CONTROL

.1 Concrete testing: to CSA-A23.2 by testing laboratory designated and paid for by Departmental Representative.

.2 If tests do not meet requirements of the Departmental Representative, take such measures as indicated in CSA-A23.2, and approved by the Departmental Representative.

3.11 CLEANING

.1 Use trigger operated spray nozzles for water hoses.

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

.3 Cleaning of concrete equipment to be done in accordance with Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

PART 1 – GENERAL

1.1 DESCRIPTIONWORK

.1 This section specifies requirements for repointing existing stone masonry and underwater repointing using divers.

.2 Work under this section includes but is not limited to:
.1 Raking mortar joints to required depths for finish pointing, back pointing, and deep back pointing.
.2 Finish pointing of masonry joints to depth of twice joint width to maximum depth of 35 mm.
.3 Back Pointing all joints from a depth of 35mm to 75 mm.
.4 Deep Back Pointing where voids or unsound mortar are encountered in joints from 75mm up to maximum depth of 300 mm.
.5 Installing grout tubes for grouting dutchman repairs, deep voids in joints and grouting internal core of wall.
.6 Installing underwater grout tubes for underwater grouting of dutchman repairs, deep voids in joints and grouting internal core of wall.
.7 Underwater raking to depth of 50 to 100 mm.
.8 Underwater Pointing to depth of 50 to 100 mm.
.9 Pointing of Flagstone Paving.
.10 All raking and repointing required for the repair of all masonry lock staircases.

1.2 HERITAGE PROTECTION

.1 The Kingston Mills Lockstation is a National Heritage Site.

.2 Preserve heritage fabric of site by executing repointing without damage to masonry joint edges, adjacent stones or other site features.

.3 Damage to stones will not be tolerated.

.4 Ensure appropriate supervision work, adequate training for workers, and other necessary precautions to protect existing masonry structures.

.5 Notify Departmental Representative immediately where reasonable concern exists that damage will result from work

.6 Contractor may propose alternative work methodologies to be accepted by Departmental Representative.

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 Work covered by this section will be paid under payment items included in Unit Price Table as follows:
- .1 Item No. U64 - Raking Joints - Finish.
- .2 Item No. U65 - Raking Joints - Back.
- .3 Item No. U66 - Raking Joints - Deep Back.
- .4 Item No. U67 - Finish Pointing.
- .5 Item No. U68 - Back Pointing.
- .6 Item No. U69 - Deep Back Pointing.
- .7 Item No. U70 - Raking Joints – Finish – Sluice Tunnels.
- .8 Item No. U71 - Raking Joints - Back – Sluice Tunnels.
- .9 Item No. U72 - Raking Joints - Deep Back – Sluice Tunnels.
- .10 Item No. U73 - Finish Pointing – Sluice Tunnels.
- .11 Item No. U74 - Back Pointing – Sluice Tunnels.
- .12 Item No. U75 - Deep Back Pointing – Sluice Tunnels.
- .13 Item No. U76 - Underwater Joint Raking.
- .14 Item No. U77 - Underwater Pointing.

.3 Work to below items is covered by this section but is paid under Section 03 03 09 - Pressure Grouting:
- .1 Install Grout Tubes.
- .2 Install Deep Grout Tubes.
- .3 Install Grout Tubes Underwater.
- .4 Install Deep Grout Tubes Underwater.
- .5 Install Deep Grout Tubes for Leaking Areas.
- .6 Install Deep Grout Tubes for Additional Leaking Areas.

.4 Payment under all items requiring work inside the sluice tunnels shall include all costs associated with the work and includes, but is not limited to; mobilization, access, enclosures, ventilation, scaffolding/work platforms and shoring of existing masonry elements. This item also includes costs of any engineering design associated with any measures required to carry out the work.

.5 Temporary enclosures and heating are included for payment under Section 01 56 00 - Temporary Barriers and Enclosures.

.6 Temporary enclosures and heating are included for payment under Section 01 56 00 - Temporary Barriers and Enclosures.

.7 Pointing of Flagstone Paving to be included in Unit Price Items above.

1.4 RELATED WORK

.1 Section 01 20 01 - Site Access

.2 Section 01 22 01 – Measurement and Payment.

.3 Section 01 33 00 - Submittal Procedures

.4 Section 01 35 46 – Archaeological, Cultural and Environmental Procedures

.5 Section 01 56 00 - Temporary Barriers and Enclosures

.6 Section 01 74 11 – Cleaning

.7 Section 03 03 09 - Pressure Grouting

.8 Section 35 49 25 - Turbidity Curtain

1.5 QUALIFICATIONS

.1 Repointing work to be performed by qualified and experienced stone masons. Submit resume and certificates demonstrating level of experience working with stone masonry units.
.1 Each mason to fabricate mock-up in presence of Departmental Representative for acceptance of ability to perform each type of work prior to start of work.

.2 For mix consistency, one thoroughly experienced, reliable and competent workman to oversee mortar mixing for duration of work.
.1 Experience to include mixing mortar for three similar projects.

.3 Contractor to appoint one principal stone mason with minimum two similar historic stone masonry projects in the last 10 years.

.4 Repointing work to be supervised by qualified and experienced principal stone mason.

.5 Departmental Representative reserves right to refuse work to any mason unable to satisfactorily complete mock-ups or prove minimum experience. Contractor to replace such persons at no cost to Departmental Representative and without delaying work.

1.6 DEFINITIONS

.1 Repointing: raking and pointing of masonry joints.

.2 Raking Joints - Finish: removal of loose/deteriorated mortar for finish pointing. Raking depth to be to sound mortar up to a maximum depth of 35 mm.

.3 Raking Joints - Back: removal of loose/deteriorated mortar for back pointing. Raking depth to be to sound mortar between 35 mm and 75 mm deep.

.4 Raking Joints – Deep Back: removal of loose/deteriorated mortar for back pointing. Raking depth to be to sound mortar between 75 mm and 300 mm deep.

.5 Pointing: filling, compacting and finishing of masonry joints which are void or from which mortar has been raked out or omitted. Includes; finish pointing, back pointing, and deep back pointing.

.6 Finish Pointing: repointing of finish depth of masonry joints from masonry surface to depth of twice joint width or maximum depth of 35 mm from masonry surface.

.7 Finish Pointing (Rounded Edges): repointing of finish depth of masonry joints with rounded edges at exposed face from depth of arris determined on-site by Departmental Representative to depth of twice joint width or maximum depth of 35 mm from arris.

.8 Back Pointing: repointing of masonry joints from depth of finish pointing from a depth of 35mm to a depth of 75 mm.

.9 Back Pointing (Rounded Edges): repointing of masonry joints with rounded edges at exposed face to be from depth of finish pointing based on arris determined by Departmental Representative from a depth of 35mm to a depth of 75 mm.

.10 Deep Back Pointing: repointing to depths greater than 75 mm to a maximum depth of 300 mm.

.11 Low-pressure water soaking: water soaking of masonry using less than 350 kPa (50 psi) water pressure, measured at nozzle tip of hose.

.12 Low-pressure pressure washing: pressure washing using less than 2700 kPa (400 psi) water pressure, measured at nozzle tip of hose.

.13 Tooling: finishing for masonry joints to provide final contour.

.14 Underwater Joint Raking: raking and masonry joints to depth of 50 to 100 mm in the wet using divers.

.15 Underwater Pointing: pointing masonry joints between 50 and 100 mm deep in the wet using divers.

1.7 REFERENCES

.1 ASTM International (ASTM).
.1 ASTM C207-06(2011) Standard Specification for Hydrated Lime for Masonry Purposes.

.2 Canadian Standards Association (CSA Group).
.1 CSA A23.1-14 Concrete Materials and Methods of Concrete Construction.
.2 CSA A179-04 (R2014), Mortar and Grout for Unit Masonry.
.3 CAN/CSA A371-14, Masonry Construction for Buildings.
.4 CAN/CSA A3000-13 Cementitious materials compendium.

1.8 INSPECTION AND TESTING

.1 Contractor to carry out Quality Control Inspections and Testing of proposed mortar mixes, of work in progress and of final work for compliance with Contract Documents.
.1 Minimum one test required for each proposed mortar mix, one test per section of wall up to 5m by 10m. Minimum of 14 test sections.

.2 Departmental Representative will carry out Quality Assurance Inspection and Testing of materials, proposed mortar mix, work in progress and final work for compliance with specifications.

.3 Mortar samples to be taken randomly by Departmental Representative for testing. Cooperate fully with Departmental Representative in obtaining these samples and observing mixing procedures.

.4 If test results show that performance criteria are not met, removal and repair of rejected work to be performed at no additional cost.

.5 Work suspected to be completed in similar manner or with same materials as work that has been rejected, may also be rejected.

1.9 ACTION AND INFORMATION SUBMITTALS

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

.2 Submit Engineered methodology and work sequence for phases of masonry work including; repointing, removal of stone, installation of stone and grouting.

.3 Submit materials data sheets for materials to be used under this Section for review by Departmental Representative 10 days in before start of work.

.4 Submit proposed mortar mix design and 28 day Quality

Control test results at least 5 days before start of work.

.5 Submit finished mortar sample for review of mortar colour and finish 5 days before start of work.

.6 Submit mortar samples for Quality Assurance testing in quantity and size to requirements of CSA A179.

.7 Clearly labelled samples of materials to be used on job to be submitted to Departmental Representative for approval before work starts.

.8 Approved samples to become standard for the materials used. Substitutions not permitted without written approval from Departmental Representative.

.9 Submit Diving Plan explaining diving operations to be followed, diving schedule and underwater raking and pointing equipment, materials and techniques to be used. Include plan for daily Quality Control and Quality Assurance inspections and final inspection by video.

1.10 STORAGE AND HANDLING OF MATERIAL

.1 Store cementitious materials in accordance with CSA A3000.

.2 Store aggregates in accordance with CSA A23.1.

.3 Materials to be kept dry and protected from weather and contamination.

.4 Manufacturer's labels and seals to be intact upon delivery.

1.11 ENVIRONMENTAL REQUIREMENTS

.1 Masonry mortar to be prepared and placed to requirements of Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

1.12 EXISTING CONDITION

.1 Report to the Departmental Representative, in writing, areas of severely deteriorated masonry revealed during the work, and await instruction regarding repair or replacement of masonry units.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Deep and back pointing mortar
- .1 Site mix mortar from individual components
- .2 Follow general provisions of CAN/CSA-A179-14 Mortar and Grout for Unit Masonry except as modified in the Contract.
- .3 Mortar for deep and back pointing in areas where no dampness of free water that would affect work is present shall be of Portland cement/hydrated lime/sand ratio of 3:1:12.
- .4 Air entrainment of the final approved mortar mix for deep pointing shall be between 15% to 17% as measured in accordance with CSA A23.2-4c. If this can not be achieved by original mix proportion and mixing process, an air entrainment agent shall be added to provide the specified air entrainment.
- .5 Anti-washout additive to be added to the mortar mix for all application where substrate is moist and ground water infiltration that cannot be controlled is present.
- .6 The expectancy is that the mix will produce mortar with compressive strength approaching 17 MPa.

.2 Finishing mortar
- .1 Site mix mortar from individual components
- .2 Follow general provisions of CAN/CSA-A179-14 Mortar and Grout for Unit Masonry except as modified in the Contract.
- .3 Mortar for finishing pointing in areas where no dampness of free water that would affect work is present shall be of Portland cement/hydrated lime/sand ratio of 2:1:9.
- .4 Air entrainment of the final approved mortar mix for finish pointing shall be between 10% to 12% as measured in accordance with CSA A23.2-4c. If this can not be achieved by original mix proportion and mixing process, an air entrainment agent shall be added to provide the specified air entrainment.
- .5 It is expected that the mortar with mix as per above will produce compressive strength approaching 12 MPa.

.3 Underwater pointing
- .1 Proprietary repair mortar will be used based on fine hydraulic cement, sand, anti-washout additives, air entraining additives and proprietary additives.

PART 3 - EXECUTION

3.1 GENERAL

.1 Use only accepted materials, equipment and procedures to carry out work.

.2 Provide tools and equipment maintained in good working condition and of approved types.

.3 Tool and compact mortar using jointing tool to force the mortar into joint.

.4 Finish joints to match existing. Repoint sample area at the beginning of the job, to the Departmental Representative approval. Approved sample to be standard of quality for the entire work.

3.2 INSPECTION

.1 Install scaffolding to Section 01 20 01 - Site Access.

.2 Clean Masonry Surfaces to Section 01 74 11 - Cleaning.

.3 Departmental Representative will inspect cleaned masonry surfaces from scaffold and verify extent of repointing and identify locations for deep grout tubes.

3.3 HEATING

.1 Provide enclosures and heating when air temperature is at or below 5°C or when temperatures are expected to fall below 5°C for upcoming work.

.2 Enclose and heat mixing equipment and materials to heat sand and mixing water to produce mortar at uniform temperature of not less than 5°C or more than 27°C.
.1 Maximum Water temperature: 27°C.

.3 Pre-heat materials and work areas for minimum period of three days at temperatures of 15°C but not more than 27°C.

.4 Minimum substrate and joint temperature of 5°C is required 36 hours prior to placing mortar and to be maintained for duration of repointing and curing.

.5 Verify substrate above 5°C prior to placing new masonry mortar.

.6 Supply max/min thermometer per section of work area, including mixing and storage areas in accordance with Section 01 56 00 – Temporary Barriers and Enclosures.

.7 Record and submit daily log of max/min temperatures weekly or as directed.

.8 Continue heating for minimum of 10 days beyond required curing period.

3.4 MASONRY MOCK-UP

.1 Construct masonry mock-ups in designated work area to demonstrate raking and pointing procedures for each stage of work including; inserting grout tubes, deep back pointing, back pointing and finish pointing.

.2 Each mason proposed for work to construct separate mock-up in presence of Departmental Representative.

.3 Each mock-up area to be minimum 1 m wide by 1 m tall.

.4 Provide full access to Departmental Representative during construction of masonry mock-up to allow for observation of masonry techniques and procedures.

.5 If mock-up is accepted, complete work in mock-up area for final acceptance.

.6 If mock-up is not accepted, rake and re-construct mock-up.

.7 Accepted masonry mock-up to be standard of quality and workmanship for entire work.

.8 Underwater masonry mockup to be constructed to demonstrate raking and pointing in underwater environment for acceptance prior to continuing underwater repointing.

3.5 STANDARD RAKING

.1 Carefully rake joints to 75 mm depth using manual tools or light chipping hammers with maximum weight 2 kg.

.2 Plan work so joints are raked out in sections that can be deep back pointed and back pointed within 2 weeks.

.3 Do not leave raked joints unprotected or unfilled for more than 2 weeks or duration accepted by Departmental Representative.

.4 If required, carefully saw cut mortar joints down centre of joint to 35 mm minimum and 75 mm maximum to avoid damaging edges of stones. Stop short when cutting near ends of joints to not cut stones.

.5 Clean joints, voids and cavities encountered to be free of deteriorated and loose mortar, dirt and other undesirable material.

.6 Rake back of joints to be square face and full width.

.7 Flush all open joints and voids clean with water under low pressure and if not free draining blow clean with compressed air.

.8 Existing masonry joints may contain high strength Type M Mortar or high strength grout with over 30 MPa compressive strength.

.9 Where durable, sound mortar or grout is encountered at depths less than 35 mm, continue raking to minimum depth of twice joint width, 35 mm. Request Departmental Representative acceptance to stop raking at 35 mm minimum.

.10 Where unsound mortar or voids are encountered deeper than 75 mm seek Departmental Representative's approval to continue raking up to 300 mm for Deep Back Pointing.

.11 Where unsound mortar or voids are encountered deeper than 300 mm, seek Departmental Representative's approval to install grout tube.

3.6 GROUT TUBES

.1 Install grout tubes (and vent tubes) where accepted by Departmental Representative.

.2 Grout tubes to project outside of stone face sufficiently to accommodate grouting hardware and operations.

.3 Fix grout tubes in place by deep back pointing and back pointing.

.4 Ensure grout tubes are adequately secured for pressurized air cleaning and pressure grouting.

.5 Allow pointing to cure 72 hours minimum prior to grouting.

3.7 DEEP GROUT TUBES

.1 Drill and install deep grout tubes to inject grout into core of walls.

.2 After joints are raked, Departmental Representative will inspect and designate locations for deep grouting.

.3 Deep Grouting Locations:
.1 Deep grout tubes to be inserted into masonry joints only.
.2 Tubes to be inserted at intersection of horizontal and vertical joints.
.3 Tubes to be placed in every row of horizontal joints of chamber wall and every second intersection of vertical and horizontal joints, roughly every 3 m,

offsetting location in each row.
.4 Locations for tubes in other areas to be designated by Departmental Representative based on water infiltration, exfiltration and suspected location of deep voids in core of wall.

.4 Drill hole suitable for insertion of grout tubes at designated locations into core of wall to depth of 800mm to 900mm.
.1 Provide protection measures to ensure heritage stones are not damaged during drilling operations.

.5 In deep voids where drilling not required, anchor deep grout tubes in place with mortar.

.6 Insert deep grout tubes minimum of 25 mm into drilled holes and grout in place with at least 75 mm of mortar.

.7 Deep Point and Back Point to anchor deep grout tubes in place.

.8 Allow pointing to cure 72 hours minimum prior to grouting.

3.8 JOINT PREPARATION

.1 Prepare joints for pointing with mortar by cleaning to remove dust, debris and other foreign material.

.2 Dampen surfaces of joint with low pressure water soaking and keep damp prior to pointing.

.3 Remove free standing water from joint and masonry surfaces.

.4 Keep joints damp while joint filling is being performed.

3.9 POINTING

.1 Departmental Representative to accept substrate for each stage of repointing prior to filling joint to verify quality of work and measure depth of raking or pointing.

.2 Fill joints with mortar to specified depth for each stage of repointing.
.1 Deep Back pointing: Fill joints from 300 mm deep to 75 mm deep.
.2 Back Pointing: Fill joints from 75 mm deep to depth from the surface twice joint width or 35 mm maximum.
.3 Back Pointing areas where stone edges are rounded at exposed face: Fill joint to depth required for installation of finish pointing using areas determined on-site by Departmental Representative.

.3 Pack mortar solidly into all voids and joints ensuring full contact with back and sides of joint and leaving no voids.

.4 Buildup pointing and pack solidly in individual layers not exceeding 35 mm.

.5 Departmental Representative to inspect and accept deep back pointing prior to start of back pointing.

.6 Roughen top surface of Deep Back Pointing or Back Pointing when "Thumb print" hard to improve bond with next lift of mortar.

3.10 REMOVING GROUT TUBES

.1 After grout has cured, remove grout tubes by stretching and cutting tube as close as possible to back pointing mortar face.

.2 Fill joint with mortar by finish pointing to hide area where grout tubes were removed.

3.11 FINISH POINTING

.1 Finish point at end of work or at end of work after on approved section of work.

.2 Pack mortar solidly to fill joint to face of masonry.

.3 Avoid feathered edges.

.4 Finish mortar where stone edges are rounded at exposed faces so mortar is maximum 20 mm from exposed face using areas determined on-site by Departmental Representative.

.5 Tool mortar when "thumb print" hard to produce concave profile.

.6 Use stiff bristle brush, if required, to give finish that matches existing to approval of Departmental Representative.

3.12 ROUTINE CLEANING

.1 Immediately remove mortar droppings from surfaces.

.2 Routinely clean all surfaces of mortar droppings, stains and other blemishes as work progresses.

.3 Clean exposed stone surfaces by washing with stiff fibre brush, clean water and low pressure wash.

3.13 CURING

.1 Provide warm, moist curing after each stage of repointing for 24 hours. Provide three days curing for finish pointing.

.2 Cover all pointing with damp burlap tarps. Condition burlap prior to use by soaking 24 hours, immersed in water.

.3 Hang burlap approximately 50 mm or less in front of the wall but not in contact with the wall since this could lead to unacceptable discolouration.

.4 Cover burlap with white waterproof plastic tarps to reduce evaporation of water and protect newly laid mortar from frost, rainfall and rapid drying from wind or sun. Anchor coverings securely.

.5 Inspect and maintain constant dampness of burlap.

.6 Cure mortar joints by applying water with a portable pressurized sprayer a minimum of three times a day for three days. Note, more frequent misting, to maintain adequate humidity levels, may be needed if housing and heating is required. Maintain humidity levels to satisfaction of the Departmental Representative.

.7 Provide enclosure and heating if required to keep substrate temperatures above 10°C for three days and above 5°C for 7 days.

.8 Provide watchkeeper to routinely verify and record moisture and heating for duration of curing in accordance with Section 01 56 00 – Temporary Barriers and Enclosures.

3.14 UNDERWATER RAKING AND POINTING

.1 Rake and point deteriorated underwater masonry joints in the wet using divers to extent, schedule and methods accepted by Departmental Representative.

.2 Setup environmental measures in accordance with accepted Environmental Protection Plan in accordance with Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

.3 Install turbidity curtain as close as possible to work area in accordance with Section 35 49 25 - Turbidity Curtain.

.4 Use helmet mounted video cameras and radio communication for Quality Control/Quality Assurance monitoring and inspection from dry land.

.5 Diving operations may be carried out by boat or from land.

.6 Notify Departmental Representative 48 hours prior to Underwater work and provide schedule to allow for Quality Assurance during underwater operations.

.7 Rake only deteriorated joints designated for underwater repair. If joints are sound, do not rake.

.8 Saw cut centre of deteriorated joints to minimum of 25 mm and maximum of 75 mm deep. Do not cut stones adjacent to joints.

.9 Rake joints to maximum 100 mm depth.

.10 Obtain acceptance by Departmental Representative prior to raking of joints deeper than. Areas of deeper raking to be measured and recorded with Departmental Representative using diving video feed.

.11 Obtain acceptance by Departmental Representative prior to installing grout tubes for joints deeper than 300 mm.

.12 Fill joints from 300 mm to 75 mm to anchor grout tubes in place. Allow to mortar time to set.

.13 Grout deep voids in accordance with Section 03 03 09 Pressure Grouting.

.14 After grout has cured, cut back grout tubes.

.15 Point to stone face from 50 to 100 mm from stone face except immediately around area of grout tubes.

.16 When joint is "thumb print" hard, tool joint to give slight concave profile.

.17 Brush joints with stiff bristle brush, if required, to match existing texture.

3.15 UNDERWATER INSPECTION

.1 Include time each day for daily masonry video inspection for Quality Control and Quality Assurance and measurement as well as one full day for underwater inspection of underwater masonry repairs at end of work and prior to demobilizing diver.

3.16 FINAL CLEANING

.1 Clean exposed surfaces by washing with stiff fibre brush, clean water and low pressure wash.

PART 1 – GENERAL

1.1 DESCRIPTION

.1 Removals of full individual stones or portions of individual stones which have been designated for repair either by full stone replacement or dutchman repair as indicated. This section also applies to masonry removals to the masonry lock staircases.

1.2 HERITAGE PROTECTION

.1 Kingston Mills Lockstation is a National Heritage Site.

.2 Preserve heritage fabric of site by executing repointing without damage to masonry joint edges, adjacent stones or other site features.

.3 Damage to stones will not be tolerated.

.4 Ensure appropriate supervision work, adequate training for workers, and other necessary precautions to protect existing masonry structures.

.5 Notify Departmental Representative immediately where reasonable concern exists that damage will result from work

.6 Contractor may propose alternative work methodologies to be accepted by Departmental Representative.

1.3 RELATED WORK

.1 Section 01 20 01 - Site Access

.2 Section 01 22 01 – Measurement and Payment.

.3 Section 01 33 00 – Submittal Procedures

.4 Section 01 56 00 - Temporary Barriers and Enclosures

.5 Section 01 74 11 - Cleaning

.6 Section 04 43 04 - Repointing Stone Masonry

1.4 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01.

.2 Work covered by this section will be paid for under payment item included in the Unit Price Table:
.1 Item No. U78 - Stone Removal
.2 Item No. U79 - Stone Removal for Salvage
.3 Item No. U80 - Stone Removal for Dutchman

Repairs.

.4 Item No. U81 - Stone Removal – Sluice Tunnel Walls.

.5 Item No. U82 - Stone Removal – Sluice Tunnel Soffit.

.6 Item No. U83 - Stone Removal – Sluice Tunnel Floors.

.7 Item No. U84 - Stone Removal – Staircases.

.8 Item No. U85 – Stone Removal – Drainage for Chamber Floor

.1 Measurement for payment for the above item shall be for each area where stone removal is specified for drainage of chamber floor into gate recess floor.

.9 Item No. U86 - Underwater Stone Removal for Dutchman Repairs

.3 Measurement for payment for the above items shall be for volume of stone removed, not including volume of mortar for joints.

.1 Volume will be calculated as the face area of replacement stone times the average depth of stone removed.

.2 Depth of removal only includes 50 mm pocket behind new stone. No measurement and payment will be made for pocket excavated deeper than 50 mm without prior approval.

.3 Depth of removal for approved deep pocket includes a maximum pocket depth of 150 mm. No measurement and payment will be made for deep pocket excavated deeper than 150 mm without prior approval.

.4 Measurement for payment for stone removal in the sluice tunnel walls, floor and soffit shall be by volume of stone removed, not including volume of mortar for joints.

.1 The depth of removals shall be measured from the back of the removal area, perpendicular to the original face of the sluice tunnel wall, soffit or floor surface, regardless if stone spalling/deterioration has already occurred at the measurement location.

.5 Raking and removal of adjacent mortar joints will be measured under section 04 43 04 - Repointing Stone Masonry.

.6 Contractor and Departmental Representative to verify measurements of masonry removals together to establish average depth.

.7 Scaffolding included for payment as Lump Sum under Section 01 20 01 - Site Access.

.8 Temporary enclosures and heating are included for

payment as Lump Sum under Section 01 56 00 Temporary Barriers and Enclosures.

1.5 ACTION AND INFORMATION SUBMITTALS

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

.2 Submit Engineered methodology and work sequence for all phases of masonry work including; masonry removals stamped and signed by a professional engineer registered and licensed in the Province of Ontario.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Use hand held masonry tools and small hand held chipper hammers accepted by Departmental Representative.

.2 Gas or electric cut-off saw.

PART 3 – EXECUTION

3.1 GENERAL

.1 Use procedures accepted by Departmental Representative.

.2 Provide enclosure and heating to Section 01 56 00 - Temporary Barriers and Enclosures so work is executed on stones in an unfrozen state.

.3 Removals of existing sound stone material, beyond deteriorated areas, is required on this project. The Contractor is hereby informed that the existing stone material is extremely strong and may be difficult to remove. The average strength of the existing stone material, based on testing of core samples, is 112MPa.

3.2 INSPECTION

.1 Install scaffolding to Section 01 20 01 - Site Access.

.2 Clean masonry surfaces to Section 01 74 11 - Cleaning.

.3 Departmental Representative will inspect cleaned masonry surfaces from scaffold and verify location of masonry removals.

3.3 SUPPORT

.1 Construct shoring, bracing, and other temporary framing and stabilization work, to support masonry structure, or parts of it, during removal operations.

.2 Shoring and bracing for stone repair and removal to be designed by Contractor's Engineer.

3.4 REMOVAL OF STONE FACE DUTCHMAN REPAIR

.1 Scale masonry units designated for Dutchmen repair to determine if Dutchman repair is required.

.2 Rake joints to depth of 75 mm and remove joint mortar around entire perimeter of area to be repaired in accordance with Section 04 43 04 - Repointing Stone Masonry

.3 Carefully saw cut stone perimeter of repair area to 75 mm deep minimum.
.1 For partial dutchman repairs, saw cut at slight angle to more easily create an invisible joint.

.4 Carefully break out stone face using accepted methods and equipment to prevent damage to adjacent stones to remain in place or damage invisible edge of dutchman repair.

.5 Remove stone to indicated depths including a 50mm pocket at back of new stone between new stone and existing stone.
.1 Do not remove stone for pocket greater than 50 mm without prior approval of Departmental Representative.

.6 Where unsound stone encountered beyond indicated depth of removal, seek approval of Departmental Representative to create a deep pocket to sound stone, to a depth of 100mm. Seek Departmental Representative approval for deeper removals.

.7 Cut and remove any existing anchors found.

.8 Complete removal to produce a "neat" squared opening to receive dutchman replacement stone.

3.5 REMOVAL OF FULL STONE

.1 Rake joints to depth of 75 mm and remove joint mortar around entire perimeter of full stone to be removed in accordance with Section 04 43 04 - Repointing Stone Masonry.

.2 Carefully break out stone using accepted methods and

equipment to remove stone without damage to adjacent stones to remain in place.

.3 Cut and remove any existing anchors found.

.4 Complete removal to produce a "neat" squared opening to receive replacement stone.

.5 Cut and remove any existing anchors found.

3.6 CLEANUP

.1 Routinely clean-up work area to remove excavated stone and mortar.

.2 Construct enclosures to capture falling debris and prevent excavated stone and mortar from falling into waterway.

PART 1 – GENERAL

1.1 DESCRIPTION

.1 The work of this section covers the requirements for the supply, cutting, finishing and delivery of new stones for the following work:

- .1 Full Dutchman: Repair of whole stone face with dutchman repair. Includes flat, and curved sections of wall which requires finishing on one face of stone.
- 2 Full Dutchman - Special: Refacing of whole stone face with dutchman repair in special areas such as pilasters and quoins which may require dressing of two or more faces of stone.
- .3 Partial Dutchman: Repair of portion of stone face with dutchman repair.
- .4 Full Stone Replacement: Replacing full stones in kind. Includes flat, curved and battered sections of wall which require finishing on face of stone.
- .5 Full Stone Replacement – Special: Replacing full stones in kind. Requires finishing of two or more faces and includes battered and curved stones. Includes coping stones, top Quoin stone and masonry staircase stones.
- .6 Flagstone Pavers: Replacement of concrete slab on grade and flagstone/ slate pavers with new flagston pavers.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 Measurement and Payment.

.2 The following work covered by this section will be paid for under payment items included in the Unit Price Table:

- .1 Item No. U87 - Cut Stone - Full Dutchman.
- .2 Item No. U88 - Cut Stone - Full Dutchman - Special.
- .3 Item No. U89 - Cut Stone - Partial Dutchman.
- .4 Item No. U90 - Cut Stone - Full Stone.
- .5 Item No. U91 - Cut Stone - Full Stone - Special.

.3 Measurement will be taken as actual in-place volume in cubic metres of new stone that is supplied, cut, finished, and delivered.

.4 Payment to be made when the stone has been placed, set and accepted into the work.

.5 Include payment of the supply, cutting, finishing and deliver of Flagstone in accordance with Section 32 13

11 Flagstone Paving.

1.3 RELATED WORK

.1 Section 01 22 01 - Measurement and Payment

.2 Section 01 03 33 – Submittal Procedures

.3 Section 32 13 11 – Flagstone Paving

1.4 REFERENCES

.1 ASTM International (ASTM).
.1 ASTM C568-15 Standard Specification for Limestone Dimension Stone.
.2 ASTM C97/C97M-15 - Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.
.3 ASTM C99/C99M-15 - Test Method for Modulus of Rupture of Dimension Stone.

.4 ASTM C170/C170M-17 - Test Method for Compressive Strength of Dimension Stone.

.2 Canadian Standards Association (CSA International).
.1 CSA S304.1-04(R2010), Design of Masonry Structures.

1.5 ACTION AND INFORMATION SUBMITTALS

.1 Submittals to be in accordance with Section 01 03 33 – Submittal Procedures.

.2 Submit technical data sheets, certificates, purchase orders, laboratory test results and other documentation to show proposed stone meets requirements.

.3 Submit stone samples to Departmental representative sufficient in size and quantity to demonstrate stone properties such as colour variation and texture and be clearly marked as to location of quarry of origin and identify supplier.

.4 Submit supplier's acknowledgement of ability to accept order, confirming stone availability and required lead time.

.5 Stone samples to demonstrate details and look of unfinished and finished stone.

.6 Samples will demonstrate workmanship of stone finish details for acceptance.

.7 Acceptability of the source of stone will also be determined by the weathered colour of the stone. Samples to include example of weathered face.

.8 Submit samples that show:
- .1 Weathered stone surface.
- .2 Unfinished stone surface.
- .3 Range of colour variation.
- .4 Smooth finish.
- .5 Bush hammer finish.
- .6 Chisel drafted margin.
- .7 Rounded over edge.
- .8 Drilled hole for anchors B1 to B5.

.9 Samples will be kept by Departmental Representative.

.10 Submit table with identifying number and dimensions of stones to be repaired to Departmental Representative.

1.6 DELIVERY AND STORAGE

.1 Deliver, store and handle cut stone in a manner to prevent damage, adulteration, deterioration and soiling.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Finished stone masonry supplied from quarry to be limestone to ASTM C568M-15

.2 Colour pitch and texture to match existing as closely as possible, with following physical requirements:
- .1 Absorption: 1% max. to ASTM C97M;
- .2 Density: 2560 Kg/cu.m. min. to ASTM C97M;
- .3 Compressive strength: 55 MPa min., taken in the weakest direction tested wet and dry to ASTM C170M;
- .4 Colour:
  - .1 Stone colour to match the existing un-weathered stone color as closely as possible which is a dark grey with blue tones.
  - .2 The following shall not be accepted with regards to color:
    - .1 Stones with any red or pink hues.
    - .2 Stones with any dark brown hues.
- .5 Bed Depths and Stone Size:
  - .1 Stone material shall be extracted from beds which have sufficient depth to accommodate the stone heights required for full stone replacements in this project.
  - .2 Maximum Required Stone Height = 500mm
  - .3 Minimum Required Stone Height = 330mm

.6 The Departmental Representative reserves the right to inspect the proposed source quarry to select areas of the quarry, or specific stone beds, which have been deemed to have acceptable color for use in this project. Stones from specific areas will be identified for use for repairs in any highly visible areas of the locks (i.e. coping stones, stones above the lowest operating water levels and partial Dutchman repairs).

.3 Submit samples for acceptance of stone colour, texture and finish.

.1 Minimum size for colour and texture to be 300mm x 300mm x 200mm.

.2 Minimum size for finish to be 300mm x 300mm x 50mm.

.3 There may be variations in colour within each quarry and not all stone from each quarry will be acceptable.

.4 Exterior and finished faces of Stone to be free of seams, cracks, repairs or other flaws/ imperfections on any face that would impair its structural integrity.

.5 In specific instances, the Departmental Representative will allow repairs of stones in shop prior to shipping the stones to the site as per following:

.1 In general no repairs shall be implemented on front exposed faces of stones and the stones shall have natural appearance.

.2 In general repairs shall be limited to the faces and corners not exposed in final product.

.3 The repairs shall be limited to maximum 10% of the area of the face being repaired.

.4 The permitted repairs to non-exposed surfaces include:

.1 Replacement of soft impurities with matching mortar,

.2 Filling natural cavities with matching mortar, repairing broken off corners by grinding, trimming and mortaring to reconstruct in full or 90 % of original shape,

.3 Epoxy injection of partial depth and width cracks and open seams.

.5 The repairs to exposed surfaces shall be limited and allowed as follows:

.1 Use in exceptional circumstances of special stones and impossibility of securement raw replacement material.

.2 Cracks that are partial width and depth may be epoxy injected with colour matching epoxy material resulting that no repair can be seen from 6 metres in normal view as the stone will be exposed in place.

.3 Filling soft surface impurities and cavities that constitute no more than 5 % of the exposed surface with material matching stone in colour and compositions and of appearance that the repair cannot be visible from 6 metres in normal view as the stone will be exposed in place.

.4 Repair of corners broken off only if the transverse maximum dimensions of the corner break as measured perpendicular to surface is less than 30 mm and repair to be by trade mason by grinding to reduce the effect of broken corner to be barely distinguishable from 6 metres in normal view as the stone will be exposed in place.

2.2 CUTTING

.1 Cut stone to shape and dimensions required, square with jointing to match existing.

.2 Dress exposed faces true.

.3 Cut stone to lay in horizontal plane on its natural quarry bed and to accuracy of 3 mm. Install stone so beds are horizontal.

.4 Make beds and joints to match adjacent masonry and at right angles to face.

.5 Dutchman repairs to maintain stone coursing pattern with joint between new stone and existing stone.

.6 Do not cut holes in exposed surfaces.

2.3 STONE FINISH

.1 Refer to drawings for stone finish details.

PART 3 – EXECUTION

3.1 GENERAL

.1 Inspect masonry removals with Departmental Representative after raking of joints and after removal of stone to confirm as near as possible, the extent of stone replacement required. Supply replacement stones by number and size based on this delineation.

.2 Cut stones as required to match removals and to CSA S304.1.

.3 Score sawn faces which will be in contact with mortar as indicated.

.4 Deliver stones to site and protect from damage.

3.2 PROTECTION

.1 Prevent damage to stone during transportation, storage and handling.

.2 Replace damaged stones prior to placing.

3.3 STONE SUPPLY

.1 Inspect and verify supplied stone dimensions and finish details prior to requesting inspection by Departmental Representative.

.2 Provide unrestricted access to all faces of stone for inspection by Departmental Representative.

.3 Review work to track quantity of stone required to finalize the supply and minimize over-supply and losses.

.4 Mark stones on back face with unique identifying number using numbering system provided by Departmental Representative.

3.4 CUTTING/SIZING OF STONE

.1 Use calipers, squares and levels to measure opening for new stone.

.2 Allow for mortar joint width around perimeter of stone to match existing or as directed by Departmental Representative.

.4 Allow for 50 mm pocket behind stone to be filled with grout. In areas of deterioration and with Departmental Representative's acceptance, the pocket may be up to 100mm behind stone and repaired as indicated.

.5 For Dutchman repairs, the face between new and old stone to be cut as indicated.

PART 1 – GENERAL

1.1 DESCRIPTION

.1 Work of this section includes the preparation and installation of stone masonry for the following work:
- .1 Full Dutchman: Repair of whole stone face with dutchman repair. Includes flat, and curved sections of wall which requires finishing on one face of stone.
- .2 Full Dutchman - Special: Refacing of whole stone face with dutchman repair in special areas such as pilasters and quoins which may require dressing of two or more faces of stone.
- .3 Partial Dutchman: Repair of portion of stone face with dutchman repair.
- 4 Full Stone Replacement: Replacing full stones in kind. Includes flat, curved and battered sections of wall which require finishing on face of stone.
- .5 Full Stone Replacement – Special: Replacing full stones in kind. Requires finishing of two or more faces and includes battered and curved stones. Includes coping stones, top Quoin stone and masonry staircase stones.

.2 In general, stone installation to replicate the "original" installation in terms of unit "squareness", matching thickness to adjacent or standard units, level and, square to level. Variance from this will only be permitted as directed by the Departmental Representative.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 Measurement and Payment.

.2 Work covered by this section will be paid for under payment items included in the Unit Price Table:
- .1 Item No. U92 - Install Stone – Full Dutchman.
- .2 Item No. U93 - Install Stone – Full Dutchman - Special.
- .3 Item No. U94 - Install Stone – Partial Dutchman.
- .4 Item No. U95 - Install Stone – Full Stone.
- .5 Item No. U96 - Install Stone – Full Stone - Special.
- .6 Item No. U97 - Install Stone – Underwater Full Dutchman
- .7 Item No. U98 - Install Stone – Underwater Partial Dutchman
- .8 Item No. U99 - Install Stone – Staircases

.3 Measurement will be taken as actual in-place volume

in cubic metres of new stone that is installed.

.4 Unit prices for installation of stone to include full compensation for labour, equipment and materials necessary to execute the work.

1.3 RELATED WORK

.1 Section 01 20 01 – Site Access

.2 Section 01 22 01 Measurement and Payment.

.3 Section 01 33 00 Submittal Procedures.

.4 Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

.5 Section 01 74 00 - Cleaning

.6 Section 02 41 18 – Concrete Removal

.7 Section 03 03 09 - Pressure Grouting

.8 Section 04 43 04 - Repointing Stone Masonry

.9 Section 04 43 05 – Masonry Removals

.10 Section 04 43 06 - Cut Stone

.11 Section 05 05 20 – Anchors

1.4 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CSA-A371-04 (R2014) - Masonry Construction for Buildings

1.5 QUALIFICATIONS

.1 All work to be performed by skilled tradespersons, experienced in type of work specified.

.2 All work to be supervised by skilled and experienced tradespersons in type of work specified. Work to this section to be executed under continuous supervision and direction of a competent mason.

1.6 PRECAUTIONS

.1 Move and lift stone units using means to prevent dropping or sudden impacts.

.2 Stone units, dropped or impacted, are to be inspected by Departmental Representative and condition accepted before installation.

.3 Do not make holes or indentations for lifting devices on face or visible top side of stone.

1.7 ENVIRONMENTAL REQUIREMENTS

.1 All masonry to be prepared and placed to requirements of Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

1.8 PROTECTION

.1 Protect adjacent stones from markings or damage due to work.

.2 Provide temporary support for masonry work during erection until permanent structure provides adequate support.

1.9 ACTION AND INFORMATION SUBMITTALS

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

.1 Submit Engineered methodology and work sequence for all phases of masonry work including; installation of stone masonry.

PART 2 – PRODUCTS

2.1 CUT STONE

.1 Supply cut stone in accordance with Section 04 43 06 - Cut Stone.

2.2 GROUT

.1 Supply grout to Section 03 03 09 - Pressure Grouting.

2.3 MORTAR MIX FORMULA

.1 Masonry mortar for all jointing and bedding finished stone masonry: to Section 04 43 04 - Repointing Stone Masonry.

2.4 ANCHORS

.1 Anchors to Section 05 05 20 - Anchors.

PART 3 – EXECUTION

3.1 PREPARATION AND GENERAL REQUIREMENTS

.1 As early as possible in project, prepare site for inspection of masonry surfaces by Departmental Representative.

.2 Install scaffolding to Section 01 20 01 – Site Access.

.3 Clean masonry surfaces to Section 01 74 11 - Cleaning.

.4 Excavate stone in accordance with Section 04 43 05 – Masonry Removals.

.5 Excavate concrete to be refaced with stone in accordance with Section 02 41 18 – Concrete Removal.

.6 Inspect masonry removals with Departmental Representative after raking of joints and after removal of stone to confirm as near as possible, the extent of stone replacement required. Supply replacement stones by number and size based on this delineation.

.7 Supply stones to site and protect from damage. Cut stones and deliver to site as per Section 04 43 06 Cut Stone.

.8 All face finishing debris and end cut-offs which are not used shall be removed from site.

3.2 MOVING STONES

.1 Use lifting devices requiring drilling of the stones, on hidden faces of stones only.

3.3 HEATING

.1 Provide enclosures and heating when air temperature is at or below 5°C or when temperatures are expected to fall below 5°C during upcoming work.

.2 Pre-heat repair areas for minimum period of three days at temperature of not less than 15°C but not more than 27°C.

.3 Substrate minimum temperature of 5°C is required 36 hours prior to placing stone and to be maintained for duration of placing and curing.

.4 Provide heating for duration of curing period.

3.4 PLACING ANCHORS

.1 Place anchors in stones only after acceptance by Departmental Representative.

.2 Place anchors in new stone to Section 05 05 20 - Anchors,

prior to placing and setting stone.

.3 Drench stones to refusal by spraying with clean water and keeping stones clean and damp before placing and setting.

3.5 NEW STONE INSTALLATION

.1 All masonry installation to CSA-A371-04 (R2014) - Masonry Construction for Buildings

.2 Clean stone by washing with clean water and natural fibre brush before laying. Stone should not be dry at time of placing.

.3 Drench stones to refusal by spraying with clean water and keeping stones clean and damp before placing and setting.

.4 Dampen surfaces of opening and apply mortar to be of opening.

.5 Place stones with bedding planes horizontal unless Departmental Representative directs otherwise.

.6 Where there is more than one course of stone replacement, lay successive stone courses in accordance with methodology developed by contractor's engineer and reviewed and accepted by Departmental Representative.

.7 Prop and anchor stones until mortar has set. Include spacers for joint width.

.8 Set new stones plumb, true and level in full bed of mortar with vertical joints pointed full except where otherwise specified. Remove and reset stones that are not laid plumb, true and level.

.9 Set large stones on water soaked hardwood wedges to support stone in proper alignment until mortar has set. Remove wedges when dry, do not break off.

.10 Provide bracing and shoring as required to hold new stone installations in place until mortar sets.

.11 Remove mortar droppings from face of stone immediately after placing and before mortar has set. Sponge stone free of mortar as work progresses.

.12 Install grout tubes and vent tubes for grouting behind each replaced stone as indicated.

3.6 FILLING JOINTS AND REPOINTING

.1 Fill joints and point: in accordance with Section 04 43 04 Repointing Stone Masonry.

.2 Fill joints to 300 mm depth. Leave finish pointing until end of work.

.3 Allow repointing to cure 72 hours prior to grouting.

3.7 CURING

.1 Moist cure new mortar for 3 days in accordance with Section 04 43 04 - Repointing Stone Masonry.

.2 Heating requirements for cold-weather protection during curing to be in accordance with Section 04 43 04 - Repointing Stone Masonry

3.8 GROUTING

.1 Completely fill pockets behind new stone and surrounding stones with grout to Section 04 43 04 - Repointing Stone Masonry.

PART 1 – GENERAL

1.1 DESCRIPTION

.1 This section specifies requirements for anchors (anchors and dowels) required to complete concrete and stone work (includes stonework specified to masonry staircases).

1.2 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment.

.2 Section 01 33 00 – Submittal Procedures

.3 Section 01 56 00 – Temporary Barriers and Enclosures.

.4 Section 03 03 09 – Pressure Grouting

.5 Section 03 20 00 Concrete Reinforcing

.6 Section 05 50 00 - Metal Fabrications

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment

.2 Work covered by this section will be paid for under payment items included in Unit Price Table:
- .1 Item No. U100 - Anchor Type B1.
- .2 Item No. U101 - Anchor Type B2.
- .2 Item No. U102 - Anchor Type B3 (not used).
- .2 Item No. U103 - Anchor Type B4 (not used).
- .3 Item No. U104 - Anchor Type B5.
- .4 Item No. U105 - Dowel Type D1.
- .5 Item No. U106 - Dowel Type D2 (not used).
- .6 Item No. U107 - Dowel Type D3.
- .7 Item No. U108 - Dowel Type D4.
- .8 Item No. U109 - Dowel Type D5
- .9 Item No. U110 - Dowel Type D6.
- .10 Item No. U111 - Dowel Type D7.
- .11 Item No. U112 - Dowel Type D8.
- .12 Item No. U113 - Dowel Type D9.

.3 Payment for anchors includes;
- .1 Drilling or coring holes in concrete or stone substrate material.
- .2 Water flushing, vacuuming and cleaning holes.
- .3 Supplying and placing anchors or dowels.
- .4 Supplying and placing plates, nuts and other accessories.
- .5 Supplying and placing grout tubes for dowels.
- .6 Supplying and placing epoxy for anchors and

dowels (all grout for dowels to be paid under separate grout item).

1.4 REFERENCES

.1 American Society for Testing and Materials (ASTM):
- .1 ASTM A193/A193M-16 Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature High Pressure Service and Other Special Purpose Applications.
- .2 ASTM F593-17, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- .3 ASTM C881M-15, Standard Specification for Epoxy-Resin Base Bonding System for Concrete.
- .4 ASTM C882M-13a, Standard Test Method for Bond Strength of Epoxy-Resin used with Concrete by Slant Shear.

.2 Canadian Standards Association (CSA):
- .1 CAN/CSA G30.18-09 (R2014) Carbon steel bars for concrete reinforcement.

1.5 ACTION AND INFORMATION SUBMITTALS

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

.2 Submit the following for review 5 days prior to work.
- .1 Contractor's installation procedures.
- .2 Material Technical Data Sheets (MTDS).
- .3 Material Safety Data Sheets (MSDS).
- .4 Manufacturer's recommended installation procedures.

.3 Keep copy of accepted Contractor's installation procedures and Manufacturer's Material Technical Data Sheets, Material Safety Data Sheets, and recommended installation procedures at work site.

PART 2 – PRODUCTS

2.1 MATERIALS GENERAL

.1 Grout:
- .1 Grout: to 03 03 09 – Pressure Grouting

.2 Anchors:
- .1 Galvanized Reinforcing Steel: to Section 03 20 00 Concrete Reinforcing.
- .2 Stainless Steel Reinforcing Bars: to Section 03 20 00 Concrete Reinforcing.
- .3 Stainless steel threaded bars: to ASTM F593-17,

Type 316L.

.3 Plate and Washers: Stainless Steel to ASTM A193

2.2 EPOXY AND GROUT

.1 Thermosetting epoxy or acrylic resin type with binder and hardener/accelerator component.

.2 Dowel adhesive to be commercial supplied in double tubes cartridges, injectable, mix in nozzle of epoxy or acrylic type. The selected material to be specifically designed and suitable for type of installation, including:
.1 Orientation (vertical, horizontal)
.2 Moisture content in the substrate (damp holes)
.3 Application in low temperatures
.4 Presence of free water in the substrate

.3 Utilize an epoxy anchoring system reviewed and accepted by Departmental Representative complying with ASTM C881, which provides a minimum pull out strength of 55 kN as tested on 15 mm diameter deformed reinforcing bar for 15 M dowel embedded 125 mm in un-cracked 30 MPa strong Portland cement concrete cured for 28 days, tested per ASTM C882.

.4 The pre-approved materials are listed on a Designated Source of Material list 9.30.25 maintained current by Ontario Road Authority. Utilize as many different products as required to suit any and particular application.

2.3 ANCHOR TYPE B1, B2 and B5

.1 Anchors B1, B2 and B5 for anchoring new stone to existing stone, existing concrete and new concrete substrate.

.2 Anchor Type B1, B2 and B5: Stainless steel threaded bar.

.3 Sizes and locations as indicated.

.4 Minimum embedment depth as indicated.

2.4 DOWEL TYPE D1 to D9

.1 Dowels for anchoring grout or concrete to existing stone or existing concrete.

.2 Dowel type: galvanized reinforcing steel or stainless steel reinforcing steel bars as indicated.

.3 Sizes and locations as indicated.
- .1 Type D1: 20M galvanized reinforcing steel
- .2 Type D2: Not used
- .3 Type D3: 20M galvanized reinforcing steel
- .4 Type D4: 15M galvanized reinforcing steel
- .5 Type D5: 20M galvanized reinforcing steel
- .6 Type D6: 10M Stainless Steel reinforcing steel bars
- .7 Type D7: 15M Stainless Steel reinforcing steel bars
- .8 Type D8: 20M galvanized reinforcing steel
- .9 Type D9: 15M galvanized reinforcing steel

.4 Minimum embedment depth as indicated.

2.5 MISCELLANEOUS ANCHORS

.1 Anchors for Lock Chamber Ladders and other metal components to Section 05 50 00 - Metal Fabrications.

PART 3 – EXECUTION

3.1 GENERAL

.1 Use materials and procedures accepted by Departmental Representative.

.2 Provide housing and heating to Section 01 56 00 – Temporary Barriers and Enclosures.
- .1 Maintain rock or concrete substrate and ambient air temperature within enclosures to temperature and for duration of curing period recommended by manufacturer or to Section 01 56 00 – Temporary Barriers and Enclosures, whichever is more strict.

.3 Except as specified, install epoxy and grout to Manufacturer's recommendations.

.4 Anchors may vary in length. Cut to lengths as indicated or as required.

3.2 DRILLING

.1 Use rotary drilling equipment or core drilling equipment, not percussion drilling equipment.

.2 If rotary drilling equipment causes damage to stone, use diamond core drilling equipment.

.3 Locate holes as indicated, without damaging stone to be drilled or adjacent stones.
.1 Modify drilling procedure immediately if stone is damaged.

.4 Drill holes for Type D1, D5, D6 & D7 dowels at a slight angle and place vent tube on top of dowel to improve venting during grouting.

3.3 ANCHOR TYPE B1

.1 Core holes in new stone using epoxy manufacturer's recommended core size or 20 mm minimum diameter and extend depth of hole to manufacturer's recommended depth beyond length of anchor or 13 mm minimum.

.2 Clean holes thoroughly of dust and debris and prepare holes to Manufacturer’s recommendations prior to placing epoxy.

.3 Use epoxy to grout anchors to new stone in accordance with manufacturer's recommendations. Completely fill hole in new stone with epoxy and insert anchors into new stone.

.4 Support anchor in position until epoxy has set. Allow epoxy to completely cure to Manufacturer's recommendations prior to moving or placing stone.

.5 Core 30 mm diameter hole into stone or concrete substrate. Install epoxy immediately before installation of new stone and anchorages.

.6 Use wedges around all edges of new stone to support new stone in position.

.7 Allow epoxy to cure completely prior to placing deep back pointing, back pointing or cement grout for pockets behind stone.

3.4 ANCHOR TYPE B2

.1 Core holes in new stone using epoxy manufacturer's recommended core size or 20 mm minimum diameter and extend depth of hole to manufacturer's recommended depth beyond length of anchor or 13 mm minimum.

.2 Clean holes thoroughly of dust and debris and prepare holes to Manufacturer’s recommendations prior to placing epoxy.

.3 Use epoxy to grout anchors to new stone in accordance with manufacturer's recommendations. Completely fill hole in new stone with epoxy and insert anchors into new stone leaving sufficient length for installation

of stainless steel plates and nuts as indicated.

.4 Support anchor in position until epoxy has set. Allow epoxy to completely cure to Manufacturer's recommendations prior to moving or placing stone.

.5 Once epoxy in new stone has completely cured, install stainless steel plates and nuts as indicated.

.6 Use wedges around all edges of new stone to support new stone in position.

.7 Allow epoxy to cure completely prior to placing deep back pointing, back pointing or cement grout for pockets behind stone.

3.5 ANCHOR TYPE B5

.1 Core holes in new stone using epoxy manufacturer's recommended core size or 20 mm minimum diameter and extend depth of hole to manufacturer's recommended depth beyond length of anchor or 13 mm minimum.

.2 Clean holes thoroughly of dust and debris and prepare holes to Manufacturer’s recommendations prior to placing epoxy.

.3 Use epoxy to grout anchors to new stone in accordance with manufacturer's recommendations. Completely fill hole in new stone with epoxy and insert anchors into new stone.

.4 Support anchor in position until epoxy has set. Allow epoxy to completely cure to Manufacturer's recommendations prior to moving or placing stone.

.5 Core 25 mm diameter hole into stone or concrete substrate. Install epoxy immediately before installation of mortar bed and new stone and anchorages.

.6 Use wedges around all edges of new stone to support new stone in position.

.7 Allow epoxy to cure completely prior to placing deep back pointing, back pointing or cement grout for pockets behind stone.

3.6 DOWEL TYPE D1

.1 Core holes in stone or concrete substrate 50 mm minimum diameter or to grout manufacturer's recommendations.

.2 Core holes at a downwards angle (10°) and place vent tube at top to improve venting of air.

.3 Clean holes thoroughly of dust and debris with pressure washing and vacuuming as specified.

.4 Sizes and locations as indicated.

.5 Minimum specified embedment depth as indicated.

.6 Grout dowel by injecting cement grout for anchors through grout tube until a continuous flow of grout exits from the vent tube.

.7 Allow cement grout for dowels to cure completely prior to placing concrete or grout.

.8 Trim grout tubes by stretching tubes then cutting tube close to surface.

3.7 DOWEL TYPE D2 (NOT USED)

.1 Not Used.

3.8 DOWEL TYPE D3

.1 Core holes in substrate 50 mm minimum diameter or to grout manufacturer's recommendations.

.2 Clean holes thoroughly of dust and debris with pressure washing and vacuuming as specified.

.3 Sizes and locations as indicated.

.4 Minimum specified embedment depth as indicated.

.5 Grout dowel by completely filling hole with non-shrink grout prior to placing concrete.

.6 Allow grout to set completely prior to placing new concrete.

3.9 DOWEL TYPE D4

.1 Core holes in joints of masonry substrate 50 mm minimum diameter or to grout manufacturer's recommendations.

.2 Clean holes thoroughly of dust and debris with pressure washing and vacuuming as specified.

.3 Sizes and locations as indicated.

.4 Minimum specified embedment depth as indicated.

.5 Grout dowel by injecting cement grout into anchorage holes.

.6 Allow grout to set completely prior to placing new concrete.

3.12 DOWEL TYPE D5

.1 Core holes in stone or concrete substrate 50 mm minimum diameter or to grout manufacturer's recommendations.

.2 Core holes at a downwards angle (10°) and place vent tube at top to improve venting of air.

.3 Clean holes thoroughly of dust and debris with pressure washing and vacuuming as specified.

.4 Install in locations as indicated.

.5 Minimum specified embedment depth as indicated.

.6 Grout dowel by injecting cement grout for anchors through grout tube until a continuous flow of grout exits from the vent tube.

.7 Allow cement grout for dowels to cure completely prior to placing concrete or grout.

.8 Trim grout tubes by stretching tubes then cutting tube close to surface.

3.13 DOWEL TYPE D6

.1 Core holes in stone or concrete substrate 25 mm minimum diameter or to grout manufacturer's recommendations.

.2 Core holes at a downwards angle (10°) and place vent tube at top to improve venting of air.

.3 Clean holes thoroughly of dust and debris with pressure washing and vacuuming as specified.

.4 Install in locations as indicated.

.5 Minimum specified embedment depth as indicated.

.6 Grout dowel by injecting cement grout for anchors through grout tube until a continuous flow of grout exits from the vent tube.

.7 Allow cement grout for dowels to cure completely prior to placing concrete or grout.

.8 Trim grout tubes by stretching tubes then cutting tube close to surface.

3.13 DOWEL TYPE D7

.1 Core holes in stone or concrete substrate 30 mm minimum diameter or to grout manufacturer's recommendations.

.2 Core holes at a downwards angle (10°) and place vent tube at top to improve venting of air.

.3 Clean holes thoroughly of dust and debris with pressure washing and vacuuming as specified.

.4 Install in locations as indicated.

.5 Minimum specified embedment depth as indicated.

.6 Grout dowel by injecting cement grout for anchors through grout tube until a continuous flow of grout exits from the vent tube.

.7 Allow cement grout for dowels to cure completely prior to placing concrete or grout.

.8 Trim grout tubes by stretching tubes then cutting tube close to surface.

3.13 DOWEL TYPE D8

.1 Core holes in stone or concrete substrate 50 mm minimum diameter or to grout manufacturer's recommendations.

.2 Clean holes thoroughly of dust and debris with pressure washing and vacuuming as specified.

.3 Install in locations as indicated.

.4 Minimum specified embedment depth as indicated.

.5 Grout dowel by completely filling hole with non-shrink grout prior to placing concrete.

.6 Allow cement grout for dowels to cure completely prior to placing concrete or grout.

3.13 DOWEL TYPE D9

.1 Core holes in stone or concrete substrate 50 mm minimum diameter or to grout manufacturer's recommendations.

.2 Clean holes thoroughly of dust and debris with pressure washing and vacuuming as specified.

.3 Install in locations as indicated.

.4 Minimum specified embedment depth as indicated.

.5 Grout dowel by completely filling hole with non-shrink

grout prior to placing concrete.

.6 Allow cement grout for dowels to cure completely prior to placing concrete or grout.

PART 1 – GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for salvage, repairs, replacement and reinstallation of various metal components and accessories, as specified in the contract drawings.

.2 All metal components and accessories that are specified, or otherwise required to be removed, shall be salvaged, refurbished off-site and reinstalled.

.3 All metal components and accessories that are not specified to be removed, shall be refurbished in-place.

.4 All metal components of the existing lock gates, excluding metal gate components which are not removed with the gates (i.e. spider assembly and foot box at the base of the lock gate), are not required to be repaired or replaced, unless damaged by the contractor’s construction activities.

.5 Metalwork components and accessories required for removal, salvage, off-site refurbishing and reinstallation include, but are not necessarily limited to, the following:
- .1 Gate (crab) winches
- .2 Sluice tunnel valve (rack and pinion) winches including connection rods, and counterweights.
- .3 Bollards
- .4 Mooring line anchorage assemblies (upper and lower)
- .5 Vent covers for sluice tunnels
- .6 Accessories such as: masonry cramps, signs, sign/accessory posts, barbeques, garbage containers, benches, information plaques, etc.
- .7 Existing railing posts which are designated for re-use.

.6 Metalwork components and accessories to be repaired in place include components in Section 1.1.5. above which are not specified or required to be removed.

.7 Metalwork components and accessories required for replacement include, but are not necessarily limited to:
- .1 All lock chamber ladders (to dimensions as indicated in the contract drawings).
- .2 Existing railings as specified in the contract drawings.
- .3 Upper and lower anchorages for mooring lines where existing anchorages are required to be removed.

.8 New metalwork components include, but are not necessarily limited to, the following:
.1 Pressure relief valves.

1.2 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment.

.2 Section 01 33 00 – Submittal Procedures

1.3 REFERENCES

.1 Canadian Standards Association (CSA):
.1 CSA-G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
.2 CSA-W59-13, Welded Steel Construction (Metal Arc Welding).
.3 CSA-W47.1-09(R2014), Certification of Companies for Fusion Welding.
.4 CSA-W55.3-08, Certification of Companies for Resistance Welding of Steel and Aluminum.

.2 American Society for Testing and Materials International, (ASTM):
.1 ASTM A307-14, Standard Specification for Carbon Steel Bots and Studs, 60,000 PSI Tensile Strength.
.2 ASTM A510-13, Standard specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy steel.

.3 Society for Protective Coatings (SSPC)/National Association of Corrosion Engineers (NACE)
.1 SSPC-SP 1, Solvent Cleaning.
.2 SSPC-SP 2, Hand Tool Cleaning.
.3 SSPC-SP 3, Power Tool Cleaning.
.4 SSPC-SP 6/NACE No. 3, Commercial Blast Cleaning.
.5 SSPC-SP 10/NACE No. 2, Near White Blast Cleaning.
.6 SSPC-SP 11, Power Tool Cleaning to Bare Metal.

1.4 ACTION AND INFORMATION SUBMITTALS

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

.2 Shop drawings required for any replacement or new metalwork.
.1 Indicate materials, thicknesses, finishes, connections, joints, method of anchorage, welds, number of anchors, supports, reinforcement, details, and accessories.

.3 Submit technical data sheets for paint and manufacturer's specifications and recommendations.

1.5 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment

.2 Unless specified under a unit price item, payment shall be included in Lump Sum Price table under the following item:
- .1 Item No. L50 - Metal Fabrications.
- .2 Item No. L51 - Steel Raker Supports for Stop Logs.

.3 Payment shall be included in Unit Price table under the following items:
- .1 Item No. U114 - Supply and Install Pressure Relief Valves
- .2 Item No. U115 - Supply and Install Access Ladders
- .3 Item No. U116 - Supply and Install Stair Railings
- .4 Item No. U117 - Supply and Install Raised Wall and Monolith Railings
- .5 Item No. U118 - Supply and Install Upper Anchorage for Mooring Line
- .6 Item No. U119 - Supply and Install Lower Anchorage for Mooring Line
- .7 Item No. U120 - Reinstate Salvaged Sluice Tunnel Valves and Frames
- .8 Item No. U121 - Reinstate Salvaged Sluice Gate Winches
- .9 Item No. U122 - Reinstall Salvaged Masonry Cramps

.4 Payment for pressure relief valves includes the supply and placement of geotextile and clear stone/river stone in substrate pockets below valve locations. Excavation of substrate (stone masonry, bedrock, grouted stone fill, etc.) shall be paid for under separate item, as applicable.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Steel sections and plates: to CSA-G40.21, Grade 300W unless noted otherwise.

.2 Welding materials: to CSA W59.

.3 Bolts and Nuts: to CSA G40.21 Type 300W and ASTM A307.

.4 Anchors:
- .1 Anchor bolts to ASTM A307.
- .2 Size: as indicated for new installations and to match existing or as directed to replace existing anchors.
- .3 Embedment: to anchor adhesive manufacturer's

recommendations.

.4 Anchors to be complete with all accessory parts as specified by manufacturer, and additional accessories indicated on drawings or described in specification.

.5 Anchor Adhesive:
- .1 Injectable, two-component, hybrid adhesive mortar for masonry.
- .2 Acceptable materials: Hilti HIT-HY-200 or accepted alternative matching physical properties and performance.

.6 Paint Primer:
- .1 Water based, rust-inhibitive, steel primer.
- .2 Colour: not to match finish paint.
- .3 Compatibility: Compatible with finish paint.
- .4 Acceptable Materials: Tremclad Rust Primer, Grey or accepted alternative primer with identical or better physical properties and performance.

.7 Finish Paint:
- .1 Alkyd based, rust-inhibitive paint.
- .2 Colour/Finish: Gloss Black.
- .3 Acceptable Materials: Tremclad Rust Paint, gloss black or accepted alternative paint with identical or better physical properties and performance.

.8 Pressure Relief Valves:
- .1 All steel components of pressure relief valves to be stainless steel (T316).
- .2 Pressure relief valve diameter to be 150mm (6”).
- .3 Valve cover shall open when the external pressure (below floor) exceeds internal pressure by approximately 125mm (5”) of head.

.9 Existing Metalwork:
- .1 Contractor is advised that the existing metal work may be iron or steel. Contractor shall take required and appropriate measures when working with either material.

PART 3 - EXECUTION

3.1 OFF-SITE PREPARATION

.1 Surfaces of existing metal components designated for removal, salvage, and off-site refurbishment shall be prepared as per the following:
- .1 Prepare metal surfaces for inspection by blast cleaning to SSPC-SP 6 Commercial Blast Cleaning.
- .2 Departmental Representative may designate specific items for cleaning to SSPC-SP 11 Power

Tool Cleaning to Bare Metal, SSPC-SP 3 Power Tool Cleaning, or SSPC-SP 2 Hand Tool Cleaning to minimize damage to heritage items.

.2 Prepare and submit shop drawings indicating proposed repairs for review and acceptance by Departmental Representative.

.3 Prepare steel surfaces to be repaired by welding to SSPC-SP 11 Power tool Cleaning to Bare Metal without damaging existing metal surfaces.

3.2 ON-SITE PREPARATION

.1 Surfaces of existing metal components designated for in-place repairs shall be prepared as per the following:

.1 Provide enclosure to capture dust and debris during preparation of surface and protect from elements.

.2 SSPC-SP 3 Power Tool Cleaning.

.3 Departmental Representative may designate specific items for cleaning to SSPC-SP 2 Hand Tool Cleaning, to minimize damage to heritage items.

.2 Prepare and submit shop drawings indicating proposed repairs for review and acceptance by Departmental Representative.

.3 Prepare steel surfaces to be repaired by welding to SSPC-SP 11 Power tool Cleaning to Bare Metal without damaging existing metal surfaces.

.4 Salvage existing decorative posts at east staircases and monoliths on flight locks.

3.3 FABRICATION (ON-SITE AND OFF-SITE)

.1 Repairs decorative posts salvaged from existing railings and incorporate salvaged posts into construction of new railings as shown on contract drawings.

.2 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.3 Where possible and applicable, fit and shop assemble work, ready for erection.

.4 Erect metalwork square, plumb, straight and true, accurately fitted, with tight joints and intersections.

.5 Do welding work in accordance with CSA-W59 unless

specified otherwise.

.6 Welding companies to be certified for fusion welding or under CSA-W55.3 for resistance welding.

.7 Provide certification that all welded joints are certified by Canadian Welding Bureau.

.8 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

.9 Grind sharp edges smooth.

3.4 SHOP PAINTING

.1 Prepare steel components for painting in accordance with SSPC-SP 3 Power Tool Cleaning (and SSPC-SP 2 Hand Tool Cleaning if directed by Departmental Representative) without damaging existing or new steel surfaces.

.2 Clean surfaces immediately prior to applying paint to SSPC-SP 1 Solvent Cleaning.

.3 Prime steel surfaces by spraying with approved primer. Ensure there are no spray defects.

.4 Allow curing time between coats to manufacturer's recommendations.

.5 Finish steel surfaces using approved finish paint. Apply second finish coat.

3.5 FIELD PAINTING

.1 Prepare surfaces in accordance with Section 3.2.

.2 Priming and painting in accordance with shop painting requirements above.

.3 Provide enclosure to capture dust and debris during preparation of surface and protect paint from rain or dust and debris from other activities.

.4 Provide heated enclosure when temperatures are below, or expected to fall below 10°C during preparation, painting and curing. Provide heat for 24 hours prior to applying paint.

3.6 ERECTION

.1 Erect metal fabrications into position as indicated unless directed otherwise.

.2 Make field connections with high tensile bolts to ASTM A307, unless specified otherwise.

.3 Install using new anchors in accepted locations.

.4 Provide heated enclosure when setting anchors if temperature below 5°C or expected to fall below 5°C within 24 hours.

3.7 PRESSURE RELIEF VALVES

.1 New pressure relief valves to be installed as per details on contract drawings and as per manufacturers recommendations/specifications.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for timber repairs to the floor of Lock 49. Timber floor of Lock 49 to be maintained in a wet environment in accordance with Section 35 20 22 - Dewatering.

1.2 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment.

.2 Section 01 33 00 – Submittal Procedures

.3 Section 01 74 11- Cleaning

.4 Section 01 74 20 - Waste Management and Disposal

.5 Section 35 20 22 - Dewatering

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 Payment to be included in the Unit Price table under the following item:
.1 Item No. U123 – Replace Timbers in Lock Floor

1.4 REFERENCES

.1 ASTM International
.1 ASTM A123/A123M-15 , Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
.2 ASTM A153/A153M-09 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
.3 ASTM A307-14 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
.4 ASTM A653/A653M-15 , Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
.5 ASTM D 5055-13e1, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.
.6 ASTM D 5456-14b, Standard Specification for Evaluation of Structural Composite Lumber Products.
.7 ASTM F1667-13 Standard Specification for Driven Fasteners: Nails, Spikes and Staples.

.2 Canadian Wood Council
- .1 Wood Design Manual 2010 (R2014) Edition
- .2 Engineering Guide for Wood Frame Construction [2014]

.3 CSA International
- .1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
- .2 CSA O86-14 Engineered Design in Wood
- .3 CSA O121-08(R2013), Douglas Fir Plywood.
- .4 CSA O141-05(R2014), Softwood Lumber.
- .5 CAN/CSA-Z809-08 , Sustainable Forest Management.

.4 National Lumber Grades Authority (NLGA)
- .1 Standard Grading Rules for Canadian Lumber 2010.

1.5 ACTION AND INFORMATION SUBMITTALS

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

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

.3 Storage and Handling Requirements:
- .1 Store materials in dry location, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store materials in dry location, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .3 Store and protect from nicks, scratches, and blemishes.
- .4 Replace defective or damaged materials with new.

PART 2 – PRODUCTS

2.1 STRUCTURAL TIMBER

.1 Lumber: softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
- .1 CSA O141.
- .2 NLGA Standard Grading Rules for Canadian Lumber.
- .3 Lumber in floor of Lock 49 shall be:

2.2 FURRING AND BLOCKING

.1 Furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers:
- .1 S2S is acceptable for all furring and blocking.
- .2 Board sizes: "Standard" or better grade.
- .3 Dimension sizes: "Standard" light framing or better grade.
- .4 Post and timbers sizes: "Standard" or better grade.

2.3 ACCESSORIES

.1 Nails, spikes and staples: to ASTM F1667.

.2 Bolts: As indicated, complete with nuts and washers.

.3 Connectors and fasteners: in accordance with accepted shop drawings, minimum 1 mm thick sheet steel, galvanized to minimum ZF001 coating designation.

.4 Nailing discs: flat caps, minimum 25 mm diameter, minimum 0.4 mm thick, sheet metal, formed to prevent dishing. Bell or cup shapes not acceptable.

.5 Fastener Finishes:
- .1 Galvanizing: to ASTM A653 or ASTM A123/A123M, use galvanized fasteners for all work unless otherwise noted.
- .2 Stainless steel: use stainless steel Type 316.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product 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 FURRING AND BLOCKING

.1 Install furring and blocking as required to space-out and support work as required.

.2 Install sleepers as indicated.

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 WASTE MANAGEMENT

.1 Separate waste materials for recycling and reuse in accordance with Section 01 74 20 - Waste Management and Disposal.

.2 Re-use scrap lumber to the greatest extent possible. Separate scrap lumber for use on site as accessory components, including: shims, bracing, and blocking.

.3 Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill. Prevent saw dust and wood shavings from entering the storm drainage system.

.4 Do not burn scrap lumber that has been pressure treated.

.5 Do not send lumber treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

3.5 PROTECTION

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

.2 Repair damage to adjacent materials caused by rough carpentry installation.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specified the requirements for penetrating concrete sealer for application on concrete surfaces.

1.2 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment.

.2 Section 01 33 00 – Submittal Procedures

.3 Section 01 35 29 - Health and Safety Requirements.

.4 Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

1.3 REFERENCES

.1 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-37-GP-37M-[77], WITHDRAWN Application of Hot Asphalt for Dampproofing or Waterproofing.
.2 CAN/CGSB-37-GP-6Ma-[83], Asphalt, Cutback, Unfilled, for Dampproofing.

.2 National Cooperative Highway Research Program (NCHRP) December 1981, Report No. 244.

.3 AASHTO Designation T259 and T260, Chloride Permeability of Concrete.

.4 American Society of Testing and Materials (ASTM).

.5 ASTM C672/C672M-12, Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to De-icing Chemicals.

.6 Oklahoma Dept. of Transportation OHD-L-35, 92- Test for Moisture Vapour Permeability of Treated Concrete.

.7 Canadian Standards Association (CSA).

.8 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction

1.4 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 Payment to be included in the Unit Price table under the following item:

.1 Item No. U124 - Penetrating Concrete Sealer

1.5 ACTION AND INFORMATION 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 water repellents and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit WHMIS MSDS in accordance with Section 01 35 29 - Health and Safety Requirements and Section 01 35 46 – Archaeological, Cultural and Environmental Procedures. Indicate VOC's for water repellent.

.3 Manufacturer's Instructions:
.1 Submit manufacturer's installation instructions

1.6 QUALITY ASSURANCE

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

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

1.7 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.

1.8 SITE CONDITIONS

.1 Ambient Conditions:
.1 Maintain substrate temperature at water repellent installation area in accordance with water repellent manufacturer's printed instructions.
.2 Apply coating during dry weather. Allow surfaces to dry minimum of 3 days after rainfall or cleaning before applying further coats.
.3 Protect plants and vegetation which might be

damaged by water repellents.

.4 Protect surfaces not intended to have application of water repellents.

PART 2 – PRODUCTS

2.1 CONCRETE SEALER

.1 Concrete sealer must comply with the following:

.1 The active ingredient in the sealer to be one of the following:

.1 Alkylalkoxysilane.

.2 Oligomeric alkoxy siloxane/silane.

.3 Monomeric silane.

.2 Carrier:

.1 alcohol or mineral spirits.

.3 Active Ingredient Content: minimum 40% by weight.

.4 Appearance: clear.

.5 Water Repellency:

.1 The sealer to comply with requirements of Cube Test – Series II of NCHRP Report 244, when tested on concrete samples designed for Class C-1 exposure as per CAN/CSA-A23.1- 00, Concrete Materials and Methods of Concrete Construction, with treated samples exhibiting less than 25 % weight gain of untreated samples when submerged in 15 % solution of NaCl for 21 days.

.6 Freeze Thaw Resistance

.1 The Sealer to comply with requirements of ASTM C672/C672M-98e1, with no scaling observed after 100 freeze-thaw cycles.

.7 Resistance to Chloride Penetration as per AASHTO Designation T259 and T260

.1 Less than 0.37 kg/m3 at 12.5 mm level.

.2 Less than 0.34 kg/m3 at 25 mm level.

.8 Moisture Vapour Transmission

.1 100 % minimum as per OHD-L-35.

PART 3 – EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable 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 MANUFACTURERS INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.3 PREPARATION

.1 Pressure wash concrete surfaces to remove all latence, loose material, flakes and any foreign material and matter. Do not allow dirt or debris or laden run-off to enter watercourse. Install debris catch complete with filter fabric below bridge deck, downstream of retaining walls and other areas to be sprayed to satisfaction of Departmental Representative prior to pressure washing. Include plan in environmental mitigation plan submission for approval.

.2 Utilize 35 MPa water pressure minimum with cleaning rate of 10 m2/hour or less.

.3 Allow the surface to dry.

3.4 APPLICATION

.1 Apply sealer as per the following:
.1 Do not thin.
.2 Do not apply below temperatures of +5ºC or when ambient temperature is expected to fall below +5ºC within 12 hours following application.
.3 Apply to completely dry surface.
.4 Roll to point of rejection obtaining the minimum coverage specified in the manufacturer’s written recommendations. Do not spray sealant due to risk of contamination of watercourse. Protect from spills and overruns.

3.5 FIELD QUALITY CONTROL

.1 After water repellent has dried, spray coated surfaces with water to verify coating coverage. Allow Departmental Representative to witness tests.

3.6 CLEANING

.1 Progress Cleaning: Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

3.7 PROTECTION

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

.2 Repair damage to adjacent materials caused by water repellent application.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for the removal and reinstatement of the existing live electrical components (conduit, boxes, wires, anchorage, etc.) which cross the lower gate recess of Lock 46. This utility interferes with the specified repairs to the lock walls and requires relocation/removal to carry out the work.

.2 This work includes localized excavation behind the lock walls in order to complete the work.

1.2 RELATED WORK

.2 Section 01 22 01 – Measurement and Payment

.1 Section 01 33 00 – Submittal Procedures

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment

.2 There will be no measurement for payment for this work

.3 Payment to be included in Lump Sum price under the following item:

.1 Item No. L52 - Remove and Reinstate Electrical Utility – Lock 46.

.4 No additional payment will be made for repeated removal and reinstallation if required to suit the contractor work staging.

1.4 ACTION AND INFORMATION SUBMITTALS

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

.2 Contractor to submit shop drawings of electrical components and installation (including anchorage to lock surfaces) for approval by Departmental Representative.

1.5 QUALITY ASSURANCE

.1 Electrical work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 GENERAL

.1 All removed electrical components shall be re-installed, except the conduit anchorages to the lock wall and floor, which will require replacement with new.

.2 And components damaged by the contractor’s activities shall be replaced in-kind with new.

.3 Provide CSA certified equipment and material.

.4 Colour of all new components to match existing.

PART 3 - EXECUTION

3.1 WORK RESTRICTIONS

.1 Electrical components must be reinstated at the end of any construction season and shall be approved for use.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for all aggregate materials.

1.2 RELATED WORK

.1 Section 01 33 00 – Submittal Procedures.

.2 Section 01 74 11 - Cleaning.

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Payment for these items shall be included under Section 31 23 15 – Excavating, Trenching and Backfilling.

1.4 REFERENCES

.1 Ontario Provincial Standard Specifications (OPSS).
- .1 OPSS 1001 - Material Specification for Aggregates – General, Nov. 2013
- .2 OPSS.PROV 1010 - Material Specification for Aggregates - Base, Subbase, Select Subgrade, And Backfill Material, April 2013.

1.5 ACTION AND INFORMATION 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 Submit samples in accordance with section 01 33 00 – Submittal Procedures.
- .2 Allow continual sampling by Departmental Representative during production.
- .3 Provide Departmental Representative with access to source and processed material for sampling.
- .4 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

1.6 DELIVERY STORAGE AND

.1 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.

HANDLING

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Bedding - Granular: Crushed stone or gravel base: consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
- .1 Physical Properties: Granular A in accordance with OPSS.PROV 1010.

.2 Bedding - Sand: Manufactured sand, hard, durable, crushed stone particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
- .1 Physical Properties: Manufactured Sand in accordance with OPSS 1001
- .2 Do not use limestone

.3 Backfilling - Granular: Crushed stone or gravel base: consisting of hard, durable, angular particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
- .1 Physical Properties: Granular B, Type II in accordance with OPSS.PROV 1010.

2.2 SOURCE QUALITY CONTROL

.1 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.

.2 Advise Departmental Representative a minimum of 2 weeks in advance of proposed change of material source.

.3 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

PART 3 - EXECUTION

3.1 PREPARATION

.1 Topsoil stripping:
- .1 Dispose of topsoil off site.

.2 Stockpiling:

.1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces or too close to watercourse.

.2 Space on site is limited for stockpiling. Stockpile aggregates and otherwise deliver on demand 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. Excavating of areas to permit stockpiling is prohibited. Deliver material on demand where insufficient level ground on site exists for stockpiling.

.4 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.

.5 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.

.6 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.

.7 Do not cone piles or spill material over edges of piles.

3.2 CLEANING

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

.2 Progress Cleaning: Leave Work area clean at end of each day.

.3 End of Construction Season and Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.4 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.

.5 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for bedrock removals as required to carry out the work.

1.2 RELATED WORK

.1 Section 01 35 29 - Health and Safety Requirements

.3 Section 01 74 20 – Waste Management and Disposal

.4 Section 01 56 00 - Temporary Barriers and Enclosures

.2 Section 31 23 15 - Excavating, Trenching and Backfilling

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 Payment to be included in the Unit Price table under the following item:
.1 Item No. U125 - Bedrock Removals

.3 Quantities will be taken from cross section showing original rock surface and actual grade line set by Departmental Representative, except that minimum depth of rock required to be excavated to be considered as 600 mm.

1.4 REFERENCES

.1 Definitions:
.1 Rock: any solid material in excess of 0.25 m3 and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m3 bucket. Frozen material not classified as rock.
.2 PPV: peak particle velocity.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Not Used

PART 3 – EXECUTION

3.1 BEDROCK REMOVAL

.1 Co-ordinate this Section with Section 01 35 29 - Health and Safety Requirements.

.2 Remove rock to alignments, profiles, and cross sections as indicated.

.3 Explosive blasting is not permitted.

.4 Use rock removal procedures to produce uniform and stable excavation surfaces. Minimize overbreak, and to avoid damage to adjacent structures.

.5 Excavate rock to horizontal surfaces with slope not to exceed 10%.

.6 Prepare rock surfaces which are to bond to concrete, by scaling, pressure washing and broom cleaning surfaces.

.7 Remove boulders and fragments which may slide or roll into excavated areas.

.8 Correct unauthorized rock removal at no extra cost, in accordance with Section 31 23 15 - Excavating, Trenching and Backfilling.

3.2 CLEANING

.1 Rock Disposal:
.1 Dispose of removed rock off site in accordance with Section 01 74 20 – Waste Management and Disposal.

3.3 PROTECTION

.1 Prevent damage to surroundings and injury to persons in accordance with Section 01 56 00 - Temporary Barriers and Enclosures. Erect fencing, post guards, sound warnings and display signs when blasting to take place.

PART 1 – GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for excavating, trenching, and backfilling to complete work as indicated.

.2 Work includes:
- .1 Removal of common material to expose backface of the North Basin Wall.
- .2 Dewatering trench behind North Basin Wall.
- .3 Removing and disposing of debris.
- .4 Disposing of surplus material.
- .5 Backfilling behind the new North Basin Wall
- .6 Sand bedding under the new and salvaged Flagstone Pavers.
- .7 Granular bedding under the new and salvaged Flagstone Pavers.

1.2 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment.

.2 Section 01 33 00 – Submittal Procedures

.3 Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

.4 Section 01 74 11 - Cleaning

.5 Section 31 05 16 – Aggregate Materials

.6 Section 35 20 22 – Dewatering

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 Payment for these items are included in Unit Price Table:
- .2 Item No. U126 - Common Excavation.
- .3 Item No. U127 – Bedding - Sand
- .4 Item No. U128 - Bedding - Granular
- .5 Item No. U129 - Backfilling

.3 Material specifications for Granular material to be as per Section 31 05 16 – Aggregate Materials.

.4 All other work not identified as Unit Price item to be included in Lump Sum.

1.4 DEFINITIONS

.1 "Common excavation" includes all materials, excluding rock and concrete, which must be removed to complete the work including boulders and rock or concrete fragments less than 0.5 m3 in volume, and soil of whatever nature encountered. Work includes, but is not limited to:
- .1 Providing shoring and sheeting required.
- .2 Protecting trees and other site features.
- .3 Disposing of surplus material.

.2 "Backfilling" includes:
- .1 Supplying, placing, grading and compacting new granular material (Granular A, Granular B).
- .2 Supplying, placing, grading and compacting existing common backfill for site grading and backfilling.
- .3 Backfilling includes filling.

.3 "Rock" includes any solid material more than 0.5 m^3 which cannot be removed by means of heavy duty mechanical excavating equipment. Concrete and frozen material are not classified as rock.

.4 "Concrete" includes any solid concrete material in excess of 0.5 m^3 which cannot be removed by means of heavy duty mechanical excavating equipment.

.5 "Common Backfill" - selected, excavated materials approved by Departmental Representative for use as backfill.

1.5 REFERENCES

.1 ASTM International (ASTM).
- .1 ASTM D75/D75M-14, Standard Practice for Sampling Aggregates.
- .2 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil using Standard Effort.

.2 Ministry of Transportation Ontario (MTO)
- .1 OPSS.PROV 1010, Material Specification for Aggregates - Base, Subbase, Select Subgrade and Backfill Material, April 2013.

1.6 REQUIREMENTS OF REGULATORY AGENCIES

.1 Comply with local, provincial and national codes and regulations.

.2 Adhere to municipal and provincial requirements relating to safety of excavations, trenching and protection of workers.

1.7 SOURCE QUALITY CONTROL

.1 Sieve Series: MTO OPSS 1010 Sieve Series or ASTM E11 Series equivalents.

.2 Samples and sampling: to ASTM D75/D75M.

.3 Maximum density and optimum moisture: to ASTM D698.

.4 When requested, submit for approval and testing a 25 kg sample of each granular material specified for use.

1.8 MATERIALS HANDLING

.1 Transport, store and handle granular materials in such a manner as to eliminate segregation.

1.9 ACTION AND INFORMATION SUBMITTALS

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

.2 Excavation Plan: Provide details of proposed excavation, trench bracing and shoring, details from utility locates, demolition, protection methods and equipment.

.3 Shoring Shop Drawings: Signed and sealed by Professional Engineer licensed in practice in the province of Ontario.

1.10 PROTECTION OF EXISTING FEATURES

.1 Existing surface features:
.1 Conduct with Departmental Representative condition survey of existing trees, bushes and other plants, lawns, light poles, pavement, benches, garbage containers, historical winches which may be affected by work.
.2 Protect existing surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Departmental Representative.

1.11 BLASTING

.1 Blasting is not permitted.

PART 2 - PRODUCTS

2.1 BEDDING AND BACKFILL MATERIALS

.1 Bedding - Sand: to Section 31 05 16 – Aggregate Material

.2 Bedding - Granular: to Section 31 05 16 – Aggregate Material

.3 Backfilling: Section 31 05 16 – Aggregate Material

PART 3 - EXECUTION

3.1 STOCKPILING

.1 Stockpile fill materials in areas designated by Departmental Representative. Stockpile granular materials in manner to prevent segregation.

3.2 SHORING AND BRACING

.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, Departmental Representative to verify and advise methods.

3.3 DEWATERING

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

.2 Submit to Departmental Representative details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.

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

.4 Dewater trench in accordance with Section 01 35 46 – Archaeological, Cultural and Environmental Procedures and Section 35 20 22 - Dewatering.

3.4 SAFETY OF EXCAVATIONS AND PROTECTION OF WORKERS

.1 Construct shoring and sheeting to depths, heights and locations as designated as part of work of this section and accepted by Departmental Representative on basis of accepted drawings.

.2 During backfill operation:
.1 Except as approved or directed by Departmental Representative, remove sheeting and shoring from excavations. Remove at an approved stage of construction.
.2 Do not remove bracing until backfilling has reached approved levels.

.3 Where shoring and/or sheeting is required to remain in place, cut off at elevations approved by Departmental Representative.

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

3.5 COMMON EXCAVATION

.1 Excavate to elevations and dimensions indicated or required for construction of work.

.2 Earth bottoms of excavation to be dry undisturbed soil, reasonably level, free from loose or organic matter.

.3 Make excavation to clean lines to minimize quantity of fill material required.

.4 Correct over-excavation below proposed bottom of excavation elevation with granular material compacted to 95% maximum dry density or 20 MPa lean concrete.

.5 Hand trim, make firm and remove loose material and debris from excavations immediately prior to placing concrete or granular backfill. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

3.6 BACKFILLING WITH GRANULAR BACKFILL

.1 Do not proceed with backfilling operations until Departmental Representative has inspected and approved work in place.

.2 Backfill spaces excavated and not occupied by parts of substructure or other permanent works, with specified backfill material placed up to approved elevations, and between approved limits.

.3 Do not backfill adjacent to structure until it has sufficient strength to withstand earth and compaction pressures and approval has been obtained from Departmental Representative.

.4 Place backfill material in uniform layers not exceeding 150 mm, and simultaneously on all sides of structure, pipe or other item so that loading is equalized.

.5 Compact each layer to minimum 95% of maximum dry density in accordance with ASTM D698, to testing by Contractor to be submitted to Departmental Representative.

.6 When using hand operated tamping devices, deposit backfill material in uniform layers not exceeding 100 mm loose thickness.

.7 Backfill spaces that will receive topsoil to elevations that will permit a 150 mm compacted thickness of topsoil below finished elevation.

3.7 CLEAN-UP

.1 Remove debris from work areas continuously and dispose off-site in accordance with Section 01 74 11 - Cleaning.

PART 1 - GENERAL

1.1 DESCRIPTION

.1 This section covers the requirements for geotextile.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 No measurement will be taken for geotextile. Work covered by this section will be included in the following items where geotextile is required:
.1 Item No. U125 - Bedding - Sand

1.3 REFERENCES

.1 American Society for Testing and Materials (ASTM)
.1 ASTM A123 / A123M-17, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
.2 ASTM D4595-17, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method
.3 ASTM D4355 / D4355M-14(2018), Standard Test Method for Deterioration of Geotextiles by Exposure to Light

.2 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-148.1 No. 7.3-92, Methods of Testing Geotextiles and Geomembranes Grab Tensile Test for Geotextiles

.3 Canadian Standards Association (CSA)
.1 CSA G40.20-13/G40.21-13 General Requirements for Rolled or Welded Structural Quality Steel / Structural Quality Steel

.1 Ontario Provincial Standard Specifications (OPSS)
.1 OPSS.PROV 1860-April 2012, Material Specification for Geotextiles.

1.4 RELATED WORK

.1 01 33 00 - Submittal Procedures

.2 31 23 15 - Excavating Trenching and Backfilling

1.5 ACTION AND INFORMATION 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.

PART 2 - PRODUCTS

1.3 MATERIAL

.1 Geotextile: non-woven synthetic fibre fabric, supplied in rolls.
.1 Composed of: minimum 95% by mass of polypropylene, polyethylene, polyester, or other synthetic polymers, excluding polyamides.

.2 Physical properties:
.1 Thickness: to CAN/CGSB-148.1, No.3, minimum 3.5 mm.
.2 Tensile strength and elongation (in any principal direction): to ASTM D4595.
.1 Tensile strength: minimum 1450 N, wet condition.
.2 Elongation at break: 70 to 110%.
.3 Tear strength: minimum 600 N.
.3 Bursting strength: to CAN/CGSB-148.1, No.6.1 minimum 3500 kPa, wet condition.
.4 Ultra Violet (UV) Stability: to ASTM B4355 No less than 50% retained tensile strength at 500 hours
.5 Hydraulic properties:
.1 Filtration opening size (FOS): to CAN/CGSB-148.1 No.10 40 - 110 µm.

.3 Securing pins and washers: to CSA G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m2to ASTM A123/A123M.

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

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

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 INSTALLATION

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

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

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

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

.5 Join successive strips of geotextile by sewing.

.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 15 - Excavating, Trenching and Backfilling.

PART 1 – GENERAL

1.1 DESCRIPTION

.1 This section covers the requirements for rip-rap to be placed for the following work:
.1 For use underwater to stabilize repairs to undermined apron slab at Lock 49.
.2 For use at the toe of the new section of the North Basin Wall.

1.2 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment.

.2 Section 01 33 00 – Submittal Procedures

.3 Section 31 32 19 - Geotextile

1.3 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures: in accordance with Section 01 22 01 – Measurement and Payment.

.2 Work covered by this section will be paid under payment items included in the Unit Price Table as follows:
.1 Item No. U130 - Rip-Rap.

.3 Measurement will be taken as the meter cubed of material placed and accepted into the work.

1.4 REFERENCES

.1 Ontario Provincial Standard Specifications (OPSS)
.1 OPSS.PROV 1004-November 2012, Material Specification for Aggregates Miscellaneous.

1.5 ACTION AND INFORMATION 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 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
.2 Allow continual sampling by Departmental Representative during production.

.3 Provide Departmental Representative with access to source and processed material for sampling.
.4 Pay cost of sampling and testing of aggregates which fail to meet specified requirements.

PART 2 – PRODUCTS

2.1 RIP-RAP

.1 Gradation as per Table 8, OPSS 1004.

.2 For use underwater to stabilize repairs to undermined apron slab at Lock 49:
.1 Size: R-50

.3 For use at toe of new section of north basin wall:
.1 Size: R-10

PART 3 – EXECUTION

3.1 PLACING

.1 Place geotextile on prepared surface in accordance with Section 31 32 19 - Geotextile and as indicated. Avoid puncturing geotextile. Vehicular traffic over geotextile not permitted.

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

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

PART 1 – GENERAL

1.1 DESCRIPTION

.1 Materials and installation of flagstone paving.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 Measurement Procedures in accordance with Section 01 22 01 Measurement and Payment.

.2 Work covered by this section to be paid for under payment items included in Unit Price Table:
- .1 Item No. U131 - Flagstone Pavers
- .2 Item No. U132 - Flagstone (100mm thick) (Not Used)
- .3 Item No. U133 – Flagstone (300mm thick)

.3 Work includes the supply, cutting, and delivery of new stones to site and the installation of the flagstone paving.

.4 Payment for bedding (Granular A and sand) to be included under Granular pay items in accordance with Section 31 23 15 - Excavation Trenching and Backfilling.

.5 Payment for geotextile to be included under the Geotextile pay item in accordance with Section 31 32 19 – Geotextile.

.6 Payment for joints to be included under the appropriate jointing pay items in accordance with Section 04 43 04 - Repointing Stone Masonry.

1.3 RELATED WORK

.1 Section 01 22 01 - Measurement and Payment.

.2 Section 01 33 00 – Submittal Procedures

.3 Section 04 43 04 - Repointing Stone Masonry.

.4 Section 04 43 06 - Cut Stone

.5 Section 31 05 16 - Aggregate Materials

.6 Section 31 23 15 - Excavation Trenching and Backfilling.

.7 Section 31 32 19 - Geotextile

1.4 REFERENCES

.1 Canadian Standards Association (CSA International).
.1 CSA A179-14, Mortar and Grout for Unit Masonry.

1.5 ACTION AND INFORMATION SUBMITTALS

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

.2 Submit flagstone material submissions in accordance with all submissions required in Section 04 43 06 – Cut Stone in addition to the following:
.1 Submit full size 150 mm x 250 mm x 60 mm sample of flagstone paving unit.
.2 Submit full size 300 mm x 300mm x 100mm sample of flagstone unit.
.3 Submit full size 500 mm x 500mm x 300mm sample of flagstone unit

.3 Submit proposed layout, pattern and relationship of paving joints to site details.

PART 2 – PRODUCTS

2.1 MATERIALS

.1 Flagstone (natural stone):
.1 Limestone: Matching existing stone on site in colour and texture.
.2 Physical properties to Section 04 43 06 - Cut Stone.
.3 Rectangular shape, 60 mm thick, 100mm thick or 300mm thick as indicated.
.4 Split finish face top, split finish bottom and split finish edges.

.2 Gravel Base: Granular A to section 31 05 16 Aggregate Materials

.3 Sand Bedding: Manufactured Sand to section 31 05 16 Aggregate Materials

.4 Mortar: to Section 04 43 04 - Repointing Stone Masonry

.5 Geotextile fabric: to Section 31 32 19 Geotextile

PART 3 – EXECUTION

3.1 CUT STONE

.1 Cut flagstone and finish in accordance with Section 04 43 06 Cut Stone

.2 Deliver flagstone to site in accordance with Section 04 43 06 Cut Stone

3.2 PROTECTION

.1 Prevent damage to canal walls, structures, swing bridge, landscaping, trees and other site features.

.2 Make good any damage.

3.3 EXCAVATION

.1 Excavate to elevations and dimensions indicated or required for execution of work.

.2 Excavate to depth allowing for compaction of subgrade.

3.4 SUBGRADE

.1 Prepare subgrade to levels and compaction required to allow for installation of granular base.

.2 Compact as per Section 31 23 15 Excavation Trenching and Backfilling.

3.5 GEOTEXTILE

.1 Install geotextile fabric as indicated.

3.6 GRANULAR BASE

.1 Base minimum thickness: 150 mm as indicated.

.2 Spread and compact crushed stone or gravel base in uniform layers not exceeding 100 mm compacted thickness.

.3 Compact as per Section 31 23 15 Excavation Trenching and Backfilling.

.4 Shape and roll alternately to obtain smooth, even and uniformly compacted granular base and ensure conformity of grades with finish surface.

.5 Apply water as necessary during compaction to obtain specified density. If granular base is excessively moist, remove it and install more granular material to rid it of sponginess.

.6 In areas not accessible to rolling equipment, compact to specified density with approved mechanical tampers.

.7 Ensure top of granular base does not exceed plus or minus 10 mm over 3 m as measured with a 3 m straightedge.

3.7 BEDDING SAND

.1 Place and spread bedding sand to 50mm compacted thickness as indicated.

.2 Use material other than bedding sand to compensate for depressions that exceed specified tolerances in surface of base.

3.7 SURFACE COURSE

.1 Ensure bedding sand and granular base are not saturated prior to placement of unit pavers.

.2 Install flagstone paving with 13 to 25 mm wide joints, true to grade on bedding sand, in accordance with accepted layout and pattern.

.3 Where required, cut units accurately without damaging edges.

.4 Fill joint spaces with mortar to Section 04 43 04 - Repointing Stone Masonry.

.5 Sweep surface course clean.

3.8 POINTING

.1 Fill joints with mortar to Section 04 43 04 - Repointing Stone Masonry.

PART 1 – GENERAL

1.1 DESCRIPTION

.1 This section specifies the requirements for final reinstatement of damaged landscaped areas within the work areas, staging areas, access routes and areas disturbed by the work including:
- .1 Supplying, placing and finish grading of topsoil bed.
- .2 Supplying and placing nursery sod.
- .3 Restoring lawn by sodding grass.
- .4 Maintaining sodded areas until acceptance.
- .5 Replacing all large trees designated for removal with new smaller trees of the same species.
- .6 Reinstating pavers at Lock 46 as required

.2 All disturbed sodded areas, within the limits of the construction zone, to be covered with topsoil, smoothed to finish grade, and re-sodded at Contractor's expense.

.3 Work specified elsewhere:
- .1 Protection of mature trees and other plant materials during construction: to Section 01 35 46 – Archaeological, Cultural and Environmental Procedures

.4 This section also specifies the requirements for temporary site reinstatement of lands which will be subject to damage from construction activities for more than one construction season. Temporary site reinstatement includes the following:
- .1 Installation of granular over geotextile in areas subject to pedestrian traffic.
- .2 Installation of wood chips over geotextile in areas not subject to significant pedestrian traffic.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 There will be no measurement of General Landscaping.

.2 Payment of General Landscaping will be included in the Lump Sum Price:
- .1 Item No. L53 - General Landscaping – Year 1.
- .2 Item No. L54 - General Landscaping – Year 2.
- .3 Item No. L55 - General Landscaping – Year 3 (Final Restoration).

.3 Payment to be included in the Unit Price table under the following items:
- .1 Item No. U134 – Reinstate Existing Pavers

1.3 RELATED WORK

.1 Section 01 22 01 – Measurement and Payment

.2 Section 01 32 19 – Geotextile

.3 Section 01 35 46 – Archaeological, Cultural and Environmental Procedures

.4 Section 31 05 16 – Aggregate Materials

.5 Section 31 23 15 - Excavation Trenching and Backfilling

.6 Section 31 32 19 - Geotextile

1.4 PRELIMINARY INSPECTION

.1 Establish condition of sodded areas in conjunction with Departmental Representative before starting work.

1.5 SOURCE QUALITY CONTROL

.1 At least 2 weeks before starting final topsoil work, advise Departmental Representative of proposed sources of topsoil and sod.

.2 When proposed sources are approved, use no other sources without written authorization from Departmental Representative.

1.6 DELIVERY AND STORAGE

.1 Schedule deliveries to minimize storage at job site without causing delays.

.2 Deliver, unload and store rolled sod on pallets only.

.3 Deliver sod to site within 24 hours of being lifted and lay sod within 36 hours of being lifted.

.4 Do not deliver small, irregular, or broken pieces of sod. Departmental Representative will reject these.

.5 During wet weather, allow sod to dry sufficiently to prevent tearing during lifting and handling.

.6 During dry weather, protect sod from drying. Water sod as necessary to ensure its vitality and prevent dropping soil when handling. The Departmental Representative will reject dried-out sod.

.7 Supply sod in standard-sized units and of a uniform thickness, rolled for easy handling.

1.7 SCHEDULING OF SODDING WORK

.1 Schedule sod laying to coincide with final topsoil operations.

.2 Obtain Departmental Representative's approval of the schedule for sodding before proceeding.

.3 Schedule dependent on availability of sod.

PART 2 – PRODUCTS

2.1 TOPSOIL

.1 New topsoil to be a friable sandy-clayish loam of good humus content, suitable for supporting sod growth, free from:
.1 Debris and stones over 50mm diameter.
.2 Coarse vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.

.2 Approval of topsoil material subject to soil testing and analysis. Testing of topsoil will be carried out by testing laboratory designated by Departmental Representative. Departmental Representative will pay for cost of tests.

2.2 NURSERY SOD

.1 Nursery sod: Commercial grade turf grass nursery sod, Kentucky Bluegrass/Fine Fescue, to "Canadian Standards for Nursery Stock" by the Canadian Nursery Landscape Association (www.canadanursery.com).

2.3 TEMPORARY REINSTATEMENT MEASURES

.1 Geotextile: As per Section 31 32 19 - Geotextile

.2 Granular A: As per Section 31 05 16 – Aggregate Material

.3 Wood Chips: Wood chips to be cedar.

2.4 BEDDING

.1 Sand Bedding: Manufactured Sand to section 31 05 16 Aggregate Materials

.2 Geotextile fabric: to Section 31 32 19 Geotextile

PART 3 – EXECUTION

3.1 PREPARATION OF TOPSOIL SUB-GRADE

.1 Verify that grades are correct. If discrepancies occur, notify Departmental Representative and do not start other landscape work in that area until instructed to

do so in writing by Departmental Representative.

.2 Grade soil, eliminating uneven areas and low spots, ensuring that new sodded surface will be faired-off to the existing sodded areas with no sharp transition.

.3 Remove debris, roots, branches, stones more than 50 mm in diameter and other deleterious materials. Remove debris which protrudes more than 50 mm above surface. Dispose of removed material off site.

.4 Coarse cultivate entire area which is to receive topsoil to depth of 75 mm. Coarse cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.2 PLACING AND SPREADING OF TOPSOIL

.1 Place topsoil after Departmental Representative has accepted sub-grade.

.2 Spread topsoil to 150 mm minimum depth after settlement and 80% compaction. Keep final elevation 15 mm below finished grade to allow room for sod.

.3 Manually spread topsoil around trees, shrubs and obstacles.

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

.5 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative. Leave surfaces smooth, uniform and firm enough to resist deep footprints.

3.3 ACCEPTANCE OF TOPSOIL GRADING

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

3.4 SURPLUS TOPSOIL MATERIAL

.1 Dispose of materials not required off-site.

3.5 SODDING

.1 Obtain Departmental Representative's approval of topsoil grade and depth before starting sodding.

.2 Loosen surface of topsoil where it has become compacted.

.3 Protect sodded areas against any damage until lawn has been fully established. Supply and install required protective apparatus.

3.6 SOD PLACEMENT

.1 Lay sod within 18 hours of being lifted if air temperature exceeds 20 degrees C.

.2 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.

.3 Roll sod as directed by Departmental Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

.4 On slopes greater than 3:1 (run/rise) lay sod perpendicular to slope and secure sod with stakes. Place stakes 3 per sq.m., 100 mm below top edge to prevent shifting of sod and drive stakes flush with top of sod soil.

3.7 MAINTENANCE OF SODDED AREAS

.1 Maintain sodded areas until accepted by Departmental Representative.

.2 Patch bare and dead spots immediately.

.3 Apply water daily to ensure establishment and continuous growth of grass. Apply sufficient water to ensure moisture penetration of 200 mm into soil below sod.

.4 Cut grass when it reaches a height of 80mm. Cut grass thereafter frequently enough to be kept at a height of 80 to 100 mm. Allow clippings to remain.

3.8 ACCEPTANCE OF SODDED AREAS

.1 Approval of material at its source does not prevent subsequent rejection on job site.

.2 Sod to be approved when:
.1 Growth of sodded areas has been properly established;
.2 Turf is free of bare and dead spots;
.3 No surface soil is visible when grass has been mowed to a height of 80 mm; and,
.4 Grass has been cut a minimum of 2 times.

3.9 TEMPORARY REINSTATEMENT MEASURES

.1 The requirements for temporary site reinstatement of lands which will be subject to damage from construction activities for more than one construction season. Temporary site reinstatement includes the following:
.1 Install 100mm granular over geotextile in areas subject to pedestrian traffic.
.2 Install 75mm wood chips over geotextile in areas not subject to significant pedestrian traffic.

3.10 REINSTATEMENT OF PAVERS

.1 Protection
.1 Prevent damage to canal walls, structures, swing bridge, landscaping, trees and other site features.
.2 Make good any damage.

.2 Excavation
.1 Excavate to elevations and dimensions indicated or required for execution of work.
.2 Excavate to depth allowing for compaction of subgrade.

.3 Subgrade
.1 Prepare subgrade to levels and compaction required to allow for installation of granular base.
.2 Compact as per Section 31 23 15 Excavation Trenching and Backfilling.

.4 Geotextile
.1 Install geotextile fabric as indicated.

.5 Granular Base
.1 Base minimum thickness: 150mm as indicated.
.2 Spread and compact crushed stone or gravel base in uniform layers not exceeding 100 mm compacted thickness.
.3 Compact as per Section 31 23 15 Excavation Trenching and Backfilling.
.4 Shape and roll alternately to obtain smooth, even and uniformly compacted granular base and ensure conformity of grades with finish surface.
.5 Apply water as necessary during compaction to obtain specified density. If granular base is excessively moist, remove it and install more granular material to rid it of sponginess.
.6 In areas not accessible to rolling equipment, compact to specified density with approved mechanical tampers.
.7 Ensure top of granular base does not exceed plus or minus 10mm over 3m as measured with a 3m straightedge.

.6 Bedding Sand
.1 Place and spread bedding sand to 50mm compacted

thickness as indicated.

.2 Use material other than bedding sand to compensate for depressions that exceed specified tolerances in surface of base.

.7 Surface Course

.1 Ensure bedding sand and granular base are not saturated prior to placement of unit pavers.

.2 Install pavers with 0 to 5 mm wide joints, true to grade on bedding sand, in accordance with accepted layout and pattern.

.3 Where required, cut units accurately without damaging edges.

PART 1 – GENERAL

1.1 DESCRIPTION

.1 This section specifies requirements for dewatering work areas.

.2 Work includes but is not limited to:

- .1 The design of dewatering structures and dewatering systems to remove water from work areas and maintain these areas in dry state for duration of work.
- .2 Staging of dewatering in individual dewatering zones if required for executing work.
- .3 Fabrication, supply, installation, maintenance and removal of dewatering structures and dewatering systems.
- .4 In areas where stop logs and existing log gains are to be utilized for dewatering (Lock 49):
  - .1 Contractor to perform underwater inspection with divers to assess the conditions of the log checks and log sill and measure the distance between the log checks for fabrication of new stoplogs. This inspection shall take place at the beginning of the first year of construction to allow for fabrication of the stoplogs. Provide inspection video and dimensions to the Departmental Representative. Fabrication of new stoplogs to be carried out by Parks Canada. Parks Canada will provide specifications and certification for the logs that they provide for the contractor’s use.
  - .2 During the above noted underwater inspection, divers shall also inspect the undermining of the lower apron slab and determine the extent and severity of the undermining. Video of this inspection shall also be provided to the Departmental Representative.
  - .3 Contractor shall be responsible for the installation, maintenance and removal of steel and timber stoplogs for use in existing log gains for dewatering.
  - .4 Supply, installation, and removal of water-tightness improvements for stoplog cofferdam.
- .5 Design, installation, maintenance and removal of environmental measures for dewatering system.
- .6 Operation and continuous monitoring of dewatering structures and dewatering systems to keep dewatering system operational for

duration of work.

.7 Supply of standby dewatering equipment, installed in position, ready to immediately switch into service when dewatering equipment malfunctions or requires maintenance.

.8 Removal of dewatering structures and dewatering systems.

.9 Suggested dewatering method proposed for Lock 46 involving the installation of steel raker supports at the stop logs to allow repairs to the existing log gains without removing logs. Alternate dewatering method is to install a new temporary log gain upstream of the existing log gain.

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 There will be no measurement of dewatering work.

.2 Payment of dewatering work will be included in Lump Sum Price table under the following items:

.1 Item No. L56 – Dewatering – Lock 46
.2 Item No. L57 – Dewatering – Lock 47
.3 Item No. L58 – Dewatering – Lock 48
.4 Item No. L59 – Dewatering – Lock 49

.3 Payment for dewatering each lock, as covered in the above items, includes payment for dewatering activities in each construction year where dewatering is required, as per the construction staging plan, and is summarized below:

.1 Lock 46: Year 1
.2 Lock 47: Year 3
.3 Lock 48: Year 3
.4 Lock 49: Year 2

1.3 RELATED WORK

.1 Section 01 11 00 – General Instructions

.2 Section 01 33 00 – Submittal Procedures

.3 Section 01 35 46 – Archaeological, Cultural and Environmental Procedures

.4 Section 01 74 11 - Cleaning

.5 Section 35 49 25 – Turbidity Curtain

1.4 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 Contractor to engage services of Professional Engineer

to design, plan and certify dewatering structures and dewatering systems.

.3 Dewatering Plan to be reviewed and accepted by Departmental Representative and Client Department.

.4 Carry out Dewatering work in accordance with Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

.5 Obtain and pay costs of required permits.

1.5 ACTION AND INFORMATION SUBMITTALS

.1 Submittals to be in accordance with Section 01 30 00 – Submittal Procedures.

.2 Dewatering Plan describing proposed dewatering structures and dewatering systems including:
.1 Design and layout of dewatering structures
.2 Design and layout of dewatering systems,
.3 Design and layout of environmental features that form part of dewatering system,
.4 Staging of dewatering for different phases of work,
.5 Schedule of installation and staging of dewatering structures and dewatering systems,
.6 Installation and removal procedures including diving and crane details,
.7 Backup plan and emergency procedures during operation.
.8 Monitoring procedures during operation.

.3 Dewatering Plan and related submittals to bear signature and stamp of Professional Engineer registered or licensed in province of Ontario, Canada.

1.6 SCHEDULE

.1 Schedule work and stage dewatering so that all work can be completed in accordance with Section 01 33 00 – General Instructions.

.2 Submit and obtain acceptance for Dewatering Plan as early as possible.

.3 Install dewatering structures, dewatering systems and commence dewatering as early as possible after end of each navigation season starting October 8, 2018, October 14, 2019, October 12, 2020.

.4 Construction activities within waterways are prohibited after March 15 of any given year.

.5 Schedule work so that sufficient time is provided to complete work in waterways outside stoplog cofferdams,

remove dewatering structures and restore areas prior to March 15 of any given year.

.6 Work may continue in lock chamber after March 15 of any given year using stoplog cofferdam until end of day April 19, 2019 for Year 1 Construction, April 17, 2020 for Year 2 Construction, and April 23, 2021 for Year 3 Construction.

.7 Cleanup of chamber to be completed and stoplogs removed by April 26, 2019 for Year 1 Construction, April 24, 2020 for Year 2 Construction, and April 30, 2021 for Year 3 Construction.

1.7 DESIGN CRITERIA

.1 Design dewatering structures, dewatering systems and staging of dewatering to ensure maintenance of work spaces in dry state for duration of work.

.2 Water which enters "dry" work areas during construction to be directed through site and pass through filter, sediment trap, or settling pond prior to being discharged downstream. Do not discharge water upstream or downstream of work area.

.3 Expect water seepage through lock walls, lock floor, cracks and around or under dewatering structures.

.4 Plan and design dewatering structures and dewatering systems considering:
.1 Access to cofferdams and access to reach any portion of Work.
.2 Space required for scaffolding, equipment and crews to work in dewatered areas.
.3 Sequence of work and staging of work and dewatering to speed up work.
.4 Underwater (diving or "wet") repairs to wingwalls.
.5 Water levels which rise and fall due to rainfall, snowfall, snow melt and spring freshet.
.6 Hydraulic pressure on structures.
.7 Seepage of water through dewatering structures, canal structures and substrate such as; river bottom, rip rap, lock walls, lock floors and breast walls.
.8 Wind, wave and ice action.
.9 Winter conditions such as; build-up of ice and snow; freezing temperatures, free-thaw cycles and ice sheets.
.10 Environmental requirements.

.5 Plan for dewatering system to include:
.1 Initial Dewatering System:
.1 Minimum of 2 high capacity pumps.
.2 Pump capacity to allow dewatering of dewatering zone within 8 hours.

.2 Continuous Dewatering System:
.1 Continuous dewatering system to be setup in each dewatering zone.
.2 Minimum of 3 medium capacity pumps for each dewatering zone.
.3 Total combined capacity for pumps to be greater than twice expected rate of seepage.
.3 Emergency Backup Dewatering System:
.1 Emergency backup dewatering system to be setup to rapidly dewater work areas in event of a failure of dewatering structures or dewatering systems.
.2 Minimum one large capacity pump to remain installed in position ready to be switched into service. Typically, one of the initial dewatering pumps.
.3 Pump capacity (including continuous dewatering pumps) to allow dewatering within 8 hours.
.4 Install additional pumps to increase pumping capacity and act as backup if required flow rates are not achieved.
.5 Immediately replace pumps that fail to perform continuously and reliably.

.6 At all times, maintain environmental quality of water to Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

.7 Ensure that no phase of Work threatens safe performance of cofferdam.

.8 Provide minimum freeboard of 600 mm above maximum water level, to prevent overtopping of dewatering structures.
.1 Minimum freeboard elevation upstream: 88.9m (CGVD28 Datum), roughly equal to elevation of top of coping stones of upper wingwalls.
.2 Minimum freeboard elevation downstream: 76.0m (CGVD28 Datum).
.3 Contractor's engineer to verify information and select design elevation for dewatering structures.

.9 River bottom elevations are uneven and those indicated on existing bathymetric survey drawings are dated, approximate and may vary.

.10 Mandatory dry work area to provide access, at a minimum, to all areas between lock log gains, including upper gate recesses floors and walls, chamber floors and walls and lower gate recess floors and walls.

.11 It is recommended to use custom fabricated or prefabricated steel, aluminum, timber or composite frames to construct cofferdam with membrane and apron.

.12 Drilling and bolting to heritage stone faces is not permitted. Drilling and bolting into masonry joints may be permitted upon acceptance of proposed equipment and procedures.

.13 Plan work so that priority is on work located outside area that can be dewatered using stoplog cofferdams in stoplog gains.
.1 Construct cofferdams outside Stoplog Gains as early as possible.
.2 Complete work outside stoplog gains as early as possible.
.3 Use stoplog cofferdams at gains to commence work in the dry as quickly as possible.
.4 Remove cofferdams before the date required in spring due to spawning of fish.

.14 Other considerations:
.1 Fluctuation of water levels as a result of rain and snow.
.2 Fluctuation of temperature.
.3 Spring Freshet.
.4 Action of ice and snow.

1.8 WATER LEVELS

.1 Refer to Section 01 11 00 – General Instructions.

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Environmental requirements in accordance with Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

.2 Dispose of water so that it does not create safety or health hazard or cause damage to environment, to adjacent property or cause damage to any portion of Work.

.3 Install environmental systems to capture sedimentation prior to release of water into waterways.

.4 Fuel powered pumps to be positioned and protected in accordance with Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

.5 Turbidity limit: to Section 01 35 46 – Archaeological, Cultural and Environmental Procedures and Section 35 49 25 – Turbidity CurtaiN.

.6 Do not release silt or other materials into watercourse during construction or removal of dewatering structures.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Use materials in good condition, accepted by Departmental Representative and suitable for use in work.

.2 Do not use materials which may cause environmental damage to waterway or to land at or near work site.

.3 Materials and methods proposed for use in dewatering structure improvements, and dewatering systems, must also be accepted by Owner, Parks Canada.

.4 Earth or granular materials are not acceptable for improving water-tightness at stoplog gains, or construction of dewatering structures.

.5 Granular materials for use in sandbags to be clean, washed granular materials free of sand or silty materials.

.6 Fabricated or Prefabricated Panels: steel, aluminum, timber or composite panels. Engineered for and suitable for underwater use.

2.2 EQUIPMENT

.1 Pumps:
.1 Supply and install multiple pumps to carry out dewatering operations in accordance with accepted Dewatering Plan.
.2 Pumps to be in good working condition.
.3 Power source: Electric or fuel. Contractor responsible for power supply.
.4 Pumps to be able to operate in severe conditions under which work to be executed including; freezing temperatures, silty sediment, construction debris, marine vegetation and continuous use.
.5 Pumps to be equipped with screens and filters.

PART 3 - EXECUTION

3.1 GENERAL

.1 Evaluate, plan and execute work in an expert and prudent manner giving due consideration to:
.1 Existing strata within and adjacent to work location.
.2 Climatic conditions which may occur at work location during period of doing work in its entirety.

.3 Safety of personnel and public.
.4 Safety of removals.
.5 Protection of existing structures and materials.

.2 Install and maintain work areas in dry state for duration of work in accordance with accepted Dewatering Plan.

.3 Immediately return work areas to dry state in event of flooding.

.4 Submit revised Dewatering Plan if dewatering system does not maintain work areas in dry state and implement accepted changes immediately.

.5 Locate and protect underwater utilities from damage.

.6 Lock Chamber floors to be completely dewatered following initial dewatering and maintained dry.

.6 Dewatering of Lock 49 shall be carried out such that the timber lock floor is always saturated with water and does not dry out. Contractor shall make all necessary provisions to comply with this work restriction.

3.2 CLEAN-UP AND PREPARATION AT START OF WORK

.1 Divers to inspect, clean, prepare and repair masonry surfaces against which dewatering will be attached.

.2 Divers to inspect, clean and prepare lake bed on which dewatering structures to be constructed.

3.3 DEWATERING STRUCTURES

.1 Supply and install dewatering structures and improve water-tightness of structures as required in accordance with accepted Dewatering Plan.

.2 Parks Canada will supply timber stoplogs for use in stoplog gains for use in staging of dewatering zones.

.3 When existing structures are incorporated into dewatering plan, Departmental Representative does not guarantee water-tightness of existing structures.

.4 Design, supply and install any additional methods and materials required to maintain site in dry condition.

.5 The contractor to improve water-tightness of stoplogs if used as dewatering structures by using flexible rubberized sheet membrane or similar material. Water-tightness improvements required between stoplogs, interface of stoplogs at gains and stoplogs

along timber sill. Installation of extended apron is recommended.

3.4 DEWATERING

.1 Dewater work areas and maintain them in dewatered state until work has been completed.

.2 Dewater work areas continuously to enable work to proceed in the dry, for duration of work.

.3 Repeat entire dewatering procedure immediately and as often as required if flooding or other damage occurs prior to completion of work.

.4 Maintain dewatered state with adequate quantity and capacity of pumps.

.5 Ensure that any drawdown of water surface due to pumping does not affect:
- .1 Safety or quality of work.
- .2 Neighboring property in an adverse manner.
- .3 The stability of soils.

.6 Ensure continuity of dewatering by providing a watch person to make periodic checks at all times including night-time and weekends.

3.5 EQUIPMENT

.1 General:
- .1 Provide equipment in safe operating condition and maintain it in safe operating condition for periods of use or when on standby for use as backup.
- .2 Provide skilled operators for equipment.

.2 Standards and Performance:
- .1 Provide equipment of such quality and in such quantity as to provide sufficient capability to perform the essential functions of the work.
- .2 Provide standby replacement for pumps, generators and other essential dewatering equipment which may require cleaning, routine maintenance or break down during the work.
- .3 Keep this standby equipment available installed in-place on-site for immediate use.
- .4 Watch person to be qualified and trained sufficiently to perform equipment duties such as:
  - .1 Preventive maintenance and refueling normally performed during any shift.
  - .2 Emergency repairs of minor complexity.
  - .3 Placing standby items into service.

3.6 DEWATERING STRUCTURE REMOVAL

.1 At stage in work accepted by Departmental Representative, remove materials used to construct dewatering structures and dewatering systems.

.2 Remove all materials to ensure site restored to condition as-found.

3.7 CLEAN-UP AT END OF WORK

.1 Clean lock chamber in accordance with Section 01 74 11 - Cleaning.

.2 Dispose of unwanted materials in approved manner off-site.

.3 Do not dispose of materials in lakes or canal.

.4 Waste described as subject to Regulation 347, Environmental Protection Act, must be transported with valid "Certificate of Approval for Waste Management System" to site approved by Ontario Ministry of the Environment to accept waste.

PART 1 - GENERAL

1.1 RELATED WORK

.1 Section 01 33 00 Submittal Procedures

.2 Section 01 35 46 – Archaeological, Cultural and Environmental Procedures

1.2 MEASUREMENT AND PAYMENT PROCEDURES

.1 There will be no measurement of Turbidity Curtain.

.2 Include payment of Turbidity Curtain in lump sum price:
.1 Item No. L20 - Environmental Procedures.

1.3 REFERENCES

.1 Ontario Provincial Standard Drawings (OPSD)
.1 OPSD 219.260 November 2015, Turbidity Curtain.
.2 OPSD 219.261 November 2015, Turbidity Curtain, Seam Detail.

.2 Ontario Provincial Standard Specification (OPSS)
.1 OPSS 805 November 2015, Construction Specification for Temporary Erosion and Sediment Control Measures.

1.4 ACTION AND INFORMATION SUBMITTALS

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

.2 Submit Sediment Control Plan with details of temporary turbidity curtain system at least 1 week prior to commencing work.

.2 Submission to include:
.1 Materials data sheets for geotextile.
.2 Installation, monitoring, maintenance and removal procedure.
.3 Installation drawings.
.4 Seam details.

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 Turbidity Curtain:
1. Marine grade turbidity curtain
2. Medium Duty Turbidity Curtain Specification US DOT Type 2

PART 3 - EXECUTION

3.1 GENERAL

.1 Refer to Section 01 35 46 – Archaeological, Cultural and Environmental Procedures.

.2 Install turbidity curtain after acceptance of Sedimentation Control Plan.

.3 Supply, install, maintain and remove turbidity curtains where work may release sediment or materials into waterway.

.4 Take turbidity and total suspended soils measurements of water immediately outside turbidity curtain:
.1 Before start of work.
.2 Monthly.
.3 Whenever a spill or noticeable change occurs.
.4 As directed by Departmental Representative.

.5 Background measurements to be taken immediately upstream of project on same day other turbidity measurements are taken.

.6 Maximum increase of total suspended solids above background levels:
.1 25 mg/L in a period of 24 hours in all waters during clear flows or in clear waters.
.2 If such a change is observed take immediate corrective action. Work may be stopped to address the problem.

.7 Maximum average increase of 5 mg/L for long term exposure (>24hr to 30 day).

.8 Turbidity Standards: Water discharged into surface water bodies from dewatering should have a turbidity:
.1 <8 NTU above background levels during short term exposure periods not to exceed 24 hours.
.2 <2 NTU above background levels for long term exposure.

.9 Monitor background turbidity levels to assess turbidity increases due to construction activities.

.10 Submit test results as a part of Water Quality Testing Reports.

3.2 INSTALLATION

.1 Turbidity curtains to consist of turbidity curtain geosynthetic fabric, load line, flotation, ballast, anchors, mooring buoys, mooring lines, adjustment lines, and tie-downs.

.2 Design turbidity curtain to conform to Ontario Provincial Standard Specification, OPSS 805 and Ontario Provincial Standard Drawings: OPSD 219.260 and OPSD 219.261 or better.

.3 Construct turbidity curtains as follows:
.1 Provide flotation support along full length of turbidity curtain.
.2 Form heat-sealed or sewn along entire bottom edge of the turbidity curtain geosynthetic to contain ballast.
.3 Breaks may be made in sleeve to facilitate pulling, provided they are 100 mm minimum in size and spaced at minimum 3 m intervals.
.4 Where turbidity curtain geosynthetic fabric sections are joined to provide continuous run, provide continuous seal to prevent escape of turbid water between sections.
.5 Turbidity curtain to be of sufficient width to account for expected variations in water depth and wave or ice action.
.6 Place adjustment lines at maximum intervals of 10 m, and encircle turbidity curtain from top to bottom.
.7 Prepare turbidity curtain for installation by furling and tying with furling ties every 1.5 m for entire length of the curtain.
.8 Place turbidity curtain as close as possible to work area to trap sediment in as small an area as possible for clean-up.
.9 Anchor locations to be established as necessary to maintain turbidity curtain in place and functioning.

3.3 OPERATION AND MAINTENANCE

.1 Install turbidity curtains to prevent sediment passage, from work areas enclosed by curtain, to remaining water body.

.2 Install and maintain turbidity curtains in manner that avoids entry of equipment, other than hand-held equipment or boats to remaining water body.

.3 Equipment permitted in work areas to be enclosed by turbidity curtain.

.4 Operate and maintain turbidity curtains with entire top edge above water or ice surface.

.5 Curtain to be free of tears and gaps, and bottom edge of curtain to be continuously in contact with bed of water course so that sediment passage from the area enclosed is prevented.

.6 Regularly monitor folds which form in turbidity curtain next to flotation collar and remove collected sediment.

.7 Monitor and maintain turbidity curtain booms both during and outside normal working shifts as required.
.1 Provide all personnel, materials and equipment necessary to maintain, repair or relocate silt curtain system.
.2 Maintain standby supply of geotextile equal to the length of in-place turbidity curtain.
.3 Repair turbidity curtain immediately if curtain is not performing correctly.
.4 Adjust setup of turbidity curtain as work evolves.
.5 Submit proposed changes to turbidity curtain for acceptance by Departmental Representative.

.8 Carry out construction operations to minimize impact on fish habitat from both disturbed sediments and fill materials.

.9 Adjust setup of turbidity curtain immediately as work evolves or when curtain is not performing correctly. Submit proposed changes for acceptance by Departmental Representative.

.10 Replace damaged or deteriorated geotextile to approval of Departmental representative.

.11 Remove turbidity curtain when authorized by the Departmental representative after completion of the work.