

## ANNEX D – Terms of Reference

Information contained in there Terms of Reference identifies the project requirements and the Construction Management services required for this project.

This document is divided into three sections:

Project Description (PD)

Project Administration (PA)

Required Services (RS)

For standards relating to the service provisions herein please refer to the document '*Doing Business with PWGSC*' as provided as an Appendix of the RFP. The standards in Doing Business must be adhered to in conjunction with these Terms of Reference, as the two documents are complimentary. The Terms of Reference describe project-specific requirements while Doing Business deals with information common to all projects. In case of a conflict between the two documents, the requirements of the Terms of Reference take precedent.

**TABLE OF CONTENTS**

PROJECT DESCRIPTION (PD).....	6
1 PROJECT INFORMATION .....	6
1.1 General.....	6
1.2 Project Identification .....	6
1.3 Project Delivery .....	6
1.5 Project Schedule .....	7
1.6 Stakeholders .....	8
2 PROJECT BACKGROUND.....	9
2.1 Overview .....	9
2.2 Description of Sites .....	10
2.2.1 Site A: Dam 1 and Lock 1 – Trenton .....	10
2.2.2 Site B: Glen Miller Dam 3 at Lock 3 .....	14
2.2.3 Site C: Frankford Dam 6 at Lock 6 .....	15
2.2.4 Site D: Meyers Dam 8 at Lock 9 .....	16
2.2.5 Site E: Dam 9 at Lock 10 Hagues Reach .....	17
2.2.6 Site F: Ranney Falls Locks 11 and 12, Lock Gate and Valve Rehabilitation.....	19
2.2.7 Site G: Dam 10 at Lock 11 and 12 Ranney Falls.....	20
2.2.8 Site H: Campbellford Dam 11 and Lock 13 .....	21
2.2.9 Site I: Crowe Bay Dam 12 and Lock 14.....	23
2.2.10 Site J: Southern Sector Concrete Repairs.....	24
3 PROJECT OBJECTIVES .....	28
3.1 Construction Principles.....	28
3.2 Environmental Management.....	28
3.3 Project Objectives .....	29
3.4 Cultural Resource Management.....	29
4 OPERATIONS.....	31
4.1 Navigation .....	31
4.2 Flood Mitigation .....	32
5 PROJECT DELIVERY .....	32
5.1 Municipal Approvals and Access to Property .....	32
5.2 Codes and Standards.....	32

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5.3	Sustainable Development.....	34
5.4	Solid Waste Management .....	35
5.5	Health and Safety .....	36
5.6	Constraints and Challenges .....	36
6	TECHNICAL REQUIREMENTS .....	37
6.1	Design Philosophy.....	37
6.2	Structures .....	38
6.3	Earth Dams Rehabilitation.....	40
7	EXISTING DOCUMENTATION .....	40
8	RESOURCE REQUIREMENTS .....	41
	PROJECT ADMINISTRATION (PA).....	42
1	Roles and Responsibilities .....	42
1.1	PWGSC.....	42
1.1.1	Departmental Representative .....	42
1.1.1	PWGSC Contracting Authority .....	42
1.1.2	PWGSC Technical Resources .....	42
1.1.3	PWGSC Commissioning Manager .....	42
1.1.4	PWGSC Project Management Consultants.....	43
1.1.5	PWGSC Specialty Consultants .....	43
1.2	Client Department .....	43
1.3	Consultant .....	43
1.3.1	Requirement Analysis Phase .....	43
1.3.2	Design Concept Phase .....	44
1.3.3	Design Development Phase.....	44
1.3.4	Construction Documents Phase.....	44
1.3.5	Tender Phase .....	44
1.3.6	Construction Phase.....	45
1.3.7	Post Construction Phase .....	45
1.4	Construction Manager .....	46
2	Communications:.....	46
2.1	Document Submissions to PWGSC .....	46
2.1.1	Acceptance of Document Submissions .....	47
2.2	Correspondence .....	47
2.3	Lines of Communication .....	48

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2.4	Media Relations.....	48
2.5	Public Relations.....	49
2.6	Meetings.....	49
2.6.1	Project meetings .....	49
2.6.2	Design Meetings .....	49
2.6.3	Construction Meetings .....	50
2.7	Response Time .....	51
2.7.1	Design Phase .....	51
2.7.2	Tender Phase .....	51
2.7.3	Construction Phase.....	52
2.7.4	Post-Construction Phase .....	52
	REQUIRED SERVICES (RS).....	53
1	General Requirements .....	53
2	Summary of Services .....	53
3	Project Manual and Plans .....	53
3.1	Construction Implementation Strategies and Requirements.....	54
3.2	Tendering Strategy and Process Plan .....	54
3.2.1	Specific Tendering Requirements .....	56
3.3	Construction Cost Management Plan .....	56
3.4	Construction Time Management Plan .....	57
3.5	Construction Scope Management Plan .....	58
3.6	Construction Risk Management Plan .....	58
3.7	Construction Quality Management Plan .....	59
3.7.1	Commissioning Plan .....	59
3.8	Site Specific Construction Management Plans .....	60
3.8.1	Occupational Health and Safety Plan.....	61
3.8.2	Environmental Management and Protection Plan .....	61
3.9	Reports.....	62
3.9.1	Monthly Report .....	62
3.9.2	Post-Construction Evaluation Report .....	64
3.10	Operations and Maintenance Manuals.....	64
4	Construction Management Services.....	65
4.1	General.....	65
4.2	Advisory Services - General .....	66

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4.2.1	Cost Estimating.....	66
4.2.2	Time (Planning and Scheduling) .....	66
4.2.3	Scope Management.....	67
4.2.4	Risk Management.....	67
4.2.5	Quality Management.....	67
4.2.6	Documentation .....	68
4.3	Advisory Services – By Project Phase.....	68
4.3.1	Requirement Analysis Phase .....	68
4.3.2	Design Concept Phase .....	69
4.3.3	Design Development Phase.....	69
4.3.4	Construction Documents Phase.....	70
4.3.5	Tender Stage .....	71
4.3.6	Construction Phase.....	71
4.3.7	Post Construction Phase .....	72
4.4	Construction Services.....	72
4.4.1	Commissioning .....	75
4.5	Post Construction .....	76
4.5.1	Warranties and Rectification of Defects in Work .....	76
Appendix A - Existing Documentation .....		78

## PROJECT DESCRIPTION (PD)

### 1 PROJECT INFORMATION

#### 1.1 General

Public Works and Government Services Canada (PWGSC-TPSGC), on behalf of Parks Canada Agency (PCA), intends to retain the services of a Construction Manager.

#### 1.2 Project Identification

**PWGSC Project Title:** Trent-Severn Waterway (TSW) Infrastructure  
South Bundle

**Location of the Project:** Trenton, Ontario

**Sub Project Components:** Dam 1 at Lock 1 Recapitalization (R.076951.130)  
Glen Miller Dam 3 at Lock 3 Rehabilitation (R.076951.230)  
Frankford Dam 6 at Lock 6 Rehabilitation (R.076951.330)  
Meyers Dam 8 at Lock 9 Rehabilitation (R.076951.430)  
Dam 9 at Lock 10 Hagues Reach Rehabilitation (R.076951.530)  
Ranney Falls Locks 11 and 12 – Lock Gate and Valve Rehabilitation (R.076951.630)  
Dam 10 at Lock 11 and 12 Ranney Falls Rehabilitation (R.076951.730)  
Campbellford Dam 11 and Lock 13 Recapitalization (R.076951.830)  
Crowe Bay Dam 12 and Lock 14 Recapitalization (R.076951.930)  
Southern Sector Concrete Repairs (R.076951.010)

**PWGSC Project Number:** See above

**Client Department / User:** Parks Canada Agency (PCA)  
Peterborough, Ontario, K9J 6Z6

**PWGSC Project Manager:** To be provided after Contract Award

#### 1.3 Project Delivery

PWGSC has partnered with Parks Canada Agency (PCA) to deliver an infrastructure program on the Trent-Severn Waterway (TSW) over the next four (4) years. The objective of the program is to improve the infrastructure, operational effectiveness and public safety on the waterway while protecting its heritage value and character-defining elements to the extent possible and promoting visitor experience.

In order to achieve the program objectives, PWGSC will engage the services of a Construction Manager to provide construction related advice during design, procurement of subcontractors to undertake the work and act as General Contractor and Constructor during the work for all Sites identified herein and as defined in these Terms of Reference (TOR).

The project requires a Construction Management firm with experience in waterway infrastructure design and rehabilitation with significant heritage considerations. PWGSC intends

to engage up to two (2) Design Consultants through separate Request For Proposals (RFPs) and, in some cases, in-house staff to prepare the design and construction documents for some of the sub project components. Each Design Consultant will have one or more Sites assigned to them. One of the two consultants will be retained as a Prime Consultant to undertake the design and construction documents for some of the sites and provide contract administration, technical support and site engineering services during the construction and post construction phases for all sites in the TSW South bundle. The Design Consultants and the Prime Consultant will be referred to as the Consultant(s) as appropriate.

The Construction Manager will act as Commissioning Manager (CxM) to establish the Client's criteria for system function, performance and maintainability, and to verify and document compliance with these criteria throughout design, construction, start-up, initial period of operation, and seasonal testing. PWGSC may engage additional specialty consultants to assist with various aspects of the work.

The Construction Manager shall work in collaboration with the consultants, the project team and all stakeholders through the Departmental Representative.

The South Bundle including the sites listed below is one of the identified projects in the overall program and the subject of these TOR.

1. Site A: Dam 1 at Lock 1 Reconstruction and Lock 1 Rehabilitation, Trenton;
2. Site B: Glen Miller Dam 3 at Lock 3 Rehabilitation;
3. Site C: Frankford Dam 6 at Lock 6 Rehabilitation;
4. Site D: Meyers Dam 8 at Lock 9 Rehabilitation;
5. Site E: Dam 9 at Lock 10 Hagues Reach Rehabilitation;
6. Site F: Ranney Falls Locks 11 and 12 – Lock Gate and Valve Rehabilitation;
7. Site G: Dam 10 at Lock 11 and 12 Ranney Falls Rehabilitation;
8. Site H: Campbellford Dam 11 and Lock 13 Recapitalization;
9. Site I: Crowe Bay Dam 12 and Lock 14 Rehabilitation; and
10. Site J: Southern Sector Concrete Repairs

A Design Consultant will be retained to provide design services including the following Project Phases: Requirement Analysis; Design Concept; Design Development and Construction Documents for Sites H and I. The Prime Consultant will be required to provide tender, contract administration, construction, and post construction phase services for all the sites.

#### **1.4 Project Schedule**

The Project is to be delivered generally in accordance with the indicative project milestone listed below; however the Construction Manager in coordination with the Consultants and Departmental Representative will be expected to reduce project schedule to the extent possible with an eye to cost and time efficiencies. Each site will follow separate but parallel time paths. Specific site schedule(s) may be exchanged subject to delivery efficiencies discussions between PCA, PWGSC, the Consultants and the Construction Manager. PWGSC will make the final determination. Considering a possibility of encountering unidentified site conditions, flexibility is important in terms of accommodating unanticipated site requirements. The indicative timelines shown below include normal PWGSC turnaround time.

Phase	Milestone
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Pre-Design – Analysis of Project Requirements Complete	Nov 2016
Design Concept Complete	Dec 2016
Supplementary Investigations Complete	Dec 2016
In-Water Work: Design Development Complete	Feb 2017
In Water Works: Construction Documents Complete	Apr 2017
In-Water Works: Tender and Award Complete	May 2017
In-Water Works: Start Construction (subject to in water work restrictions)	Jul 2017
In-Water Work: Construction Complete (subject to in water work restrictions)	Sept 2017
Infrastructure: Design Development Complete	Mar 2017
Infrastructure: Construction Documents Complete	Jun 2017
Infrastructure: Tender and Award Complete	Aug 2017
Infrastructure: Start Construction	Sep 2017
Infrastructure: Construction Complete	Nov 2019

The schedule provided above allows for in-water work restrictions based on the Ontario Ministry of Natural Resources (OMNR) guidelines and administered by PCA. The restricted period for in-water work is from March 15 to July 15 inclusive. Restriction periods may vary by site. Site specific in water work restrictions will be confirmed in the environmental impact assessment (EIA) after baseline studies are complete. The breeding bird timing restriction for no vegetation removal works is from March 31st to August 27th for Zone C2. Breeding birds including Barn Swallow (SAR) may inhabit the dam structures and will require exclusion netting prior to the nesting period or work on the dams will be restricted to the March 31st to August 27th period. There are also several Species at Risk considerations and Critical Habitat restrictions for the proposed project areas (see Section 3.2), additional timeline constraints may be required. It is possible that Dam 1 may have further timing window restrictions for cool water species from Lake Ontario or due to Species at Risk.

Note that the above time allocations for pre-construction including design and tendering phase durations are meant to provide a preliminary time frame of major activities and milestones. The schedule supplied by the Construction Manager is to include sufficient details to clearly demonstrate the sequence and interdependency of construction activities and to provide a reasonable basis for progress monitoring and coordination. Each site is to be scheduled and tracked both as a separate project and incorporated into an overall schedule with all sites. The duration of some task may vary depending on the overlapping design and construction phases through multiple tendering and construction packages.

The Construction Manager shall identify and take advantage of opportunities to advance tasks concurrently with the intent to reduce the project schedule.

A major impact on construction start will be the approval of impact assessments that include such environmental, archaeological, cultural resource, First Nations and public consultation components.

## 1.5 Stakeholders

The Prime Project Stakeholders include representatives from the following organizations:

- Parks Canada Agency (PCA) - Client Department / User – Project Leader
- PWGSC - Real Property Branch - Project Manager

Other Stakeholders include as a minimum:



- Ontario Ministry of Natural Resources and Forestry (OMNRF);
- Ontario Power Generation (OPG);
- Peterborough Utilities Inc. (PUI)
- Hydroméga Utilities (Dam 01 power proponent)
- Other power generators;
- Local municipalities;
- Fisheries and Oceans Canada (DFO);
- First Nations;
- Conservation Authorities
- Public; and
- Impacted commercial enterprises.

PCA to be the lead when contacting other authorities having jurisdiction,

## **2 PROJECT BACKGROUND**

### **2.1 Overview**

The Parks Canada Agency Act requires that management plans be prepared for national historic sites and states that it is 'in the national interest to ensure the commemorative integrity of national historic sites. The Historic Canals Regulations under the Department of Transport Act provide the regulatory framework for the management, use and protection of the Rideau Canal and Trent-Severn Waterway in accordance with the Historic Canals Policy and the Management Plan.

The facilities identified above as the South Bundle are part of the Trent-Severn Waterway (TSW) which meanders 386 km along Central Ontario and consists of many locks, bridges and dams. Constructed between 1833 and 1920, the Trent-Severn Waterway was declared a National Historic Site in 1929. It commemorates Canada's history of canal construction and the importance of the canal system throughout this country's history. This heritage corridor is enjoyed by more than 1.5 million land and water based visitors every year.

After nearly 100 years, the original waterway mandate of navigation is now challenged to meet the widely varying needs and expectations of modern stakeholders. As a national historic site, the waterway must be managed for the protection and presentation of nationally significant cultural resources. Government agencies and environmental organizations expect the system to be managed to provide for the protection of natural values including species at risk, while business organizations and individual business owners strive for contributions to the economic well-being of the area. Municipalities, cottagers and shoreline owners expect it to contribute to the quality of their lifestyles and recreational interests, while ensuring water supplies of adequate quality and quantity.

The Ontario Waterways Unit of Parks Canada Agency owns and operates, on behalf of Canada, the TSW that extends from the Bay of Quinte on Lake Ontario at the City of Quinte West (Trenton) to Port Severn in the north, located to the south of Georgian Bay (Lake Huron). The waterway traverses two major watersheds, the Trent River Watershed and the Severn River Watershed. The Trent River basin, which drains more than 12,600 km<sup>2</sup>, encompasses some 218 lakes in the Haliburton Highlands region, 47 of which are directly controlled by the TSW. Water from these lakes flows south along either the Gull River, Burnt River, Nogies Creek, Mississagua River, Eels Creek or Jack Creek systems into the Kawartha Lakes. The Kawarthas drain down the Otonabee River into Rice Lake and on to Trenton on Lake Ontario via the Trent River. The Crowe River drains the eastern-most lakes in the Trent Watershed. Lake Scugog drains northward from the Oak Ridges Moraine to Sturgeon Lake. The neighboring Severn

River basin drains an area just over 6,000 km<sup>2</sup>. Included in this watershed are the Canal Lake - Talbot River system, the Holland River, the Lake Simcoe - Couchiching basin, the Black River and the channels of the Severn River below the hamlet of Washago.

The water levels and flows on the waterway are managed by 104 operable dams which are owned and operated by the Ontario Waterways Unit of Parks Canada Agency. Of the 104 dams, 83 are located on the Trent River Watershed, including 47 dams and water retaining structures in the Haliburton sub-watershed to control various reservoir lakes and rivers feeding the waterway. The remaining 21 dams and water retaining structures associated with the waterway are located in the Severn River Watershed.

## **2.2 Description of Sites**

### **2.2.1 Site A: Dam 1 and Lock 1 – Trenton**

The site is located on the Trent River in the City of Quinte West (Trenton), Ontario, about 750m south of Highway 401. The downstream reach of the Trent River extends 2.8 km through the core of the City of Quinte West to its outlet in the Bay of Quinte.

Dam 1 can be accessed either via the lock lower east side approach walls or via the Trenton Water Treatment Plant, which accessible via Sydney St. and Chester Rd. (44° 07' 13" N and 77° 35' 23" W). Lock 1 lock station can be accessed via Trent-Frankford Road (Hwy 33) on the west shore of the river.

Built in 1913 Dam 1 is a mass-concrete gravity structure founded on bedrock. The 222m structure spans across the Trent River with both ends of the dam abutting onto Parks Canada property. Although, PCA owns a large parcel of land along the east shore of the river, only a small segment of this parcel of land extends to the dam. At the west end of the dam abutments onto a narrow island / embankment created through the construction of Lock 1 and its navigation channel.

A Dam Safety Review (DSR) completed in 2015, concluded that the dam had a Hazard classification of Significant. As such, the dam must be capable of passing an inflow design flood (IDF) of one in 1,000-year flood, which for this site is a design flow of 1,750 cms and be capable of withstanding an earthquake (DBE) one in 1,000-year.

An inspection of Lock no. 1 Lower Canal Entrance Walls and Downstream Breakwater revealed that the lock structure and its approach walls and lower canal walls are in various states of deterioration which need to be addressed.

While there is not currently a hydroelectric generating facility on the site, a permit was offered to a private sector power proponent in 2016 by Ontario's Independent Electricity System to initiate development. The construction of this facility will either occur in concurrent with the construction of the replacement of dam or it will be built following completion of the dam construction. The sequence is yet to be determined. Presently feasibility, concept designs and environmental reviews are being carried out by the private sector power proponent. The design of the new dam will include bypass gates to accommodate a low-head turbine power generating plant

An illustration of the conceptual installation is provided in Appendix A under Aerial Imagery.

#### **2.2.1.1 Existing Structure, Conditions and Constraints**

##### **a) Dam 1**

- i) The dam is a 222m long structure and is between 6.5 to 8.5 meters in height. 168m of the dam is the spillway structure, which is equipped with eighteen 7.62m wide stop log bays to control the upstream water of the Trent River. A 40.5m and 13.5m

concrete retaining structures at either sides of the spillway structure extends the dam into the east and west river banks respectively.

- ii) Out of the 18 bays 10 bays accommodate nine (9) stoplogs and 8 bays accommodate twelve (12) stoplogs. All stoplogs are 0.3 m high by 0.35 m wide (12" x 14") timbers. Stop log adjustment/manipulation is achieved by means of a motorized hydraulic log lifter that moves from one bay to the other. Under normal operations only bay 4 through bay 14 operated.
- iii) There is a 70m long training located on the west upstream side of the dam. The training wall is thought to be on a bedrock and have an approximate height of 3.6m.
- iv) Major concerns with prolonged use of the existing structure and associated mechanical equipment are:
  - Age of the concrete structure
  - Aging equipment with questionable reliability;
  - Ongoing deterioration of the concrete structure with the presence of the alkali silicate reactivity
  - Concerns with overall structural stability due to the condition of the structure.
  - Risk associated with access to and operation of the dam due to concerns with overtopping.

b) Lock 1 and, Upstream and Downstream Lock Approach Walls

- i) Lock 1, built in 1911, is a 74.4 m long concrete structure, with a 53.5 m long by 10.1 m wide and 9.1 m deep lock chamber, equipped with timber mitre gates spanning between concrete monoliths located at both upstream and downstream end of the chamber.
- ii) The upper gates are manually operated with a gear system while the lower gates have been retrofitted with hydraulic cylinders.
- iii) The filling and discharge of the lock chamber are controlled by a side port culverts-to-chamber manifold with control valves. The existing hydro-mechanical equipment consists of the original 1911 manual operating system.
- iv) The lock is operated during navigational season, from the May Victoria Day long weekend through the Thanksgiving weekend in October, and is closed during the winter period. When closed to operation, the lock chamber is filled with water.
- v) The upstream entrance to the lock is consist of:
  - 42m approach nose wall, with 77m total length of wall, on the east side; and
  - 102m approach wall on the west side
  - Both of the walls are gravity retaining wall founded on bedrock with an approx. height of 3 to 3.5m.
- vi) The downstream entrance to the lock consists of the section of wall between the lock lower lock structure and the canal walls which are located at the canal widening on the west side of the rail bridge abutments and consist of:
  - Approx.130m walls on both side of the lock entrance.

- Archive drawings suggest that the walls are approximately 1.5m thick, 4.5m in height and are cast directly overtop and against the vertical face of the canal rock cut. Limited construction details are available.
- vii) Downstream east and west retaining, including the railway bridge abutments.
- viii) Inspection results identified many of the deficiencies associated with the lock structure which in general terms are:
- Upstream approach walls have significant spalling and deteriorated/damaged concrete at the waterline;
  - Upper gate monoliths have minor spalling and deteriorated concrete;
  - Lock tunnels and valve pits have minor spalling and deteriorating concrete;
  - Lock chamber walls have spalling and deteriorated concrete of varying degree;
  - Downstream gate monoliths have large cracks, significant leaks and general deterioration;
  - Downstream approach walls have significant spalling and deteriorated/damaged concrete at the waterline. Section of the walls that have experienced rotational and linear movements;
  - Downstream east retaining wall has significant spalling, cracking, delamination and deteriorated concrete wall, while the downstream west retaining wall has minor deteriorated concrete;
  - Rail bridge abutments surfaces are showing signs of spalling and surface deterioration.

c) Lower Lock Canal Walls

- i) The lower lock canal walls are the concrete shoreline walls starting where the canal widens on the west side of the rail bridge abutments and they consist of:
- 530 m wall on the east of the canal; and
  - 540 m wall on the west side of the canal.
  - Wall heights are between 3m to 4.5m from the top of the wall to the canal bottom.
  - The walls are approximately 1.2m thick and built directly against and anchored to the limestone bedrock. Limited information on the construction of these walls. Rehabilitation work done in the 1970's included some reinforced resurfacing of sections of walls together with anchorage of the walls into the limestone bedrock. Area behind both wall sloped embankment formed overburden from the construction of the canal.
- ii) Based on Lock no. 1 Lower Canal Entrance Walls and Downstream Breakwater inspection report, concrete deterioration (erosion and undermining of varying significance) was observed along the waterline of the walls. There is rotational and linear movement of Canal Wall sections inwards towards the canal at the expansion joints. In addition, East Canal Wall sections and the West Canal Wall sections have experienced movement.

### **2.2.1.2 Scope of the Work**

#### **Dam 1 Reconstruction**

The scope of work involves the demolition of and replacement of the entire existing dam structure, including but not limited to the deck, piers, abutments, spillways, downstream apron, including the rehabilitation of the upstream west training wall. Demolish and remove from site all existing ancillary structures, which will no longer be needed following the dam replacement.

The new dam deck will be suitable to allow access to maintenance vehicles and pedestrians (general public) with appropriate separation barriers. The project will require installation of safety booms, dam safety signs, fencing and other measures to improve public safety at site in accordance with CDA Guidelines and PCA Public safety designs templates

The new dam will be completely mechanized, requiring the installation of a new hydro service to the site including backup generator, and electrical/storage building to be built at the eastern end of the dam structure. The hydraulic log lifter will be removed and handed over to Parks Canada for rehabilitation and deployment elsewhere. Although the Design consultant is to look at the feasibility and options for the mechanization, the general thought is to install Tainter gates on the new structure together with vertical lift or radial gates in a bypass spillway(s) for the potential future power generating plant.

The Work includes all associated temporary work for access and in order to complete the work in the dry, while ensuring that river flow is safely discharge through the dam or diverted around the site. The work includes establishing and executing all necessary leases of surrounding private lands that may be required for use during the construction phases of this project.

Note: The new dam may incorporate a privately funded, operated and separately designed Hydro Electric production facility at the East end of the dam. It is possible that the construction of the hydro facility will occur simultaneously with the rest of the dam structure. It is also possible that the Construction Manager may execute both projects and manage sharing of costs where appropriate between Parks Canada and the hydro electric company. These arrangements need to be confirmed.

#### Rehabilitation of Lock 1 and Associated Structures

While the full extent of rehabilitation requirements of the Lock 1 site needs to be quantified during the design stage, it is anticipated that that most lock components will require standard cut back and recast rehabilitation typical for Locks on the TSW. The anticipated rehabilitation requirements include:

- West Upper Concrete Approach Walls. Repair significant concrete spalling and damage in waterline area of upstream maintenance gains. Repair waterline deterioration along upstream end of wall to extend service life
- East Upper Concrete Approach Wall. Repair concrete cracks/deterioration at upstream end and concrete spalling/cracks in gain area to extend service life by 25 years
- Upper Gate Monoliths. Standard cutback and reinforced concrete rehabilitation anticipated to extend service life.
- Lock Tunnels and Valve Pits. With the exception of the tunnels in the lower monolith areas, standard cut back and recast repair is expected scope in tunnels.
- Lock Walls. Standard cut back and reinforced concrete rehabilitation anticipated
- Downstream East and West Gate Monolith. Demolition and reconstruction anticipated
- Downstream East High Retaining Wall (gate monolith to railway abutment). Poor condition with extensive cracking, delamination and spalling. Extensive efflorescence

and water flow through drains. Major rehabilitation anticipated with drainage improvements. Walking surfaces also require repair in this area.

- Concrete Railway Abutments. These assets are owned by Parks Canada. Scope to include cut-back and placement of reinforced concrete layer to improve surface condition and extend service life.
- Downstream Approach Walls. The Lower Entrance Canal Walls are located downstream of the lock and railway bridge. Construction details of the walls such as reinforcement and anchorage are not available. The intention of this scope component is to rehabilitate these walls to extend their service life as concrete wall structures and to stabilize them against further movement. The entire length of these walls is no longer required to support navigation. Therefore a run of these walls (length to be determined) will be demolished and left as a more natural shoreline. This length will be determined by Parks Canada based on requirements

Note: Lock gate fabrication and replacement requirements undertaken by contract will be defined after review of their condition.

The Construction Work generally includes but is not limited to:

- Establishing and maintaining temporary site access and staging areas;
- Provision of public and recreational traffic detours
- Provision of all controls identified in the Detailed Impact Assessment;
- Obtaining regulatory permits and certificates of authorization and approvals as required;
- Design, installation, and maintenance of dewatered work areas, including supply of the dewatering system and any required cofferdam construction
- Site reinstatement and restoration.

### **2.2.2 Site B: Glen Miller Dam 3 at Lock 3**

Glen Miller Dam 3 is a concrete gravity dam built in 1910 and partially rehabilitated in 1943. Dam 3 is operated to maintain prescribed water level ranges during the navigation period on the TSW. During the non-navigation season stoplogs are stripped from the structure.

Dam 3 is considered to be in fair to poor condition. There is major deterioration of the deck segments along with deterioration of the piers and abutments. The abutments were repaired in 1943 and are now deteriorating to the point where the above-water portion of the piers is again in need of major repair and possibly replacement.

There has been progressive erosion of the Lock 03 embankment shoreline downstream of an existing concrete toe wall. Erosion has resulted in loss of embankment fill and surficial slope instability. Toe protection exists for a portion of the reach that appears to have been put in to arrest slope failure in the area downstream from where the Sonoco Dam abuts the embankment. That portion of the embankment slope appears to have stabilized but the remaining portion of the reach continues to actively erode. A slope stability analysis for this portion indicated that the present face is unstable and will likely experience localized failures that could remove the fill from the river side of the Lock. The original lock embankment material was a shattered limestone fill constructed from material excavated during lock construction – see historical photos.

A DSR was issued for this structure in October 2015 with recommendations to address deficiencies as they relate to the Parks Canada Directive for Dam Safety.

Photos are provided in Appendix A under Aerial Imagery.

### **2.2.2.1 Existing Structure, Conditions and Constraints**

The concrete dam has a total length of approximately 158 m and consists of ten (10) stoplog weirs with nine (9) logs per weir, and four (4) stoplog weirs with twelve (12) logs per weir, operated with an Atlas Polar log lifter. The dam has a total height of approximately 7.5 m (from record drawings) and retains a reservoir height of approximately 6.28 m (from lowest sill to N.H.W.O.L.). Dam 3 has the hydraulic capacity to pass up to 98% of the 1000 year flood at 1707 cms prior to overtopping embankments which is within the parameters of a Significant Hazard Protection Classification and is considered acceptable from a risk perspective especially given the fact that the dam is stripped of all logs in the fall and not operated until the opening of the canal in May.

### **2.2.2.2 Scope of the Work**

The scope includes rehabilitation of Dam 3 so it meets the requirements of the Parks Canada Directive for Dam Safety and improves the asset condition from poor to good with a service life of 75 years for the rehabilitated structure. The scope of work includes (but is not limited) to: rehabilitation of concrete piers and sills; extension of piers upstream as required to permit installation of maintenance gains; demolition and reconstruction of the deck to facilitate full highway loading; installation of new rails for the existing Atlas Polar log lifter; installation of dam safety boom upstream of dam; installation of public style guard rails on the deck as it will be open to public and installation appropriate new gain covers to improve public/operator safety; reparation of concrete wing walls and abutments and installation of public style guards on these components; and installation of a vehicle gate at the west entrance to dam deck to prevent unauthorized vehicles from driving onto deck.

As part of the Lock 3 embankment shoreline protection and restoration, construct an erosion control mitigation measure and backfill it along the embankment to restore the original profile with a stabilized slope.

### **2.2.3 Site C: Frankford Dam 6 at Lock 6**

The Frankford Dam and Lock 6 are located on Trent River in the Town of Frankford. The dam and lock serve to provide navigation along the Waterway. The dam also controls water levels for the generating station.

Frankford Dam is a concrete gravity dam built in 1912. Lock 6 is a concrete gravity structure and was built in 1912 and is located approximately 1.2 km downstream of the Frankford Dam.

The Frankford Dam comprises from west to east:

- West Embankment / Abutment - Consists of a 250 m long earth embankment with a concrete core wall, from Sill's Island GS to the West Abutment of the dam;
- eight (8) 7.62 m wide concrete sluiceways (west end);
- a 25 m wide concrete spillway;
- a concrete Pivot section;
- two (2) 7.62 wide concrete sluiceways (east end); and

- a left (east) abutment that includes a 13 m long concrete retaining wall with an earth embankment on the downstream side.

The West (Right) Embankment was constructed as an earthfill section with a concrete core wall. The concrete core wall is approximately 5.6 m high and has a base width of 1.5 m and a top width of 0.6 m. The wall appears to be founded on bedrock based on the background information. The top of the concrete core wall is at El. 110.44 m. The crest elevation of the embankment was surveyed and ranged between El. 110.85 and El. 110.94 m and has a crest width of approximately 2.8 m. The embankment is approximately 180 m long and up to 5.1 m high on the downstream side.

A photo of the installation is provided in Appendix A under Aerial Imagery.

#### **2.2.3.1 Existing Structure, conditions and Constraints**

- a) Frankford Dam is a concrete gravity dam that has ten 7.62 m wide sluices with vertical steel roller gates and a 25 m wide concrete spillway.
- b) Lock 6 is a concrete gravity structure. The entrance to the channel upstream of Lock 6 is equipped with a guard gate which is currently not operational.
- c) In May 2015 a Dam Safety Review (DSR) was completed. In accordance with the PCA Directive, the dam was determined to have a HIGH B Hazard Classification both for the Sunny Day and Flood breach conditions. The Inflow Design Flood (IDF) was determined to be a flood 51% of the way between the 1,000-Year Flood and the PMF corresponding to 3,480 m<sup>3</sup>/s.

#### **2.2.3.2 Scope of the Work**

The scope of work involves options to address discharge capacity deficiencies identified in the Dam Safety Review (DSR) for Frankford Dam 06. These options will be assessed as part of a risk based study and are likely to include:

- a. Conversion of the existing concrete overflow spillway to vertical mechanical gates to increase discharge capacity;
- b. Modification of the concrete core west embankment to function as an overflow emergency spillway; and
- c. Installation of a new guard gate to replace a defunct guard gate system and modification of east dam abutment and embankments to isolate the canal embankments from extreme floods and reduce risk

Other scope components at this site include but are not limited to the modification of backup power generator system to power new gates and heaters in event of power disruption, installation of public style guards on upstream and downstream side of dam deck as the dam will remain open to the public, installation of dam safety boom upstream of dam in place of existing suspended cable, and improvements to public safety measures at the dam including Installation of new Parks Canada dam safety signs at the site.

#### **2.2.4 Site D: Meyers Dam 8 at Lock 9**

The Meyers Dam 8 was built in 1913 as a concrete dam and originally had fourteen stoplog sluices. The original three sluices at the east end of the dam are being used as the intakes to the OPG generating station and are under the control of OPG. Currently in operation there are four stoplog sluices and seven sluices with vertical steel roller gates that were installed in 1990. Three of the stoplog sluices are at the west end of the dam and the fourth stoplog sluice is at



the east end adjacent to the powerhouse. The dam abuts the east retaining wall that extends 100 m from the generating station to the west upper lock approach wall and consists of a concrete retaining wall with an earthfill embankment.

Photos are provided in Annex A under Aerial Imagery.

#### **2.2.4.1 Existing Structure, Conditions and Constraints**

- a) The Dam consists of an OPG Power Generating station with three intake sluices, four non-operational stop log sluices, seven vertical gate sluices and associated concrete walls.
- b) The dam abuts the east retaining wall that extends 100 m from the generating station to the west upper lock approach wall and consists of a concrete retaining wall with an earthfill embankment.
- c) According to the Dam Safety Review (DSR), the dam was determined to have a HIGH A Hazard Classification. The Inflow Design Flood (IDF) was determined to be a flood 44% of the way between the 1,000-Year Flood and the PMF corresponding to 1,610m<sup>3</sup>/s.

#### **2.2.4.2 Scope of the Work**

The main objective will be to convert four non-operable stop log sluices into mechanized vertical gates in order to improve operational effectiveness at Dam 08 with respect to water management. Modifications will also be undertaken at the site to direct extreme flood flows over the 950 m long west concrete wall that will serve as an emergency spillway in order to protect more vulnerable components of the dam. This modification includes the increase the crest elevation of the 100 m long east concrete wall to match the dam deck elevation of 125.50 m an approximate 0.48 m increase. The elevation of the right upstream lock approach wall will also be increased to 125.50 m for portion of its run coupled with landscape modification to prevent flow over this embankment.

In summary the scope of work will include the following:

- a) Mechanization of four stop log sluices to enhance operational capability;
- b) New mechanized sluices to incorporate service gains;
- c) Repair and modify sills and piers as required in new sluices to facilitate gate installation;
- d) Repair and increase elevation of east wall and portion of right approach walls and to 125.5 m to protect east embankments. Additional landscaping and modification as required to achieve this objective of directing extreme floods over west wall;
- e) Install galvanized gate covers in place of existing suspended stop logs at service gains;
- f) Modify the existing backup power generator system to power new gates and heaters in event of power supply interruption; and
- g) Install public style guards along upstream and downstream side of dam deck. Install upgraded Parks Canada dam safety signs throughout site.

#### **2.2.5 Site E: Dam 9 at Lock 10 Hagues Reach**

Hagues Reach Dam 9 is approximately 3 km south of the town of Campbellford, Ontario. The dam and lock serve to provide navigation along the Waterway and the dam also controls water levels for the OPG power generation station located 320 m south of the dam.

Hagues Reach Dam was originally built in 1915 with fifteen 6096 mm wide stoplog sluices. The concrete dam has a total length of 117 m and the outflow has been divided between two channels by a 'river' wall immediately downstream of the dam.

The west (right) channel bypasses Meyers Dam and joins the Trent River downstream of Meyers Dam. The east (left) channel outflow, the Hagues Reach GS dam outflow, and the lock all discharge into the main channel, upstream of Meyers Dam. The west and east outflows originally consisted of eight and seven stoplog sluices, respectively. The six west most sluices were demolished in 1973 and replaced with two 15.24 m wide radial-arm gates. OPG owns and operates Hagues Reach GS just south of the dam, with access from the main road via a bridge over Lock 10, just downstream of the gates. There were no drawings / records available that indicated any repair work has been done to the dam since 1973. Access to the dam from the west approach is over a poor quality gravel road.

The outflow of Hagues Reach Dam has been divided into two channels. The west channel comprises of two 15 m wide gate controlled sluices and two 6.096 m wide stoplog sluices. The east channel comprises seven 6.096 m wide stoplog sluices. The East Retaining Wall / Earthfill Embankment runs between the east abutment of the dam and the nearby OPG Hagues Reach GS. The south end of the east retaining wall transitions to a gravity section. There are three main earthfill structures associated with the dam and canal. These include the west (right) abutment and embankment adjacent to the Hagues Reach Dam, earthfill embankment located between Hagues Reach Dam and Hagues Reach GS, and the west (right) canal earthfill embankment located on the west side of the canal between the generating station and Lock 10.

Photos are provided in Appendix A under Aerial Imagery.

#### ***2.2.5.1 Existing Structure, Conditions and Constraints***

- a) Dam 9 is a concrete gravity dam originally built in 1915. The concrete dam has a total length of 117 m and the outflow has been divided between two channels by a 'river' wall immediately downstream of the dam. The dam has two 15.24 m radial gates, nine stop log sluices, and associated concrete retaining walls and embankments.
- b) In December 2015 a Dam Safety Review (DSR) was completed. In accordance with the PCA Directive, the dam was determined to have a HIGH A Hazard Classification for sunny day failure and High B for flood conditions. The Inflow Design Flood (IDF) was determined to be a flood 69% of the way between the 1,000-Year Flood and the PMF corresponding to 3,690 cms.

#### ***2.2.5.2 Scope of the Work***

The scope of work involves converting nine stop log sluices into mechanized vertical gates in order to improve operational effectiveness at Dam 09 with respect to water management. Sill elevations will be modified to increase the discharge capacity at the site so that it nominally exceeds 1,400 cms prior to overtopping embankments.

Modifications will also be undertaken at the site so the east retaining wall and west retaining wall can tolerate overtopping in order to act as emergency spillways during extreme flood emergencies. Scope will also include construction of an access bridge upstream of the radial gates to permit maintenance vehicle access to the new mechanical gates and deck.

In summary the scope of work will include the following:

- a) Mechanization of stop log sluices 7-15 to enhance operational capability;
- b) New mechanized sluices to incorporate services gains;

- c) Repair and lower sills and modify piers as required in new sluices to facilitate gate installation and achieve enhanced discharge capacity;
- d) Construct new deck at vertical gate sluices to permit service vehicle access and a pedestrian corridor;
- e) Modify east retaining wall and west retaining wall so they tolerate overtopping in order to serve as an emergency spillway in extreme flood situations;
- f) Construct service vehicle access bridge upstream of radial gates so service vehicles can access new vertical gate dam deck;
- g) Reconstruct river wall that is in poor condition;
- h) Installation of safety booms, dam safety signs, gain covers and other measures to improve public safety at site in accordance with CDA Guidelines and PCA Public safety designs templates;
- i) Install public style guards along upstream and downstream side of dam deck (excluding radial gate section); and
- j) Install backup power generator to power vertical gates and heaters in event of power supply interruption. Note that radial gates currently have a back-up electrical system.

#### **2.2.6 Site F: Ranney Falls Locks 11 and 12, Lock Gate and Valve Rehabilitation**

The Ranney Falls Locks 11 and 12 are the first of two flight locks on the Trent-Severn Waterway. Locks 11 and 12 are located in the south end of the community of Campbellford in the Municipality of Trent Hills, Northumberland County.

The Locks were built in 1912 and the chamber walls and gate monolith structures are concrete gravity retaining walls founded on bedrock. The lock chamber valves of Locks 11 and 12 are the original design from 1912 and have been repaired over the years.

A photo of the installation is provided in Appendix A under Aerial Imagery.

##### **2.2.6.1 Existing Structure, Conditions and Constraints**

- a) The Locks and gate monolith structures are concrete gravity retaining walls.
- b) The lock chamber valves of Locks 11 and 12 require major rehabilitation or replacement. Failures of these valves, at this location, have occurred which impacted navigation and visitor experience.
- c) Both the lower gates at lock 11 and 12 are steel. The lock gate gudgeon anchors (gate hinges) of the lower gates on Lock 11 and 12, are in need of replacement as a result of the failures of similar anchors at the Sault Ste. Marie lock and two failures at this location
- d) The gate anchors have proven to be defective and the anchors for the much larger Sault Ste. Marie gates have been redesigned and replaced.
- e) One hinge failed in 2007, and again the same hinge failed at a different point (most likely due to stresses caused by the first failure and time).

##### **2.2.6.2 Scope of the Work**

The main objective to rehabilitate/replace the existing valves of Lock 11 and 12, as well as replace the gate hinges on the lower gates at Lock 11 and 12 to satisfy the requirements of

Parks Canada and improve the condition of the assets from poor to good with an extended service life of 80-100 years.

The scope will include the replacement of the six existing valves for Lock 11 and 12 with new valves and the associated works related to the installation. At Ranney Falls there are 6 centrifugal valves that need to be replaced with either the same design, or a new valve design system. Scope will also include removal of existing gate hinges from the lower steel gates of Lock 11 and 12 and replacement with new as well as localized concrete repair and/or concrete design changes to anchor the new hinges into place. The lock gate gudgeon anchors (gate hinges) of the lower gates on Lock 11 and 12 will also be replaced.

### **2.2.7 Site G: Dam 10 at Lock 11 and 12 Ranney Falls**

Ranney Falls Dam is a concrete gravity dam built in 1925 and completely reconstructed in 1980. The concrete dam has a total length of 70 m and consists of six, 10 m wide, gate controlled sluices. The gates are vertical steel roller gates (installed in 1980) and each gate is operated by an electric motor with a backup hand crank, which drives two drum hoists. Gain and gate heaters are also installed at each sluice.

A portable gasoline driven hydraulic motor, that drives the hydraulic system, is available as a backup in the event of a power failure. A back up power generator was recently installed. A maintenance gain is located directly upstream of each gate. A crane lifting from the road bridge is required to place the stop logs in the maintenance gains. The dam has a total height of approximately 10.82 m (top of downstream apron to top of deck) and retains a reservoir height of approximately 9.15m. The original dam constructed in 1925 more sluices than the 1980 construction. This was an unfortunate reduction in capacity.

Photos are provided in Appendix A under Aerial Imagery.

#### **2.2.7.1 Existing Structure, Conditions and Constraints**

- a) Ranney Falls Dam is a concrete gravity and has a total length of 70 m with six (6) 10 m wide, gate controlled sluices.
- b) The gates are vertical steel roller gates and are operated by an electric motor with a backup hand crank,
- c) In March 2016 a Dam Safety Review (DSR) was completed. In accordance with the PCA Directive, the dam was determined to have a HIGH A Hazard Classification both for the Sunny Day and Flood breach conditions. The Inflow Design Flood (IDF) for Ranney Falls Dam was determined to be a flood 33% of the way between the 1,000-Year Flood and the PMF corresponding to 2,600 m<sup>3</sup>/s.
- d) Based on the standards based approach there is a significant discharge deficiency at Ranney Falls Dam.

#### **2.2.7.2 Scope of the Work**

The main objective to increase discharge capacity at Ranney Falls Dam 10 in order to reduce risk associated with hydraulic capacity. Several options to increase hydraulic capacity include the following:

- a) Modification of dam deck elevation and/or underside elevation of fully open gates that would eliminate these constrictions and allow greater discharge.

- b) Lowering of sills and modification of gates to increase capacity. The new sills would have to be at an elevation above surrounding channel to prevent debris movement onto the sill.
- c) Construction of a new auxiliary or emergency by-pass spillway with gate around the east abutment of the dam with a bridge for vehicle passage.
- d) Construction of auxiliary or emergency spillway with gate at other area on the river reach from dam downstream to the locks. This option would only be considered if the other options prove to be infeasible.
- e) full construction scope and requirements will be developed during the design process, however, the general scope and secondary objective will entail:

In summary the scope of work will include the following:

- a) Implementation of design and construction of selected option to increase capacity;
- b) Modification of the backup power generator system as required to power gates and heaters in event of power disruption;
- c) Reassess stability of rollway sluice component and if required develop stabilization measures such as adding concrete mass (preferred) or anchors (secondary preference) to address stability deficiencies identified in DSR;
- d) Extend erosion protection downstream of east wall to protect roadway embankment;
- e) Install dam safety boom upstream of dam in place of existing suspended cable. Design for full year use including ice loads; and
- f) Improve public safety measures at the dam including Installation of new Parks Canada dam safety signs at the site. These public safety measures may also include additional signs in the tail race area subject to sudden changes in flow and installation of post mounted sirens for warning downstream visitors of flow adjustments.

## **2.2.8 Site H: Campbellford Dam 11 and Lock 13**

### **Dam 11 Campbellford**

Dam 11 is a concrete gravity structure, built in 1913 and rehabilitated with two mechanized radial gates in 1976. Its purpose is to regulate water to maintain the navigation water level on the Trent-Severn Waterway. The dam also provides regulation for hydropower generation in the watershed. The current configuration of the dam consists of four wooden stoplogs spillway, an overflow spillway and two radial gates, in addition to two blocked sluices. The overall dam length is 142 m. The overall height of the dam is 11.2 m from bedrock to the top of the dam deck. By convention for the Trent-Severn Waterway, sluice numbering starts at the lock. Sluice 1 is the rightmost (west) sluice.

The wooden stoplog spillways consist of four, single gain, 7.62 m wide spillways, with 12 logs per sluice. The overflow spillway consists of a flat crest overflow spillway divided by four piers supporting the dam deck. The two radial gates are 15.24 m in width and are electrically operated. In addition to the above, there are two blocked sluices. One sluice, at the west end of the concrete dam is permanently closed by a concrete wall. The second closed sluice, between the overflow spillway and radial gates is closed with steel stoplogs and no permanent mechanism of removing these is available currently.

Three main embankment dams are also appurtenant to dam. These earth fill dams are located at the left and right approaches to the lock, between the Trent River and the powerhouse intake

canal and to the west of the powerhouse intake canal. The length of these structures is as follows:

- a) Lock Upper Approach Canal Left Embankment 560 m
- b) Right Concrete Core Earth Embankment 120 m
- c) Left Earth Embankment Dam 310 m

#### Lock 13 Campbellford

The lock associated with Campbellford Dam, Lock 13, is also a concrete gravity structure equipped with manual upper gates and mechanized lower gates. The lock is a single chamber of 53.3 m long by 10 m wide. The depth of the lock, from coping to floor is 10.8 m. Lock 13 was rehabilitated in 2004, where new wagon valves and refurbished rails were installed and again in fall 2005, where the hydraulic system was installed on the downstream gates.

Photos are provided in Appendix A under Aerial Imagery.

#### **2.2.8.1 Existing Structure, Conditions and Constraints**

- a) Dam 11 is a concrete gravity structure, consisting of four wooden stoplogs spillway, an overflow spillway and two radial gates, in addition to two blocked sluices.
- b) The overall dam length is 142 m. The overall height of the dam is 11.2 m from bedrock to the top of the dam deck.
- c) The DSR for this site identified a significant deficiency with respect to standards based discharge capacity at Campbellford Dam 11. The DSR recognized that it would not be feasible to modify the dam to achieve the standard based IDF and that increasing discharge capacity beyond that of the upstream Crowe Bay Dam 12 would not be reasonable. Considering the inadequacies of the dam's discharge capacity, the DSR recommended to convert the stop log and blocked sluices to vertical mechanical gates in order to increase the capacity to at least that of the upstream Crowe Bay Dam.
- d) Concrete deterioration at the lock and approach walls is not widespread but repairs and rehabilitation are required to improve asset conditions and extend service life of these structures.

#### **2.2.8.2 Scope of the Work**

A comprehensive rehabilitation of the dam, lock and associated structures at Campbellford Dam 11 and Lock 13 are required. The principal objectives is to rectify deficiencies identified in the DSR and the reduction of risks to a reasonable level by improving and increasing discharge capabilities to a level planned for the upstream Crowe Bay Dam 12 (approx. 650 year return).

A summary of the scope of work is as follows:

- a) Reconstruct the four timber stop log spillways as mechanized gates and extend left (east) downstream abutment wall to provide erosion protection;
- b) Reconstruct the steel stop log sluice as a mechanized gate;
- c) Reconstruct the closed spillway as a mechanized gate as and if required to satisfy discharge requirements;
- d) Rehabilitate the overflow spillway to improve its condition and replacement of the pedestrian cat walk that crosses the overflow spillway to a vehicle capable deck to allow for maintenance vehicle access up to radial gates from the east approach;

- e) Undertake other concrete repairs and stabilization measures at the concrete dam to improve condition to good and address stability deficiencies identified in the DSR;
- f) Rehabilitate the left embankment earth dam to improve its condition to good with a increased crest elevation (of approx. 0.43m) to match that of the concrete deck (154.5m geodetic);
- g) Rehabilitate the right earth embankment to improve its condition to good with an increased crest elevation (of approx. 0.43m) to match that of the concrete deck (154.5m geodetic);
- h) Rehabilitation of the lock upper approach left canal earth embankment to improve its condition to good with an increased crest elevation (of approx. 0.43m) to match that of the concrete deck (154.5m geodetic) from the right earth embankment to the left upper concrete lock approach wall;
- i) Lock rehabilitation and repair to improve overall asset condition of lock to good;
- j) Repair of upstream and downstream lock concrete approach walls to improve their condition to good and increase service life beyond 25 years;
- k) Installation of safety booms, dam safety signs, fencing and other measures to improve public safety at site in accordance with CDA Guidelines and PCA Public safety designs templates;
- l) Installation and/or modification of back-up generator with UPS switching to power new vertical dam gates and heaters; and
- m) Minor repairs to existing mechanical radial gates as recommended in the Dam Safety Review.

### **2.2.9 Site I: Crowe Bay Dam 12 and Lock 14**

#### **Dam 12 Crowe Bay**

Dam 12 (Crowe Bay) was originally constructed in 1913. In 1985 there was a major rehabilitation of the dam with the installation of five mechanized gates. No work was undertaken on other components of the dam in 1985.

#### **Lock 14 Crowe Bay**

Lock 14 was also constructed circa 1913. Numerous upgrades and repairs have been undertaken at this lock. In 1936 a concrete cutoff wall was constructed offset from the left or east side of the lock. In 1939 the east lock wall was substantially reconstructed. In 1967 the upper concrete sill was repaired. In 1973 the lower apron (downstream of lower gates) was repaired. In 2007 new wagon valves and refurbished rails were installed.

In 1981 the lower sill was repaired and in 1990 there was a rehabilitation of the lock including installation of a hydraulic system on the downstream gates. There are some problem areas with concrete and mechanical components. Concrete deterioration on walls is not widespread.

#### **Headrace Dam Bridge**

The headrace bridge is a single lane, three-span reinforced concrete slab-on-grade structure constructed in 1908. The bridge provides a service road access to the lock. The structure also serves as a stop log dam to dewater the intake to the power dam.

Photos are provided in Annex A under Aerial Imagery.

**2.2.9.1 Existing Structure, Conditions and Constraints**

- a) Crowe Bay Dam 11 is a 160m long structure that includes five mechanical sluices, a concrete overflow component and associated retaining walls and abutments.
- b) The overflow spillway the dam is in poor condition due to concrete deterioration.
- c) The DSR for this site identified a deficiency with respect to discharge capacity at this site. The DSR recognized that increasing capacity at the site by the installation of additional vertical gates would reduce risks with respect to discharge capacity.

**2.2.9.2 Scope of the Work**

Scope of work will include the comprehensive rehabilitation of the dam, lock and associated structures at Crowe Bay. Work will also include the conversion of the overflow spillway of the dam into mechanical gates in order to reduce the risks of overtopping to a level as low as possible given site characteristics and downstream dam capacities.

Additional scope components include:

- a) lock rehabilitation and repairs to improve overall asset conditions to good.
- b) repair of upstream and downstream lock approach walls to improve their condition to good and increase service life beyond 25 years
- c) construction of downstream tailrace wall along lock embankment to account for potential increased flow from new mechanical gate and provide resistance to overtopping
- d) modification of site and/or walls embankments between lock 14 and dam to resist IDF overflow conditions to a reasonable level considering effect of new gates on IDF levels and short circuiting of flood flows around the entire site
- e) installation of safety booms, dam safety signs, fencing and other measures to improve public safety at site in accordance with CDA Guidelines and PCA Public safety designs templates
- f) Installation of back-up generator with UPS switching to power dam gates and heaters
- g) Loads capacity assessment and repair of head race bridge to facilitate construction and service vehicle access
- h) Automation of a dam gate to reduce risk associated with sudden power plant shut down
- i) Minor repairs to existing mechanical gates pilasters

**2.2.10 Site J: Southern Sector Concrete Repairs****a) Healey Falls Locks 15, 16, 17**

The Healey Falls Locks 15, 16 and 17 are located 11 km north of the city of Campbellford, Ontario on the Trent River, approximately 1.3 km east of County Road 50, adjacent to Canal Road within Northumberland County. The Locks were built in 1916 and the chamber walls and gate monolith structures are concrete gravity retaining walls founded on bedrock.

The canal walls of Lock 16 and 17 are currently in poor condition & require significant repairs to ensure that the lock can remain in service to provide through navigation without creating undue risk to boaters. The general condition of the walls and floor are showing extensive signs of deterioration, with cracks showing efflorescence staining throughout.



The lock chamber valves of Locks 16 and 17 are the original design from 1916 and while they have been repaired over the years, major rehabilitation or replacement is required. Failures of these types of valves, at Ranney Falls, have occurred which impacted navigation and visitor experience.

**b) Hagues Reach Lock 10 and Canal Walls Concrete Rehabilitation**

The Hagues Reach Lock 10 is located on the Trent River and part of the Trent-Severn Waterway. The lock serves to provide navigation along the Waterway. The lock is approximately 4 km south of the town of Campbellford, Ontario.

Lock 10, built in 1913, is a concrete gravity structure with two stacked-timber mitre-type gates. The lock gates 1 & 2 and gates 3 & 4 were modified to be operated hydraulically in the 1970's and 2005, respectively, and the hydraulically operated filling and discharge valves 1 & 3 were automated in 2005.

**c) Percy Reach Lock 8 Concrete Repairs**

The Percy Reach Lock 8 is located on the Trent River and are part of the Trent-Severn Waterway. The lock serves to provide navigation along the Waterway. The lock is located about 20km south of the town of Campbellford, Ontario. Lock 08, built in 1913, is a concrete gravity structure with two stacked-timber mitre-type gates. In 1971 a major shotcrete rehabilitation of the lock and approach walls was undertaken.

**d) Meyers Lock 9 Concrete Repairs**

The Meyers Reach Lock 09 is located on the Trent River and are part of the Trent-Severn Waterway. The lock serves to provide navigation along the Waterway. The lock is located south of the town of Campbellford, Ontario.

Lock 09, built in 1913, is a concrete gravity structure with two stacked-timber mitre-type gates. A concrete rehabilitation project was undertake on the lock chamber walls in 1967.

Lock 9 has two sets of filling and discharge valves set in shafts in the concrete walls of the lock. The set of valves on the east side of the lock are hydraulically operated, while the valves on the west side of the lock are manually operated and rarely used. Each gate leaf is actuated by a horizontal pinion/gear train mounted on a steel frame. Each gear train is driven by a manual crank mechanism with two selectable gear ratios. Lock valves #2, #3, and #4 are of the vertical wagon type and are original to the lock, with #3 having been converted to hydraulic power. Lock valve #1 was replaced in the fall of 2010 with a new style guillotine valve and is hydraulically powered.

**2.2.10.1 *Existing Structure, Conditions and Constraints***

**a) Healey Falls Locks 15, 16, 17**

The lock gate gudgeon anchors (gate hinges) are in need of replacement as a result of failures of similar anchors at the Sault Ste. Marie lock and two failures on the Trent- Severn, which utilized the same design. The design of the gate anchors has proven to be defective and the anchors for the much larger Sault Ste. Marie gates have been redesigned and replaced. Similar design changes to lock 16 1nd 17 gates are recommended

The existing downstream gate of Lock 16 is constructed of wood, and based on DSR recommendations on similar size gates, the timbers of the gates are not able to withstand the pressures imposed on them & should be replaced with larger timbers or a new steel design.

The intake chamber and tunnel walls of Lock 15 are also in need of rehabilitation as found during the 2014-15 rehabilitation of the canal walls. Due to schedule and contractor constraints, they could not be added into the scope of that project and the work was delayed until the Lock 16/17 project was tendered. The deterioration is such that the gaps between the trash racks and the walls around them are large enough to allow the debris to pass into the chambers.

**b) Haques Reach Lock 10 and Canal Walls Concrete Rehabilitation**

The lock walls are generally in good condition. Minor map cracking and associated white deposits (likely to be calcite but possibly alkali-aggregate reaction gel) were noted. A minor spall was present on the west wall. Repairs to these minor deficiencies would be needed in order to extend the service life of the lock. The condition of concrete in tunnels and valve pits is not known. Required repairs to these components of the lock will be identified during the project investigations.

The downstream monoliths are in fair condition. There is extensive cracking of the concrete with associated calcite or AAR gel deposits. Some cracks are hairline but there are some that are wider. It needs to be investigated that rehabilitation of the downstream monolith will be a standard cut back and recast rehabilitation. The concrete walls downstream of the lock have suffered extensive spalling and erosion, particularly in the area downstream of the lock bulkheads. There is water line erosion in a number of areas. Comprehensive rehabilitation of these walls will be required. The linear limit of repairs will need to be qualified during the investigation process.

A structural assessment of the downstream stacked timber gates was undertaken as part of a Dam Safety Review in 2015. The bottom timbers have deficiencies related to their structural capacities based on the current wood design code and the assumed grade of timber. The DSR provided the following recommendations to address the deficiency: accept the non-compliance and monitor only; modify the gate design with respect to timber size after a more detailed analysis; or replace the timber gate with a steel gate. The preferred solution may be to replace the lower timber gates with steel gates.

**c) Percy Reach Lock 8 Concrete Repairs**

Note: There have not been recent inspections of this lock. The scope may need to be defined during the inspection process.

**d) Meyers Lock 9 Concrete Repairs**

The canal walls upstream of the lock are in to good condition and are not included in the project scope. The east (left) upstream wall is in good condition along approximately 60% of its length. Towards the upstream end of the wall (the painted section) there is freeze/thaw deterioration and spalling of the concrete. Some fine vertical cracks with calcite deposits are present. Repairs will be limited to the deteriorated section with the goal of extending its service life.

The lock walls are generally in good condition. Concrete rehabilitation was undertaken on these walls in 1967. The lock walls are not included in the project scope. There are areas of poor concrete condition in the valve pits. The scope includes repair of these components to extend service life. Extent of repairs is to be based on inspection.

The downstream monoliths are in fair to poor condition. There is extensive map cracking of the concrete on the east bulkhead. On the west bulkhead there is also extensive map cracking of the concrete. On the west abutment there is some concrete spalling at the construction joint

below the concrete cap and at the base of the monolith. A potential spall was observed at the interface with the staircase. The rehabilitation of the downstream monolith could be a standard cut back and recast rehabilitation.

The east (left) downstream wall has suffered extensive freeze/thaw deterioration in a number of areas. The upstream and downstream ends of the wall remain in good condition. There is deterioration at joints and vegetation growth was observed in these joints. Rehabilitation of this wall is included in the scope.

The west (right) downstream wall is deteriorated due to freeze/thaw cycle effects from approximately the mid-point of the wall to the downstream end of the wall. Upstream of this, the concrete is in fair condition. Rehabilitation of this wall is included in the scope. The extent of linear repairs will be identified in the inspection process.

A structural assessment of the downstream stacked timber gates was undertaken as part of a DSR in 2015. The bottom timbers have deficiencies related to their structural capacities based on the current wood design code and the assumed grade of timber. It was recommended to address the deficiency: accept the non-compliance and monitor only; modify the gate design with respect to timber size after a more detailed analysis; or replace the timber gate with a steel gate. The preference would be to replace the lower timber gates with steel gates.

#### **2.2.10.2 Scope of the Work**

##### **a) Healey Falls Locks 15, 16, 17**

The primary objective of this project is to recapitalize the lock structure of Lock 16, 17 and the remaining portion of Lock 15, by repairing the concrete walls, tunnels, chambers, coping and assessing the condition of the supporting concrete.

Secondary Objective is to rehabilitate/replace the existing valves of Lock 16 and 17; replace the gate hinges on the lower gates at Lock 17; replace the downstream gates of Lock 16 with new steel gates, complete with the new hinge detail; and repairs to intake chamber walls and concrete of Lock 15 not completed in the previous project.

A third related objective being considered by Parks Canada is the future replacement of the existing Lock 16/17 Control building, with a new building that will meet the needs of the Operational and Maintenance Requirements as well as address any accessibility issues for the public. The building scope has not yet been developed or funded and is for consideration in facilitating design of the lock rehabilitation for compatibility with this future potential project.

In Summary the scope of work is as follows:

- i. Recapitalize the lock walls of Lock 16 and 17 including the chambers, coping and floor as necessary;
- ii. Completely replace the existing valves for Lock 16 and 17 with new valves and the associated work related to the installation. This work may include an investigation or comparison of implementing new valve systems at this location;
- iii. Remove existing lower lock 17 gate hinges, and replace with new design previously approved for implementation;
- iv. Removal of the downstream wood gates of Lock 16 and install the newly designed steel gates, complete with the new hinge design, and commission;
- v. Removal & replacement of concrete, etc. of the intake chamber and tunnel walls of Lock 15 and reinstating or replacing the trash racks.

**b) Haques Reach Lock 10 and Canal Walls Concrete Rehabilitation**

The primary objective of this project is to recapitalize the lock structure of Lock 10 by a comprehensive concrete rehabilitation of downstream monoliths and lower approach walls. It is anticipated that that this could be a standard cut back and recast rehabilitation typical for Locks on the TSW. The project also entails the replacement of the lower timber lock gates with new steel gates.

Secondary objective is isolated concrete repairs to chamber walls and tunnels, inspection, coring and testing as required to quantify scope and develop rehabilitation and repair options.

Scope definition will require dewatering of lock chamber by contractor to facilitate inspection, testing and scope definition.

**c) Percy Reach Lock 8 Concrete Repairs**

The primary objective of this project is to recapitalize the lock structure of Lock 08 by a comprehensive concrete rehabilitation of downstream monoliths. It is anticipated that that this will be a standard cut back and recast rehabilitation typical for Locks on the TSW. The project also entails the replacement of the lower timber lock gates with new steel gates. Secondary objective is concrete repairs within the valve pits as required. Scope definition will require dewatering of lock chamber by contractor to facilitate inspection, testing and scope definition.

**d) Meyers Lock 9 Concrete Repairs**

The primary objective of this project is to recapitalize the lock structure of Lock 09 by a comprehensive concrete rehabilitation of downstream monoliths. It is anticipated that that this will be a standard cut back and recast rehabilitation typical for Locks on the TSW. The project also entails the replacement of the lower timber lock gates with new steel gates.

Secondary objective is isolated concrete repairs to deteriorated sections of the upstream and downstream approach walls and concrete repairs within the valve pits.

Scope definition will require dewatering of lock chamber by contractor to facilitate inspection, testing and scope definition.

**3 PROJECT OBJECTIVES****3.1 Construction Principles**

The Construction Manager is required to maintain a high standard of work based on state-of-the-art principles and practices compliant with PWGSC standards. All construction activities are to be fully coordinated resulting in cost and time effective services and successful completion of the project. Construction is to be consistent across all sites to the extent possible and incorporate lessons learned from the earlier Work to that occurring later in the program.

The project is to be implemented in an environmentally responsible manner using recognized strategies to minimize the environmental impact of the Work. The Construction Manager is to apply this principle to all construction activities across the sites.

**3.2 Environmental Management**

The project is to respect the fundamentals of aesthetics in the design of the structure by taking into account its integration into the environment including landscaping.

To meet Parks Canada's mandate, section 67 of the Canadian Environmental Assessment Act and conditions under the Species at Risk Act, the project must include exploring the

opportunities available to reduce the environmental impact of the project, operations and maintenance, and improve the nearby aquatic and terrestrial environment.

An Environmental Impact Assessment (EIA) will be undertaken by PCA and/or PWGSC for each site and the EIA reports will be made available to all stakeholders. Design and construction is to be compliant with the final EIA report and the environmental mitigations identified therein.

The following concerns, restrictions and issues will be established during the EIA process.

1. Additional restrictions on allowable range of flow rates to support fish spawning in various locations along the waterway may be applicable to the project areas.
2. Fisheries and Oceans Canada (DFO) review may be required to perform some of the Work. Requirements will be confirmed as part of the EIA process,
3. Breeding birds require that tree removal schedule is sensitive to breeding bird timing.

### **3.3 Project Objectives**

The objective of this project is to rehabilitate/replace the specified dams within the Cultural Resource Management process to meet the requirements of the Parks Canada Directive for Dam Safety with a service life of 80-100 years for the new or rehabilitated structures as effectively as possible with minimal impact on waterway operations, wildlife, the public including waterway users and neighboring properties, and continued support of affected communities and municipalities.

### **3.4 Cultural Resource Management**

For the rehabilitation work of the TSW Southern Sector, Cultural Resource Impact Analysis (CRIA) will be required for the specific projects. The CRIA is now a component of the Agency's Project Management Standard and must be considered as part of each Request for Project Approval. Cultural resource management (CRM) advice and mitigation measures will be incorporated into the detailed environmental impact assessment (DIA) report by PCA.

The proposed projects involve dams, fixed bridge, locks and landscapes that are cultural resources of "Other Heritage Value". These assets are cultural resources of other heritage value because they exemplify a form of transportation and water management technology used on the Trent-Severn Waterway National Historic Site. More specifically they contribute to the working assemblage and functional arrangement of engineering structures that make the TSW an operational system of through-navigation. The Southern Sector Dams are part of the 52 dams of various form and material that are cultural resources on the Trent-Severn Waterway, which together demonstrate the evolution of engineering construction and standard materials on the Waterway.

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

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

The dams and related installations are important heritage components of the waterway. The character-defining elements contributing to the heritage value of the Dams, Fixed Bridge and Lock include their:

1. in situ location on the Trent-Severn Waterway;
2. dimensions, design and functional qualities
3. concrete construction;
4. general massing and low profile silhouette.
5. simple, geometric, aesthetic design;
6. number and form of sluices, piers, and spans;
7. log-lifting mechanism, including its associated mobile log hoist, and steel track system; and
8. wooden stop-logs to control water flow.

Key elements contributing to the heritage value of the installations include:

1. Continued functional use;
2. Mode of operation;
3. Physical construction;
4. Overall form and massing; and
5. Contribution to the integrity of the cultural landscape as a component of the working assemblage of engineering structures.

There may be locally significant Natural Heritage features within the vicinity of the project sites, the extent of which will be determined during the early project phases, Requirements Analysis, Concept Design and Design Development.

CRM Policy (PCA Cultural Resource Management Policy, 2013) outlines the requirements for managing the wide range of cultural resources administered by Parks Canada. Its objective is to ensure that cultural resources administered by Parks Canada are conserved and their heritage value is shared and protected. Under the Parks CRM Policy, conservation of heritage value must be a primary consideration in any intervention directed at a cultural resource. Therefore, the primary recommended conservation approach based on the Standards and Guidelines for the Conservation of Historic Places in Canada is rehabilitation with an emphasis on minimal intervention. Minimal intervention in the context of heritage conservation means doing what is required to arrest and correct deterioration or meet necessary codes while protecting heritage value as much as possible.

For any addition, modification and extension, the guidelines recommend:

- Balancing the need to alter constructed elements to meet current safety codes and standards with the need to preserve the heritage value of the work's functionality and operation;
- Designing and installing new mechanical or electrical systems or equipment when required for the continued use, in a manner that minimizes adverse effects on the cultural resource;

- Adding new features to meet health, safety or security requirements, in a manner that conserves the constructed elements and minimizes impact on the heritage value of the engineering work;
- Designing addition, modification and extension to a constructed element in a manner compatible with the engineering work and respects its heritage value.

Parks Canada recognizes however that the Cultural Resource Management Policy and the Standards and Guidelines do not provide site-specific recommendations. To ensure that the project managers and design consultants planning interventions on the Trent Severn Waterway have more specific guidance, Parks Canada has elected to produce the TSW Conservation Guidance (document to be provided to the successful Construction Manager).

The TSW Conservation Guidance is meant to provide an understanding of Parks Canada's expectations to those undertaking planning and design work for the Trent Severn Waterway NHS, so that there is a common understanding of what is to be achieved not only and effective use of resources to ensure that the new work promotes the protection and conservation of the historic place, and that the TSW Vision and that the Commemorative Integrity of the TSW National Historic Site is upheld / is not compromised.

The TSW Conservation Guidance is meant to provide overall direction for new work, leaving sufficiently flexibility to the designers so they are clear to pursue excellence on their design mandates.

The TSW Conservation Guidance is not meant to interfere with, alleviate, or distract any consultant obligations to meet Codes, Standards and/or Best Practices relevant to the work.

Where on a site-specific basis two or more Conservation Guidance statements conflict, project managers and design consultants are encouraged to seek advice from Parks Canada.

Also, to ensure that conservation is based on a thorough understanding of an historic place and its character-defining elements, the Guidelines always recommend documenting and assessing the form, materials and condition of an historic place and its character-defining elements before any intervention decision and subsequent work. Further investigation and clarification of heritage value and character-defining elements will be required for each cultural resource in order to properly assess impacts and propose mitigation measures. Specific recommendations and required mitigations – based on heritage value and character-defining elements - should be incorporated throughout the phases of the projects. Under the CRM Policy, cultural resources must be recorded and documented to preserve a public record, particularly in cases of potential loss due to human or natural forces and when long-term stabilization or in-situ preservation are not possible. These records must be maintained, accessible and up-to-date and managed in accordance with the TB Directive on Recordkeeping.

As part of the CRIA process, an Archaeological Overview Assessment (AOA) will be done for the Project Area, including vehicular access routes, staging areas and areas proposed for signage and fencing. Based on the results of the AOA, an Archaeological Impact Assessment and/or additional mitigation measures may be required, prior to construction activities. These guidelines (PCA Guidelines for Management of Archeological Resources, 2005) provide direction to all Parks Canada personnel, other organizations and individuals undertaking projects and activities that may affect terrestrial and submerged archaeological resources in heritage areas administered by Parks Canada.

## **4 OPERATIONS**

### **4.1 Navigation**

Operations at the dams are typically limited to the navigation season of May to October to provide a minimum draft of 1.8 m along the reach for navigational requirements.

Work is to be planned in co-ordination with the waterway navigation season and site operations such that no interruption in navigation occurs.

Parks Canada's navigation season typically starts Victoria Day weekend and ends Thanksgiving weekend. Anticipated Navigation Seasons:

1. 2016 - May 20<sup>th</sup> to October 10<sup>th</sup>.
2. 2017 - May 19<sup>th</sup> to October 9<sup>th</sup>
3. 2018 - May 18<sup>th</sup> to October 8<sup>th</sup>.
4. 2019 - May 17<sup>th</sup> to October 14<sup>th</sup>.
5. 2020 - May 15<sup>th</sup> to October 12<sup>th</sup>.

Marine traffic shall not be interrupted during the Navigation Season, except intermittently and for a very short period at a time, if absolutely necessary and approved by the Departmental Representative.

In order to ensure continuity of operations the construction of elements below lake level are to be undertaken 'in the dry' to the extent possible while maintaining a discharge capacity to assure the effective and safe water management of the waterway.

The waterway is an interconnected system and water flow management requirements at any one site may involve water flow management at a number of upstream and downstream installations. Design and construction must take into consideration the upstream and downstream impacts.

#### **4.2 Flood Mitigation**

A key objective of this project is to provide effective water management of the waterway and enhanced safety for people, and protection of property. The project is to be delivered while maintaining, at all times, a discharge capacity to ensure the water management of the waterway in a safe manner. Management of the operational facilities at the work site as well as any upstream and downstream adjustments will remain with PCA.

### **5 PROJECT DELIVERY**

The full scope of the project is to be delivered on time, on budget and to a high standard of quality compliant with PCA's requirements. Additional information may come to light during site investigations and the current scope as defined herein may have to be adjusted to meet these findings.

#### **5.1 Municipal Approvals and Access to Property**

Municipal approvals may be required for site access and traffic control during construction. Use of right-of-ways and encroachment on adjacent lands used by the public or residents may require collaboration and special arrangements to minimize disruptions. Securing and acquiring such approvals and permits in a timely manner is the Construction Manager's responsibilities.

#### **5.2 Codes and Standards**



Design and construction must comply with the latest edition of Federal, Provincial and Municipal Acts, Regulations, Bylaws, Codes, Guidelines and decisions of Authorities having jurisdiction. In addition PWGSC and PCA Policies, Directive and Standards must be adhered to. The following is provided for information only. Compliance to the regulatory requirements is a condition of the contract. The following list is not to be considered inclusive. The Construction Manager is to become familiar with all applicable regulatory requirements. Any conflict or inconsistencies with the regulatory requirements and these Terms of Reference is to be brought to the attention of the Departmental Representative for resolution. The Consultant will be responsible for designing to code where applicable and the Construction Manager must construct to code.

1. Navigation Protection Act
2. National Building Code of Canada;
3. Canadian Highway Bridge Design Code;
4. Canada Labour Code;
5. Canada Occupational Health and Safety Regulations;
6. Treasury Board of Canada Secretariat, Directives and Standards;
7. Environment Canada Codes of Practice;
8. Canadian Standards Association, Standards and Guidelines;
9. ANSI, ASHRAE, ASTM, AWMAC, FM, MPI, TSSA, ULC Standards;
10. Provincial Codes and Municipal Codes and By-Laws, as applicable
11. PCA Guiding Principles and Operational Guidelines: National Historic Sites Policy (1994)
12. PCA Cultural Resource Management Policy (2013)
13. Standards and Guidelines for the Conservation of Historic Places in Canada
14. PCA Guidelines for Management of Archeological Resources (2005)
15. Archaeological Heritage Policy Framework (1990)

Authorities having jurisdiction may choose to review the design in order to provide approvals and permits required for the project.

As per the Historic Canal Regulations applicable to lands administered by the Trent-Severn Waterway 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 project activities.

There are no Canadian codes that specifically cover dam structure design. Design criteria have been developed by the Canadian Dam Safety Association, the Permanent International Association of Navigation Congresses, the Quebec's Dam Safety Act and Regulation, and various sources such as handbooks, manuals and texts of various origins.

Standards and codes to be used for the design and construction of the asset must be the latest edition of the following (including all amendments, supplements and revisions thereto). In case of conflict or discrepancy between codes and standards, the most stringent requirement shall apply.

16. Canadian Dam Association Guidelines 2007

17. Canadian Dam Association Technical Bulletins
18. Parks Canada Directive for Safety on Dams and Water Retaining Structures
19. Permanent International Association of Navigation Congresses Design Criteria
20. Lakes and Rivers Improvement Act (LRIA)
21. Canadian Manual on Foundation Engineering, National Research Council, Canada.
22. Concrete design in accordance with CAN3-A23.3, steel design in accordance with CAN/CSA-S16.1.
23. Environmental loads in accordance with the Supplement to the National Building Code of Canada.
24. “Design of Small Dams”, document published by U.S. Dept. of the Interior, Washington.
25. Gravity Dam Design, EM 1110-2-2200, US Army Corps of Engineers
26. Deck design in accordance with CAN/CSA-S6, Canadian Highway Bridge Design Code is the primary code to be used for design with appropriate live load levels.
27. Specific reference to the following codes may be required for clarification:  
American Association of State Highways and Transportation Officials (AASHTO) Standard Specifications for Highway Bridges and Interim Specifications and the National Building Code of Canada.
28. Load factors and resistance factors to be compatible with a target safety Beta index appropriate for ultimate limit states construction design, for an 80 to 100 year design service.

Other design codes may be available from different jurisdictions reflecting new developments in structural engineering and may be utilized whenever they appear appropriate in accordance with proper engineering practice.

Construction is to comply with design intent and be in compliance with applicable codes and standards.

### **5.3 Sustainable Development**

Parks Canada is committed to helping Canada combat climate change and reduce greenhouse gas emissions, consistent with our nation's international obligations and our nation's need for sustainable economic growth. The Trent Severn Waterway National Historic Site is a holding for the long-term that is to be maintained for the enjoyment and benefit of Canadians today and in future generations. Parks Canada therefore wishes the work to be implemented under the 2016-2021 Trent Severn Waterway program of projects to endure for many decades with minimized maintenance and O&M costs - a long-term capital investment that illustrates excellence in environmental sustainability.

The project is to be implemented in an environmentally responsible manner that balances environmental performance, social and cultural sustainability and conservation objectives.

The Real Property Branch (RPB) of PWGSC, has developed a Sustainable Development Strategy that sets out principles, goals and actions for integrating sustainable development principles into its policies and operations.

1. To sustain our natural resources, by ensuring sustainable use of renewable resources and efficient use of non-renewable resources.
2. To protect the health of Canadians and of ecosystems, by managing the risks associated with toxic substances, by protecting representative areas, and by developing effective warning and adaptive response capability to both natural and human-caused disasters.
3. To meet our international obligations, by contributing to the protection of the ozone layer, the reduction of greenhouse gas emissions, and the conservation of biodiversity.
4. To improve our quality of life and well-being, by fostering improved productivity through environment efficiency, including environmentally friendly maintenance procedures and products, and by supporting innovation towards sustainable development.
5. To contribute to the prevention, reduction and, where possible, the elimination of negative impacts on humans and the environment in their land and marine / fresh water activities.
6. To contribute to the prevention, reduction and, where possible, the elimination of negative impacts of contaminated sites on humans and the environment.
7. To contribute to the use and promotion of more efficient, environmentally friendly alternative sources of energy.
8. To include the principle of life-cycle management in the analysis of project development options and design solutions.
9. To actively encourage and support the prevention, reduction and, where possible, the elimination of impacts of toxic or hazardous substances and wastes on human health.
10. To promote the conservation of renewable and non-renewable resources through appropriate waste management, including the application of 3R concepts (reduce, reuse, recycle) for the reduction of waste.

PWGSC has also prepared the following guidance documentation outlining sustainable design principles to be included for federal real property projects:

Environmentally Responsible Construction and Renovation Handbook:

<http://www.tpsgc-pwgsc.gc.ca/biens-property/gd-env-cnstrctn/page-1-eng.html>

The project shall be aligned with the Federal Sustainable Development Strategy (FSDS) and federal government's framework for sustainability. Priorities include life cycle assessments, reduce energy usage and greenhouse gas emissions, and use durable and low environmental impact materials wherever possible and appropriate.

#### **5.4 Solid Waste Management**

The project will be implemented in an environmentally responsible manner.

The Construction Renovation and Demolition (CRD) waste management practices must be carried out in line with industry standards to support Federal Sustainable Development Strategy, and, at minimum, should seek to reuse and/or recycle all possible materials where local services and markets exist, and should ensure that CRD waste management practices meet any provincial regulations, city and/or municipal bylaws concerning CRD waste.

A waste management program must comply with applicable provincial regulations and federal policies. For all Real Property Branch projects greater than \$1 million, a solid waste

management program must be implemented to maximize reuse and recycling opportunities where the infrastructure exists. This requirement exists by regulation in the province of Ontario for projects greater than 2,000 m<sup>2</sup> (O. Reg. 102/94 and 103/94) and by policy for the rest of Canada. It is a PWGSC best practice to achieve a minimum landfill diversion rate of 75%.

## **5.5 Health and Safety**

PWGSC recognizes the responsibility to ensure the health and safety of all persons on Crown construction projects and the entitlement of both federal employees and private sector workers to the full protection afforded them by occupational health and safety regulations.

In keeping with the responsibility and in order to enhance health and safety protection for all individuals on federal construction sites, PWGSC will voluntarily comply with the applicable provincial/territorial construction health and safety acts and regulations, in addition to the related Canada Occupational Health and Safety Regulations.

## **5.6 Constraints and Challenges**

There are a number of challenges associated with the Work in addition to cost and time constraints including:

1. The Work being undertaken on a navigable public waterway that is operated open for navigation between the middle of May (Victoria Weekend) to the middle of October (Thanksgiving Weekend). The fall drawdown of the water level is typically completed by the 1<sup>st</sup> week of November;
2. Much of the Work being undertaken with the public being immediately at hand as waterway users and owners/operators of adjacent properties;
3. Public safety;
4. Given that the sites are critical habitats for Eastern Fox Snake, Massasauga Rattlesnake, Englemann's Quillwort, Blanding's Turtle, Eastern Musk Turtle and Eastern Whip-poor-will; Spotted Turtle CH(\*\*\*) overlaps the site) therefore potential for effects on Species at Risk will have to be taken into account when doing the options analysis.
5. Cultural resources of Other Heritage Value that is essential to the commemorative integrity of the Trent-Severn Waterway NHS. A Cultural Resource Impact Analysis (CRIA) will be required for projects in the TSW Southern Sector. Cultural resource management (CRM) advice and mitigation measures will be incorporated into the detailed environmental impact assessment (DIA) report by PCA.;
6. Activity restrictions are significant including:
  - a) Compliance with OMNRF guidelines, "*Ontario Restricted Activity Timing Windows for the Protection of Fish and Fish Habitat*", which limits shoreline disturbance affecting aquatic wild life. Work in the water is not permitted between March 15 and July 15 yearly;
  - b) Bird nesting habitat activities may need to be accommodated for construction works in treed areas;
  - c) Potential for disturbing species at risk;
  - d) Species at Risk including the Channel Darter will have a significant impact on construction practice such as siting of coffer dams in habitat and flow requirements;

7. Restriction periods may vary by site. Site specific in water work restrictions will be confirmed in the environmental impact assessment (EIA) after baseline studies are complete. The breeding bird timing restriction for no vegetation removal works is from March 31st to August 27th for Zone C2. Breeding birds including Barn Swallow (SAR) may inhabit the dam structures and will require exclusion netting prior to the nesting period or work on the dams will be restricted to the March 31st to August 27th period. There are also several Species at Risk considerations and Critical Habitat restrictions for the proposed project areas, additional timeline constraints may be required. It is possible that Dam 1 may have further timing window restrictions for cool water species from Lake Ontario or due to Species at Risk such as the Channel Darter.
8. The number of potential stakeholders extending beyond the immediate area of the work, both upstream and downstream;
9. As part of the CRIA process, an Archaeological Overview Assessment (AOA) will be done for the Project Area, including vehicular access routes, staging areas and areas proposed for signage and fencing. Based on the results of the AOA, an Archaeological Impact Assessment and/or additional mitigation measures may be required, prior to and during construction activities.
10. Potential for significant environmental impact including risk of excessive waterway drainage and possible flooding;
11. Restricted site access and local traffic impedance to large equipment and construction traffic;
12. Restricted laydown areas for site facilities, equipment, materials and supplies. The CM will be responsible for identifying suitable laydown and access areas to facilitate construction and be responsible for leasing property for off-site requirements;
13. Work will be impacted by weather conditions and may be severely curtailed during winter and spring thaw;
14. Some of the Work may be subject to First Nations interest and consultation
15. Coordination of work with private power proponents (e.g. Dam 01); will be a significant challenge.

## **6 TECHNICAL REQUIREMENTS**

The following information is presented as reference for the Construction Manager to provide a basic understanding of the design requirements. Not all technical requirements apply to every installation or Site. The Consultant is responsible for design however the Construction Manager has to evaluate and report on the constructability and effectiveness of the design from a construction perspective.

### **6.1 Design Philosophy**

The design process will include the requirements stipulated within the cultural resource management process that influence the selection of materials, forms and features of structural and mechanical components including landscape features. The primary approach is to provide the least intrusive intervention to the components to meet current standards and code requirements.

## 6.2 Structures

The intent of this project is to replace or rehabilitate the existing structures through the design and construction of new or rehabilitated structures complete with all ancillary installations, operator safety features, fencing for public safety, shoreline stabilization and protection, landscape and embankment works, commissioning, demolition and/or removal of replaced installations and site restoration. This work also involves providing temporary installations including coffer dams, and establishing flow diversion system, the salvage of historical operational features, and de-mobilization including removal of the cofferdams, flow diversion system, and all associated temporary ancillary works that facilitate the construction effort.

The existing dams, locks and associated structures, including but not limited to decks, piers, abutments, spillways, downstream aprons, etc. are to be rehabilitated for a minimum 80 to 100-year service life. This may be achievable in one of three ways: in-place replacement, immediately-downstream replacement, or even immediately-upstream replacement dam positioning. An options analysis will be undertaken considering time to construct, time to de-construct, risk and cost as appropriate. Each option will consider the applicability and use of a temporary waterway flow diversion channel and full-width cofferdams; single stage construction, as well as alternative multi-stage, half-width or third-width construction with limited coffer dams.

The work includes but is not limited to:

1. The dams and gate are to be designed and constructed to provide the required strength, durability, overall stability, safety and serviceability with appropriate safeguards against excessive cracking, fatigue, unacceptable deformation, pre-mature corrosion, deterioration of material, commensurate with a design service life of eighty (80) to one hundred (100) years.
2. The new dams are to have generally the same overall appearance and operational feel, the manual log hoist system is to be retained in the new design with operational safety features investigated and adjusted as may be necessary except in the case of a dam being converted from manual to mechanized operations.
3. The dam decks may currently be open to the public with the exception of the operation equipment that is isolated by guardrails. In such cases the general arrangement will be maintained for the new structures and public safety measures will be designed and constructed for this accommodation and considering site specific conditions. The measures will include but are not necessarily limited to:
  - a) Installation of permanent (considering ice loads) safety boom upstream of dam in compliance with Transport Canada/PCA approval for boom installation. Boom positioning will be constrained by existing private homes upstream of dam and will have to terminate at PCA property;
  - b) Public safety and operator enhancements based on CDA Guidelines and Parks Canada Agency practice and standards including handrails, floatation devices and fall arrest systems;
  - c) A combination of security fence and handrail, as applicable, to be installed all around perimeter of dam and the operation deck; and
  - d) Upgrading signage throughout dam site using PCA templates including signs to inform public to stay out of operation area of the dam.
  - e) The deck designs are to follow the Cultural Resource Management requirements process to determine the final materials and design features. Materials to be

considered include: wood; concrete and steel grating or a combination of these.

4. The piers are to retain the same overall appearance and operational feel however the shape will be verified to meet current standards to diminish hydraulic turbulence and losses, in accordance with the requirements of the “Design of Small Dams”, document published by U.S. Dept. of the Interior, Washington.
5. The design is to incorporate an evaluation of high performance construction materials including life cycle costing and environmental sustainability analyses of various design alternatives (e.g. zinc-coated re-bar (galvanized) or GFRP, high performance concrete, etc.).
6. Repair and/or replacement of the existing concrete approach walls, training walls, and downstream shoreline protection walls if and as required for minimum 100-year service life. Downstream retaining walls and/or training walls, if present will be either replaced or fully rehabilitated to achieve the same service life. New or extended training walls may be required at some sites to adequately protect the shoreline.
7. All sluice gates of the replacement dams are to be fully mechanized using steel gate arrangement with gate lifting mechanism located directly on a mechanical deck, which is level with the main dam deck (gantries shall not be used). Two options will be investigated, vertical gates and radial gates, considering as a minimum cost benefit analysis including delivery, installation, operations and maintenance.
8. Vehicular access decks, if such access is specified for a given site, shall be designed and constructed in compliance with the latest edition of the Canadian Highway Bridge Design Code (CHBDC) for a typical maintenance vehicle to be specified.
9. Replacement dams shall include provision for a new prefabricated control house, and for an enclosed emergency backup power generating system. Emergency power backup system shall be built to supply emergency power to: the dam control, instrumentation, and alarm equipment, gate hoisting motors, gate and gain heaters, and lighting.
10. Both 220V and 110V power supply shall be provided to the dam from available sources adjacent to the site. Wiring and electrical power systems as required for 65-year time-to-first-major-repair, and for possible future needs (requirement to be provided by User Department).
11. Replacement of the entire electrical system, new lighting, signalization and controls systems, control house and enclosed back-up generator.
12. Full mechanization of the dam using standardized gates, lifting mechanisms, heaters, controls, instrumentation, safety equipment, etc.
13. Mechanical, Electrical and Instrumentation/Control Systems and elements shall achieve three possible modes of operating the gates: fully automated mode (push-to-open-fully), selectively automated mode (controlled lift height), and manual operation mode using a single piece of self-powered equipment standardized for use at all dams with the same gate/lifter design. Automatic modes shall be operable using either main electrical power supply network, or using on-site backup generator as automatically and manually-forced switchable sources. The accepted standardized gate design shall feature an active braking system feature of high reliability and low maintenance requirements.
14. All new structural components installed are to be protected against corrosion. Stainless steel for vertical gate gain sleeves, service gain sleeves, spillway sill beams, pier liner

plates for radial gates, pier nosing plates and for concrete-embedded heating element ducts, is preferred. All structural steel installations will be subject to inspection by a NACE (National Association of Corrosion Engineers) accredited inspector.

15. The up-stream and down-stream shore lines are to be stabilized and protect from erosion.

16. The work site is to be restored to “as-before” conditions.

Other Requirements:

17. The sill beam of each sluice to be machined and ground to fit the stop logs to minimize leakage.

18. The timber stop logs to be designed for the hydrostatic and hydrodynamic forces caused by the water at maximum water elevations and flows.

19. All stop log gains are to receive bent plate gain liners and aluminium gain covers.

20. An options analysis is to be provided for the fall arrest safety system to include an overhead gantry structure to be designed to provide for a fall arrest tie-off system to protect dam operators and an alternative solution.

21. Repair and/or replacement of the existing concrete approach walls, training walls, and downstream shoreline protection walls if and as required for minimum 100-year service life. Downstream retaining walls and/or training walls, if present will be either replaced or fully rehabilitated to achieve the same service life. New or extended training walls may be required at some sites to adequately protect the shoreline.

22. All sluice gates of the replacement dams will be fully mechanized using steel gate arrangement with gate lifting mechanism located directly on a mechanical deck, which is level with the main dam deck (gantries shall not be used).

23. Vehicular access decks, if such access is specified for a given site, shall be designed and constructed in compliance with the latest edition of the Canadian Highway Bridge Design Code (CHBDC) for a typical maintenance vehicle to be specified.

### **6.3 Earth Dams Rehabilitation**

The design and construction are to include the requirements stipulated within the cultural resource management process to influence the selection of landscape features. The primary approach is to provide the least intrusive intervention to the existing components to meet requirements identified in the specific projects and current standards and code requirements.

## **7 EXISTING DOCUMENTATION**

The existing drawings and documents provided for this project are to be treated as reference material only. PWGSC and PCA cannot ensure their completeness and accuracy. As such the Construction Manager is responsible to review and confirm all information and inform PWGSC of any discrepancies.

A full list of documents related to the South Bundle project is provided in Annex A, of the Terms of Reference.

It is important to note that the structures may have been repaired and strengthened over time and features may have changed since original construction. The existing drawings and documents, including “as built” records may not be accurate.

Note that bathymetric information of the area is not available.



## **8 RESOURCE REQUIREMENTS**

The Construction Manager shall assign suitably qualified and experienced personnel from across an appropriate range of disciplines. The following list is provided for reference only and is not to be considered 'all-inclusive'. The Construction Manager will establish the expertise and experience necessary to complete the assignment based on the information provided herein and referenced documents.

- a) Project Management;
- b) Construction Management;
- c) Environmental Management
- d) Cost Estimating;
- e) Scheduling;
- f) Quality Management;
- g) Contract Administration;
- h) Waste Management;
- i) Risk Management;
- j) Emergency preparedness planning.
- k) Site Superintendence; and
- l) Site Health and Safety Management.

## **PROJECT ADMINISTRATION (PA)**

### **1 Roles and Responsibilities**

#### **1.1 PWGSC**

PWGSC administers the project on behalf of Canada and exercises continuing control over the project during all phases of development. This project is to be organized, managed and implemented in a collaborative manner. Under the leadership of the Departmental Representative, all team members are responsible for establishing and maintaining a professional and cordial relationship.

##### **1.1.1 Departmental Representative**

The PWGSC Project Manager assigned to the project is the Departmental Representative (DR). The DR is the overall Project Technical Authority as defined in R2820D GC2.1, providing direction to the Construction manager in all project matters. The DR will coordinate with the Construction Manager, the Consultant, the Project Team and the Technical Resource Team to ensure the each party is provided with all required information in a timely manner.

1. Is directly concerned with the Project and is responsible for its progress;
2. Liaises with PCA and other stakeholders, obtains their requirements, and conveys these requirements to the Consultant and Construction Manager as required;
3. Briefs and directs the Construction Manager and is the official conduit for the exchange of information between the Construction Manager, the Consultant, PCA and other stakeholders;
4. Arranges with the Construction Manager and others for review, feedback and acceptance of all design and Contract Documents, conveys review comments to the Consultant, and co-ordinates any discussion arising from the reviews and comments;
5. Liaises with PWGSC Contracting Authority, RPC – Ontario Region.

##### **1.1.1 PWGSC Contracting Authority**

The PWGSC Contracting Authority (Real Property Contracting Directorate [RPC]) as defined in R2820D GC 2.1 is responsible for the establishment and management of the Construction Management agreement including Contract Amendments, and any contractual issues related to it. The PWGSC Contracting Authority will at times attend and participate in Construction Management Meetings.

##### **1.1.2 PWGSC Technical Resources**

PCA technical staff and other consultants retained by PWGSC will be considered members of the PWGSC Technical Resources Team providing professional services to the Departmental Representative to ensure technical requirements are suitably defined and incorporated through all phases of research, planning, design and implementation. The PWGSC Technical Resources Team will participate regularly in design and construction phases and will review all deliverables at the request of the Departmental Representative.

##### **1.1.3 PWGSC Commissioning Manager**

The Construction Manager will act as Commissioning Manager for the Crown for installations requiring commissioning.

#### **1.1.4 PWGSC Project Management Consultants**

PWGSC may engage the services of a Project Management Consultant reporting directly to the Departmental Representative to assist with the management of the project.

#### **1.1.5 PWGSC Specialty Consultants**

PWGSC may, from time to time, engage specialty consultants to undertake investigations and provide reports on various aspects of the Work, including quality assurance services.

### **1.2 Client Department**

Parks Canada Agency (PCA) is the Client Department for this project, and will participate and provide input to deliverables reviews and acceptance processes at the request of, and through the Departmental Representative. PCA will work closely with the Departmental Representative to define the project requirements, facilitate access to the site and support the Project Team.

PCA is responsible for completion of the EIA and will permit all construction activities under the Historic Canal Regulations. This permit must be obtained and the environmental management plan must be approved by PCA prior to mobilization to site.

### **1.3 Consultant**

PWGSC intends to engage up to two (2) Design Consultants, including one (1) Prime Consultant. Sub-consultants and specialists with extensive relevant experience may be retained by PWGSC to provide design and technical services throughout the project. Design Services may also be provided by PWGSC and/or PCA in-house staff.

Design Consultants will provide design services including the following Project Phases: Requirement Analysis; Design Concept; Design Development and Construction Documents for the Sites identified below. The Design Packages will be tendered separately by PWGSC. The Design Consultants will unlikely participate in the Tender, Construction and Post Construction Project Phases.

The Prime Consultant will be retained to provide design services including the following Project Phases: Requirement Analysis; Design Concept; Design Development and Construction Documents for identified Sites. The Prime Consultant will also be required to provide Tender, Construction, and Post Construction Phase services for all Sites.

#### **1.3.1 Requirement Analysis Phase**

1. Obtaining and reviewing all available project information, previous studies, project reports, statutes, regulations, codes and bylaws which may have an impact on the Work;
2. Meeting with the extended project team, Construction Manager and stakeholders to establish clear project objectives;
3. Identifying Requirements for additional investigations to supplement available information;
4. Reviewing all applicable statutes, acts, regulations, codes and bylaws which may impact on the proposed work;
5. Preparing information packages and presenting to the project team and other stakeholders as may be required;
6. Preparing a Design Plan; and

7. Preparing a preliminary schedule in collaboration with the Construction Manager

### **1.3.2 Design Concept Phase**

1. Assisting the Client Department with preparation of the EIA;
2. Developing design criteria and parameters;
3. Developing a design strategy to ensure that the design complies with project objectives incorporating all Project Plans;
4. Identifying and providing analysis of three design options for each installation identifying benefits and challenges of each options;
5. Assessing the impact on construction implementation including cost, schedule and quality of results in collaboration with the Construction Manager; and
6. Preparing presentations and participating in public information sessions.

### **1.3.3 Design Development Phase**

1. Working with the Construction Manager to define the construction packages and establish the structure and form of the construction documents;
2. Receiving and reviewing the investigative reports for each site;
3. Undertaking additional investigative as may be necessary and authorized by PWGSC;
4. Conducting site assessments with the Construction Manager including topographical surveys to determine the most effective strategy for access and construction;
5. Establishing rehabilitation requirements for each property identifying significant issues; and
6. Advancing the design with enough detail to allow the Construction Manager to develop a Class B construction cost estimate.

### **1.3.4 Construction Documents Phase**

1. Completing the construction documents compliant with PWGSC standards including: PWGSC Doing Business; CADD Standards dated 2011; and the National master Specifications (NMS);
2. Preparing and submitting construction documents at 66% and 99% for review and comment;
3. Incorporating review comments as applicable; and
4. Preparing and submitting construction documents for tender purposes (100%).

### **1.3.5 Tender Phase**

The Prime Consultant will provide technical support to PWGSC during the tender phase as follows:

1. Attending tenderers briefing meetings and pre-tender site visitations;
2. Providing technical support in response to tenderer's questions and for tender amendments;
3. Participating in technical evaluations of tender submissions as may be requested by the Construction Manager and Departmental Representative; and

4. Ensuring that lessons learned during tendering are incorporated in future tender documents as may be required.

### **1.3.6 Construction Phase**

The Prime Consultant will provide technical and administrative services during the Construction Phase including:

1. Preparing “Issued for Construction” documents reflecting any changes identified during the Tender Phase and issued as addenda.
2. Attending construction meetings and providing technical support with interpretation of construction documents, responses to Request for Information, Site Instructions and Contemplated Change Notices;
3. Developing contractor submittals tracking sheets, tracking submittals, reviewing for contract compliance and accepting submittals;
4. Identifying and resolving unanticipated site condition issues as they relate to design;
5. Ensuring construction is compliant with design intent;
6. Assisting with the development of cost and time recovery options as may be requested by the Construction Manager and Departmental Representative;
7. Reviewing prices submitted in response to Contemplated Change Notices and make a determination as to whether the prices are fair and reasonable and advise the Construction Manager and Departmental Representative;
8. Providing technical support for quality assurance, deficiency inspections and contract completion inspections;
9. Advising the Departmental Representative on the progress and quality of the work and report any concerns, defects, and/or deficiencies in the work observed during routine inspections;
10. Validating field measurements and quantity calculations where payment for work is based on unit prices or per diem rates;
11. Assisting the Departmental Representative with validation of Construction Manager performance and progress billings;
12. Witnessing any equipment and/or installation commissioning activities performed by the Construction Manager or sub-contractors as may be appropriate;
13. Providing technical support in discussions with stake holders;
14. Performing final inspections and certifying completion of the Work

### **1.3.7 Post Construction Phase**

The Prime Consultant will provide technical and administrative services during the Post Construction Phase Services including:

1. Reviewing the red-line drawings prepared by the Construction Manager and preparing drawings-of-record reflecting the site conditions on completion of the Work;
2. Reviewing the warranty certificates and providing technical support during the warranty period; and

3. Providing assistance to the Departmental Representative in resolving all outstanding issues.
4. Providing technical assistance to the Construction Manager and Departmental Representative on warranty issues.

#### 1.4 Construction Manager

The Construction Manager will be contracted directly with, and report to, PWGSC to provide construction management services throughout the project and deliver the completed Work as detailed herein. The Construction Manager will be considered and act as:

1. Subject Matter Expert providing Advisory Services;
2. Sub-Contracting Authority; and
3. General Contractor and Constructor.

There may be an overlap of the phases with multiple construction packages being developed, tendered and constructed at any one time thus the Construction Manager will be required to fill all three roles concurrently.

The services required of the Construction Manager are defined within these Terms of Reference.

## 2 Communications:

### 2.1 Document Submissions to PWGSC

All deliverables and submissions required for this project are to be submitted to the Departmental Representative as follows unless specifically directed otherwise by the Departmental Representative.

Type of Submission	No of Hard Copies	No of Digital Copies	Format
Written Reports	4	2	Microsoft Word (*.doc)
Spreadsheets and Cash Flows	4	2	Microsoft Excel (*.xls)
Schedules	4	2	Microsoft Project
Drawings for Review	4	2	Auto Cad (*.dwg)
Tender Documents	4	2	Microsoft Word (*.doc)
Presentation Materials	10	2	Microsoft Office as Appropriate
All Other Submissions	4	2	Microsoft Office as Appropriate

Documents provided as digital copies attached to e-mails may be submitted in PDF format. Additional copies are to be submitted on a DVD or USB Flash Drive in the format specified above. One digital copy is to be provided in “editable” version with the second copy “locked”.

Digital versions of professionally signed and sealed documents, including shop drawings, are to be locked.

All deliverables must comply with the requirements specified in the PWGSC document '*Doing Business*' unless specifically provided for otherwise herein. Any conflict between *Doing Business* and other referenced documents are to be brought to the attention of the Departmental Representative. Unless directed otherwise by the Departmental Representative these Terms of Reference will take precedent.

The Consultant will provide and maintain an on-line file sharing platform for the project team to share project information. The Construction Manager must collaborate with the Consultant with document updates.

### **2.1.1 Acceptance of Document Submissions**

The following applies to documentation deliverables including reports, plans, and various documents defined herein.

The Construction Manager is required to submit documentation under the contract and is responsible and accountable for the quality and timely delivery of these documents. The Departmental Representative is entitled to review the documents submitted by the Construction Manager and has the right to reject undesirable or unsatisfactory submissions as determined by Departmental Representative.

The Construction Manager must obtain the Departmental Representative's acceptance of all required deliverables. Acceptance by the Departmental Representative is based on a general review of the deliverable, confirmation that it meets the intent of the requirements and is in compliance with the contract. Acceptance by the Departmental Representative does not relieve the Construction Manager of full responsibility for the deliverable. The Departmental Representative reserves the right to revisit the deliverable should there be cause to do so. Acceptance does not prohibit rejection of work, which is determined to be unsatisfactory at later stages of review.

Generally the review period for major deliverables will be identified in the Construction Manager's schedule. Typically the Departmental Representative will provide comment or acceptance as quickly as possible but no more than twenty (20) working days of receipt of a deliverable. The Construction Manager must re-submit the deliverable incorporating the Departmental Representative comments as agreed with the Departmental Representative within a further ten (10) working days.

Some deliverables are subject to acceptance by the Client/Users Department and other agencies and levels of government. The Departmental Representative will be responsible for obtaining and coordinate these requirements however the Construction Manager is to cooperate and provide the required information and make necessary changes to the deliverables as may be requested through the Departmental Representative.

## **2.2 Correspondence**

The Construction Manager must distribute all correspondence related to this project as directed by the Departmental Representative. Develop a communication protocol to be approved by the Departmental Representative and incorporate into the Project delivery.

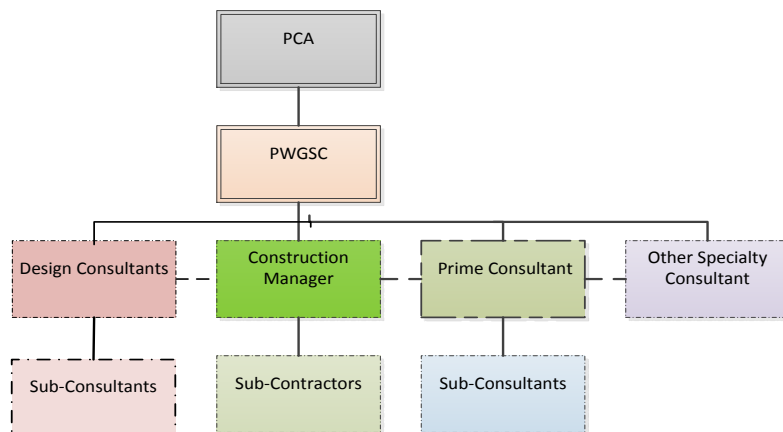
All communications must carry the Contract name/number, PWGSC Project title and PWGSC Project number. The date format will be yyyy-mm-dd. The only exception to this requirement is email correspondence. All email correspondence must have subject lines with the PWGSC

Project Number and wording of subject line must be clear. Every effort is to be made to limit emails to one topic.

### 2.3 Lines of Communication

Direct communications between and within the project team is encouraged,. however, all formal correspondence related to this project is to be directed to the attention of the Departmental Representative. The Construction Manager must not direct or copy correspondence directly with the Client, the Consultants or other stakeholders unless so instructed by the Departmental Representative in which case the Departmental Representative must be copied. The Construction Manager must assist with the development of a project communication protocol to be approved by the Departmental Representative and incorporate into the Project delivery model.

All communications must carry the Contract name/number, PWGSC Project title and PWGSC Project number. The date format will be yyyy-mm-dd.



**Figure 2.3: Communication Structure**

### 2.4 Media Relations

The Client Department (PCA) will manage all external communications related to the Work and/or the Project. The Construction Manager must ensure that no one under this contract including Construction Manager staff, sub-contractors, sub-consultants, suppliers or other related staff and/or persons communicate with anyone external to the project including the media unless requested to do so by the Client and Departmental Representative. If contacted by reporters or others, refer them to the Departmental Representative immediately. Do not publish or agree to have published for marketing or any other reason information on this Project or this Contract without the prior written approval of the Client and Departmental Representative.

All Drafts and Final Reports together with other associated notes, preliminary reports, e-mails, etc., are to be considered confidential and are not to be used or shared by the Construction Manager or any firms or persons engage by the Construction Manager for any purpose other



than the work under contract. This requirement will continue to apply after completion or termination of the contract for any reason.

## **2.5 Public Relations**

The construction work will be undertaken in close proximity to the public use of the waterways and associated facilities. The public may also have a general interest in the Work and ask for information related to the Work.

The Construction Manager is to work hand-in-hand with the Client and Departmental Representative and the Consultants in all matters dealing with public relations. All dealings with the public will be professional and courteous. Any actual, perceived or anticipated conflicts are to be brought to the attention of the Client and Departmental Representative in a timely manner and the Construction Manager is to make themselves available for discussion and resolution.

## **2.6 Meetings**

It is anticipated that the project phases will overlap such that there will be two and sometimes three series of regular bi-weekly meetings (every two weeks) for the duration of the contract requiring Construction Manager participation. Every effort will be made to coordinate meeting schedules to minimize disruption and costs. The meetings will typically consist of the Departmental Representative(s), Client Representative(s) the Construction Manager, the Consultant, the Client (PCA) and other invitees including specialist consultants and operational personnel as determined by the Departmental Representative.

1. Project meetings;
2. Design meetings; and
3. Construction meetings.

### **2.6.1 Project meetings**

Regular bi-weekly project meetings will be held at the PWGSC offices, the Consultant's offices, the Construction Manager offices or at a Client office as may be mutually convenient and time and cost effective as determined by the Departmental Representative. The project meetings will be chaired by the Departmental Representative with minutes issued by the Consultant. The agenda typically will include all aspects of the project: progress, coordination, design, scope, cost, schedule, quality, environmental plans and mitigations, risk, constructability, risks, lessons learned, etc. The focus will gradually shift from design to construction as the work progresses. The meetings will not be used to discuss contractual nor personnel matters. The Construction Manager Project Manager must attend these meetings and apply a construction perspective to the issues at hand. Other named key Construction Manager staff members will attend as required subject to the project status and specific agenda. These meetings will provide project direction and allow collaboration between team members. The Construction Manager Project Manager must review the minutes to ensure the construction perspective is fairly represented and provide comment within two (2) days of receipt and prior to the next meeting.

### **2.6.2 Design Meetings**

Design meetings, charrettes or workshops will be organized and documented by the Consultant during the design phase to discuss detailed design requirements. Frequency of the meetings will be determined based on design needs. The meetings will not be used to discuss contractual nor personnel matters. The meetings will be held at the Consultants' office unless specific

requirements dictate site visitations or the Departmental Representative request specific meetings to be held in other venues. Meeting participants to include as a minimum: key staff from the Consultant team; the Construction Manager Project Manager; the Departmental Representative; and other stakeholders identified by the Departmental Representative as deemed necessary and subject to the meeting agenda. Decisions taken at design workshops are subject to review at the next project meeting and are not binding until duly authorized by the Consultant for purely design issues and the Departmental Representative for scope adjustments.

The Consultant will prepare the agenda, invite appropriate participants, chair, record discussion, issues, and decisions made or recommended and prepare and distribute minutes within five days of the meeting. The Construction Manager is to be prepared to address construction issues including methodology, site access, etc. and provide insight as to the construction perspective. The Construction Manager Project Manager must review the minutes to ensure the construction perspective is fairly represented and provide comment within two (2) days of receipt and prior to the next meeting.

### **2.6.3 Construction Meetings**

The Construction Manager will hold and chair bi-weekly meetings to discuss and manage construction and site issues starting on award of the first sub-contract. The construction meeting will be organized and documented by the Construction Manager. Meeting participants to include: Construction Manager Project Manager, Superintendent and site Safety Officer as a minimum; the Departmental Representative(s), Client Representative(s); and the Consultants. A representative from each key sub-contractor may be invited at the discretion of the Construction Manager. The agenda will be prepared by the Construction Manager and will typically include but not be limited to:

1. Site Communications;
2. Schedule and Progress;
3. Submittals;
4. Site Health and Safety;
5. Environmental Issues and Mitigation Measures;
6. Construction risk identification and mitigation;
7. Site Conditions and Constraints including: site access, site security, utilities, haulage routes, restoration requirements, etc.;
8. Scope Management including: Site Instructions' Requests for Information, Contemplated Changes; and
9. Current and anticipated issues which may impact on the Work.

The meetings will not be used to discuss contractual nor personnel matters.

The Construction Manager will record discussion, issues, and decisions made or recommended and prepare and distribute minutes within three (3) days of the meeting asking for comment. The Construction Manager must review the comments, adjust the record as may be appropriate and issue final minutes within two (2) days and prior to the next meeting.

Any decisions or directions as a result of a meeting which have a contractual impact must be documented through formal contract correspondence with each affected contractor.

The Construction Manager must provide a template for recording the meeting discussions to be review by the Departmental Representative one (1) month prior to the first sub-contract award.

The Construction Manager may also meet individually with each contractor to address contractual issues including performance. The Departmental Representative must be pre-advised of such meetings and may choose to attend.

#### **2.6.3.1 Commissioning Meetings**

Once commissioning commences, the Construction Manager shall hold separate commissioning meetings with Subcontractors, PWGSC, Client Representative(s) and the Consultants to discuss and coordinate the commissioning of work and its progress. The commissioning meeting may be an extension of the bi-weekly construction meeting but must be documented separately. The Construction Manager will record discussion, issues, and decisions made or recommended and prepare and distribute minutes within three (3) days of the meeting asking for comment. The Construction Manager must review the comments, adjust the record as may be appropriate and issue final minutes within two (2) days and prior to the next meeting.

### **2.7 Response Time**

There are numerous stakeholders and considerable planning requirements on the project. Key Construction Manager personnel must be available to attend meetings and respond to inquiries promptly. Response time will vary depending on the project phase generally as defined below. When time measurement is expressed in days it means working days excluding holidays and weekends.

#### **2.7.1 Design Phase**

1. The Construction Manager Project Manager is to be available for, and attend, all regularly planned project meetings.
2. The Construction Manager Project Manager is to be available for, and attend, all regularly planned design meetings unless excused by the Departmental Representative. The design meetings and design charrettes typically will be held in the Design Consultants' office.
3. The Construction Manager Project Manager must respond to PWGSC inquiries within twenty-four (24) hours and provide required input in a timely manner as agreed with the Departmental Representative.
4. The Construction Manager must make available other named key staff members for meetings at the request of the Departmental Representative with three (3) days of notice or request.
5. The Construction Manager must ensure deliverables are submitted on time or better, as established by the accepted project schedule.
6. Construction Manager Bid-ability and Build-ability reviews must be completed and comments submitted within ten (10) days of receipt of the documents. Partial reviews and submittals must be pre-authorized by the Departmental Representative.

#### **2.7.2 Tender Phase**

1. The Construction Manager Project Manager is to be available for, and attend, all regularly planned project meetings.

2. The Construction Manager Project Manager must respond to PWGSC inquiries within twenty-four (24) hours and provide required input in a timely manner as agreed with the Departmental Representative.
3. The Construction Manager Project Manager is to be available and attend all pre-tender site meetings, tender openings and tender evaluation meetings.
4. The Construction Manager must make available other named key staff members with forty-eight (48) hours of notice to provide specific expertise on construction matters arising from tender submissions as may be required and requested by the Departmental Representative.
5. The Construction Manager Project Manager must be available with twenty-four (24) hours of notice and attend meetings with PWGSC to discuss tendering strategy, process and results as may be requested.

### **2.7.3 Construction Phase**

1. The Construction Manager Project Manager is to be available for, and attend, all regularly planned Project Meetings.
2. As a minimum the Construction Manager Project Manager, Superintendent and Safety Officer must be available and attend all regular Construction Meetings
3. The Construction Manager must make available other named key staff members for regular meetings as may be required to ensure compliance with project requirements and maintain a clean and productive site.
4. The Construction Manager Superintendent must be on site full time during the construction work.
5. The Construction Manager Superintendent, or their named alternate/backup, must be available after hours during construction to respond to emergencies with four (4) hours of notification of a problem or concern and take appropriate action in a timely manner as agreed with the Departmental Representative and/or dictated by the specific situation. Public safety issues must be dealt with immediately.

### **2.7.4 Post-Construction Phase**

1. The Construction Manager Project Manager is to be available for, and attend, all regularly planned project meetings.
2. The Construction Manager must make available other named key staff members for meetings on request from the Departmental Representative with three (3) days of notice or request.
3. The Construction Manager Project Manager must be available and attend meetings with the Departmental Representative to discuss complaints or resolution of deficiencies with three (3) days of notice.

## REQUIRED SERVICES (RS)

### 1 General Requirements

The Construction Manager will be considered the expert in matters of construction and provide services during the pre-construction (design), tender, construction, and post-construction phases of the project. Specific services and deliverables are defined herein.

There may be a number of construction packages with each package in turn having more than one construction contract and/or subcontract. Each construction package may advance through each phase at different times. As such there will be complex overlapping of phases.

All services must comply with the requirements specified in the PWGSC *'Doing Business'* document and the Construction Manager shall become familiar with the standards provided therein. The Departmental Representative may authorize modifications to this requirement to accommodate site specific requirements. The Construction Manager shall advise the Departmental Representative of any conditions which may have an adverse impact on the successful implementation of the construction phase of the Project.

### 2 Summary of Services

The Construction Manager shall provide the following services including but not limited to:

1. Preparation and update of project plans and procedures manuals as defined in the following section;
2. Advisory and supporting services throughout the duration of the assignment;
3. Administrative requirements as may be required throughout the duration of the assignment;
4. Work packaging and coordination;
5. Site logistics and coordination;
6. Cost management;
7. Time management;
8. Environmental Management;
9. Site Health and Safety
10. Risk management;
11. Scope control and change management;
12. Quality management;
13. Work package tendering and contract award; and
14. General Contractor services including Constructor responsibilities.

### 3 Project Manual and Plans

The Construction Manager shall prepare the various Plans detailed below with updates as may be required to reflect changes in site conditions, design philosophies, project requirements, and incorporate lessons learned as the Work progresses. Such updates are subject to Departmental Representative review and acceptance.

### 3.1 Construction Implementation Strategies and Requirements

The Construction Manager must develop a Construction Implementation Strategies and Requirements document (Construction Manual) for the execution of key construction management activities. A 66% complete initial draft of the Manual must be submitted to the Departmental Representative for review within six (6) weeks of contract award providing a Table of Content and preliminary text for most categories. A final draft incorporating any agreed changes or modifications must be submitted within three (3) weeks of receipt of review comments from the Departmental Representative. The Manual must be updated by the Construction Manager throughout the duration of the contract as may be appropriate. The Manual will provide a clear description of procedures, roles, responsibilities, levels of authority and the information systems for the effective management and delivery of the Construction Phase of the project. The Manual will be supplemented with additional documents to address specific project needs.

The Manual will include, but not be limited to:

1. Construction Manager's organization specific to the project;
2. Communications associated with and during construction;
3. Record management including tracking of all changes, lessons learned, progress, as-built remediation and installations and all information necessary for post-construction documentation;
4. Procedures for measuring, tracking and reporting on scope, time, cost and quality management;
5. Bid-ability and build-ability review processes;
6. Tendering, evaluation and contract award processes;
7. Site access and security requirements;
8. Specific work which may be undertaken by the Construction Manager directly;
9. Contract, Sub-Contract and supplier management and administration including the management and control of:
  - i. Shop drawings and other submittals,
  - ii. Requests for Information,
  - iii. Site Instructions,
  - iv. Contemplated Change Orders,
  - v. Change Orders; and
  - vi. Progress monitoring and subcontractor and supplier payment;
10. Construction claim mitigation and resolution.

Updates, as may be required during the Work, are to identify changes to the Manual and reasons for those changes.

### 3.2 Tendering Strategy and Process Plan

The Construction Manager will deliver the construction services, other than that specifically assigned to the Construction Manager, through subcontractors. The Construction Manager is to develop a Tendering Strategy and Process Plan to ensure a competitive process for awarding all project construction requirements including site installations, subcontracts and services other

than that performed directly by the Construction Manager. The tendering strategy must apply to both contractors and suppliers. The strategy must allow for a fair, open and transparent tendering process resulting in competitive tenders. PWGSC will retain the right to audit the process at the sole discretion of the Departmental Representative to ensure that the Crown is getting appropriate value for the expenditure. The Construction Manager must assume all risks associated with the tendering process. A 66% complete initial draft at of the Tendering Strategy and Process Plan must be submitted to the Departmental Representative for review within six (6) weeks of contract award providing a Table of Content and preliminary text for most categories. A final draft incorporating any agreed changes or modifications must be submitted within three (3) weeks of receipt of review comments from the Departmental Representative. In any case, the Construction Manager must have a Tendering Strategy and Process Plan acceptable to the Departmental Representative in place six (6) weeks prior to tendering any of the Work.

The tendering strategy must include as a minimum:

1. Recommended tender packages to maximize construction effectiveness;
2. A competitive and fair tenderer selection process considering 1) public tender call, 2) pre-qualification of tenders, and/or 3) pre-selected tenders. A minimum of three qualified bidders is required for any work other than a public call.
3. The tender documents which may be standard industry forms (CCDC) or custom forms appropriate for the work required including:
  - i. Instructions to Tenderers;
  - ii. Integrity Provision as defined in R2710T GI01
  - iii. Tender Form;
  - iv. General Conditions;
  - v. Supplementary Conditions,
  - vi. Terms of Payment; and
  - vii. Form of Award;
4. Tender period;
5. Pre-tender site meetings;
6. Procedures for issuance of tender amendments and response to tenderer inquiries;
7. Tender and contract surety and insurance requirements;
8. Identification of subcontractors and suppliers (subject to Integrity Provision)
9. Tender receipt and opening procedures;
10. Tender evaluation and recommendation process;
11. A process for re-tendering should the initial tender fail to produce an acceptable tender; and
12. Contract award authorization.

The intent is to have the Construction Manager competitively tender all project requirements in order to allow access to all qualified suppliers and ensure best value for the Crown however:

1. Purchase orders for materials, facilities and equipment estimated at less than \$5,000 total per supplier may be sole sourced to qualified suppliers with the Departmental Representative written pre-authorization. The Departmental Representative decision will be based on appropriate value for the expenditure and as such the Construction Manager must make the business case through an options analysis.
2. Subcontracts and service contracts estimated at less than \$25,000 total per supplier may be sole sourced to qualified firms with the Departmental Representative written pre-authorization. The Departmental Representative decision will be based on appropriate value for the expenditure and as such the Construction Manager must make the business case through an options analysis.

### **3.2.1 Specific Tendering Requirements**

The Construction Manager must include in the tendering strategy the following requirements:

1. The complete tendering documents with tendering requirements must be made available in a timely manner to all those qualified to tender the Work;
2. The tender period and delivery address must be clearly identified in the tender documents;
3. Tenders must be submitted in writing, delivered by hand or by mail at the specified location by the specified date and time complete with all mandatory tender requirements. Submissions are to be time and date stamped on receipt. Late or incomplete tenders are to be considered non-compliant with no further consideration;
4. All received tenders must be opened in public at a pre-arranged time and place in the presence of a least two representatives of the Construction Manager, as well as the Departmental Representative;
5. Tenders must be submitted in compliance with the terms and conditions of the bid documents including amendments in order for it to be given any consideration;
6. Tender analysis and recommendation must include copies of all relevant documents such as to satisfy the Departmental Representative that the tendering process has been followed and contract award is appropriate;
7. Contracts must be awarded in accordance with the requirements specified in the notices and bid documentation;
8. The Construction Manager's team, including non-arms-length entities and subcontractors and suppliers named in the proposal, will not be permitted to submit tenders on any of the construction packages or parts thereof.

### **3.3 Construction Cost Management Plan**

The Construction Manager must develop a Construction Cost Management Plan and cost control system to ensure design and construction proceeds in compliance with the projected construction costs and that any deviation is identified and addressed early in the process. Construction costs must be a consideration during the design, tendering and construction phases incorporating a Value Analysis/Value Engineering process. The Construction Manager is to identify any design element which may have a less costly alternative as early as possible in the process for the Consultant to consider in finalizing the design. The Consultant is to remain responsible for the design.



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The initial draft and final draft of the Construction Cost Management Plan must be submitted to the Departmental Representative for review with the Construction Manual submissions and incorporate the following requirements:

1. Providing cost estimating assistance to the Consultant in preparing a preliminary construction cost estimate, Class 'C' (at completion of design development), for each construction package;
2. Preparing Class 'B' (at 66% complete tender documents) and a Class 'A' (at 100% complete tender documents) construction cost estimates, assisted by the Consultant, based on the construction documents for each construction package;
3. Updating the project construction cost estimate applying lessons learned and results of earlier tender prices;
4. Tracking all committed and anticipated construction costs;
5. Evaluating and managing Contemplated Change Notices (CCNs) and Change Orders (COs) to ensure value to the Crown;
6. Establishing a process for progress billing review and payments to subcontractors and suppliers to comply with certification requirements under the Financial Administration Act;
7. Developing recovery scenarios as may be required to mitigate any threat of increases to the initial construction budget; and
8. Developing and implementing a plan and process to measure and track construction cost over time, compare against planned expenditures and predict future expenditures (cash flow). The results are to be presented in graphical form (S-curve) comparing cumulative baseline cost (plan) to actual performance and extrapolating to completion identifying time slippage and cost over-runs (Earned Value Reporting). The Plan is to provide for deviation triggers for recovery actions and measure and track the results of recovery actions.
9. Providing a cash flow requirement based on actual, estimated and projected costs applied to the project schedule with monthly updates.

### **3.4 Construction Time Management Plan**

The Construction Manager must develop a Construction Time Management plan incorporating the Critical Path Method of scheduling to ensure construction proceeds in accordance with the projected construction timelines and that any deviation is identified and addressed early in the process. The construction schedule must be a consideration during the design, tendering and construction phases including the Work to be included for each construction package and the impact of weather with its imposed limitations. The Consultant will provide the design schedule in suitable format for the Construction Manager to incorporate into the Construction schedule.

The initial draft and final draft of the Construction Time Management Plan must be submitted to the Departmental Representative for review with the Construction Manual submissions and incorporate the following:

1. A bar chart presentation of the schedule with task identification, description, duration and dependencies including as a minimum;
  - a. Start, duration and completion of each construction package;
  - b. Construction milestones dates for each construction package including;

- i. Tender document delivery;
  - ii. Tender submission date;
  - iii. Award date;
  - iv. Start date;
  - v. Completion date.
  - vi. Milestones as may be identified by the Client;
  - vii. Dates and durations of any activities impacting on waterway operations;  
and
  - viii. Dates and durations of any restrictions for public usage or access.
2. Processes for:
  - a. Reviewing scheduling risks and developing remedial measures;
  - b. Gap analysis identifying areas of schedule slippage and presentation of recovery plans; and
  - c. Tracking and reporting progress against the base-line schedule.

### **3.5 Construction Scope Management Plan**

The Construction Manager must develop a Construction Scope Management Plan to ensure construction proceeds in accordance with the intent of the design and that any deviations are identified and addressed early in the process. The overall scope of the work for the sites is defined herein. Site specific scope will be detailed in the construction documents prepared by the Consultant.

The initial draft and final draft of the Construction Scope Management Plan must be submitted to the Departmental Representative for review with the Construction Manual submissions. The Plan must incorporate as a minimum:

1. Design reviews to ensure final construction requirements comply with the initial project objectives;
2. A site specific strategy to ensure that the work has minimal impact on waterway operations and public usage and enjoyment;
3. Pre-construction Conditions Survey requirements to confirm and document existing property conditions to allow for appropriate rehabilitation work and avoid damage to current installations due to construction activities;
4. A notification process to advise the Departmental Representative of any potential increase or decrease in scope prior to implementation;
5. A process for ensuring consistency across all sites; and
6. Tendering requirements and pricing formulas to allow for changes in scope to accommodate decreases or increases in requirements due to unknown site conditions.

### **3.6 Construction Risk Management Plan**

A master Project Risk Management Plan has been implemented and is being managed by the Departmental Representative. The Construction Manager shall provide support to the Departmental Representative in identifying project risk throughout the project providing input and assessment as may be required.

The Construction Manager must prepare and maintain a Construction Risk Management Plan identifying construction implementation risks, analyzing the impacts of such risks, developing mitigation measures and follow up and recommending risk assignment. The initial draft and final draft of the Construction Risk Management Plan must be submitted to the Departmental Representative for review with the Construction Manual submissions. Mitigation measures identified by the Construction Manager must be provided to PWGSC for inclusion in the design process on an ongoing basis. Construction strategy and processes will be adjusted as may be required to mitigate risk. The Plan is to include for risk tracking, reporting, follow up and documentation.

The Construction Manager may be requested to participate in Project Meetings to discuss construction risks and mitigation measures as these may impact on project risks.

### **3.7 Construction Quality Management Plan**

The Construction Manager shall be responsible under the contract for all quality control and assurance requirements, including compliance with all federal, provincial and municipal Acts, Regulations, Bylaws, and Guidelines. The Work, both in performance and completion, must meet the design and operational intent and criteria. Although the Consultant remains responsible for design quality the Construction Manager shall take a leading role to ensure the final product is compliant in every way.

The Construction Manager must prepare a Construction Quality Management Plan compliant with ISO 9001 2008 or equivalent so as to ensure that the Work meets the design and operational intent and criteria and all quality issues are addressed promptly to mitigate impact on the pace of construction and the need for rework. The Plan must encompass all phases of the Work; pre-construction, tendering, construction and post-construction. The Plan must establish quality benchmarks, identify responsibility, define measurement of quality performance, establish a continuous improvement process and identify project documentation requirements. The initial draft and final draft of the Plan must be submitted to the Departmental Representative for review with the Construction Manual submissions.

The Construction Quality Management Plan must include for:

1. Day-to-day execution of the Quality Plan;
2. Quality awareness and training;
3. Working with sub-contractors on quality issues;
4. On site monitoring including inspections, measurements, sampling and analysis, issuance of reports and verification of corrective actions and follow up directives;
5. Facilitating quality inspections by the Construction Manager, consultants, Technical Authority and others as authorized by the Departmental Representative;
6. Quality documentation and reports; and
7. Final acceptance of work completed by sub-contractors.

#### **3.7.1 Commissioning Plan**

Commissioning is an integral part of all phases of the Work. Commissioning and performance verification is a key element of the Construction Quality Management Plan. The Construction Manager must develop a Commissioning Plan in collaboration with the Consultants, Departmental Representative(s) and Client Representative(s). The site specific scopes of work

will determine the extent of commissioning requirements. Commissioning often involves environmental risks and the plan must consider these risks and mitigations.

The Commissioning Plan is to address the planning, management and communications tools relating to commissioning, setting out scope, environmental mitigation measures, standards, roles and responsibilities, expectations, and deliverables. It is to provide an overview of commissioning, and sets out the process and the methodology for successful commissioning of the project. Commissioning will provide a fully functional facility:

1. Whose systems, equipment and components have been proven to meet all the Client's functional requirements before the date of acceptance, and operate consistently at peak efficiencies and within specified energy budgets under all normal loads.
2. In which the Client and O&M personnel will have been fully trained in all aspects of all installed systems,
3. Having optimized life cycle costs,
4. Having complete documentation relating to all installed equipment and systems

The initial draft and final draft of the Commissioning Plan must be submitted to the Departmental Representative for review with the Construction Quality Management Plan. The Client Representative will be involved with Commissioning Plan approval. The Plan must incorporate as a minimum:

1. Importance of the Commissioning Plan
2. Roles and responsibilities
3. Revisions to this Commissioning Plan
4. Risk assessment including environmental risks and mitigations
5. Objectives of commissioning
6. Extent of commissioning
7. Deliverables relating to O&M perspectives
8. Deliverables relating to the commissioning process
9. Deliverables relating to the administration of commissioning
10. Payments for commissioning
11. The commissioning process
12. Training Plan

The Construction Manager Commissioning Plan is to be modeled as described on the PWGSC National Project Management System (NPMS) Commissioning Manual.

The Commissioning Team will comprise of: the Construction Manager Commissioning Specialist; the PWGSC Commissioning Manager; the Departmental Representative; the Prime Consultant; and other Specialty Consultants and subcontractors as may be deemed appropriate by the Departmental representative.

### **3.8 Site Specific Construction Management Plans**

The Construction Manager shall develop Site Specific Construction Management Plans incorporating the requirements specific to the conditions of the sites as listed below:

1. Occupational Safety and Health Plan.;
2. Environmental Management and Protection Plan;
  - a. Spill Response Plan;
  - b. Noise and Vibration Management Plan;
  - c. Dust Management Plan;
  - d. Surface and Groundwater Management Plan
  - e. Erosion and Sediment Control Plan

These Plans must be:

1. Developed as stand-alone documents separate to the Procedures Manual;
2. Suitable for issuance to sub-contractors;
3. Made available at each site; and
4. Appropriate for enforcement by the Construction Manager.

Compliance to the various plans must be a fundamental requirement under each subcontract.

### **3.8.1 Occupational Health and Safety Plan**

The Construction Manager will have care and custody of the work sites during the construction phase and take on the role of Constructor as defined in the Construction Regulations under the Ontario Occupational Health and Safety Act. As such, the Construction Manager must comply with all the requirements of the Act and its regulations. Compliance with the Act is a condition of this contract. This is a federally funded project on federal land and the Construction Manager must also comply with the Canada Labour Code and relevant regulations under the Code.

The Construction Manager must prepare a Construction Health and Safety Plan applicable to all work sites during construction in compliance with the above. The Health and Safety Plan must be applicable to all persons entering the defined construction work sites including federal staff and authorized visitors and shall be administered and enforced by the Construction Manager as Constructor. The Plan is to allow for training, site inspections, reporting and tracking site health and safety incidences, statistical analysis and comparison to industry indices. A draft Plan must be submitted to the Departmental Representative for review two (2) months prior to accessing any sites subject to construction. A final Plan accepted by the Departmental Representative must be submitted prior to site access for construction purposes. The final Plan must be issued with and be incorporated in all contracts with full compliance a condition of each contract.

The Departmental Representative is to be copied on all occupational health and safety correspondence, meeting notes, inspections, reports, notices and directives both internal and external within 24 hours from issuance and/or receipt. The Departmental Representative may stop work should, at the sole discretion of the Departmental Representative, it be determined that an unsafe or unhealthy condition exists. Such direction would be confirmed in writing by the Departmental Representative within 24 hours.

### **3.8.2 Environmental Management and Protection Plan**

The Construction Manager must prepare a detailed Construction Environmental Protection Plan compliant with federal, provincial and municipal Acts, Regulations, Bylaws and Guidelines prior to undertaking any construction work. The plan must expand on mitigation measures and assessed impacts described in PCA's EIA. The Plan must be applicable to all work sites during construction. The Plan must be applicable to all persons entering the defined construction work

sites and will be administered and enforced by the Construction Manager. The Plan is to allow for training, site inspections, reporting and tracking of environmental incidences. A draft Plan must be submitted to the Departmental Representative and Client Representative for review two (2) months prior to accessing any sites subject to rehabilitation. A final Plan accepted by the Departmental and Client Representative must be submitted prior to site access for construction purposes.

The Plan must include but not be limited to:

1. Environmental spill preventative measures;
2. Fuel storage and handling protocols;
3. Surface and ground water management;
4. Sediment and Erosion Control
5. Dust management and control;
6. Noise and vibration management and control;
7. Site equipment management, movement and maintenance;
8. Operator training;
9. Compliance inspections;
10. Incident reporting and tracking;
11. Emergency response process; and
12. Solid waste management identifying efforts to reduce and divert waste in compliance with O. Reg. 102/94 and 103/94 as amended.

The final Plan must be issued with and be incorporated in all contracts with full compliance a condition of each contract.

The final plan will be subject to permit approval, as per the Historic Canal Regulations applicable to lands administered by the Trent-Severn Waterway 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 project activities.

Some work may consist of disturbance to aquatic habitat or species at risk. Specific construction procedures are to be designed and implemented in these situations. The Consultant or Specialist Consultants will provide detailed requirements for inclusion in construction documents. The Construction Manager will ensure that the contractors retained to undertake this work are experienced and qualified with certification from authorities having jurisdiction as may be necessary.

### **3.9 Reports**

The Construction Manager must prepare and submit regular reports to the Departmental Representative including a monthly report over the duration of the contract as well as various other specified phase and activity dependent reports.

#### **3.9.1 Monthly Report**

A Monthly Report, also commonly referred to as a Progress Report, reflecting the past, current and ongoing status of the Work providing a system for project monitoring, reporting and documentation from a construction perspective through each stage of the project. The report will

become part of the permanent project records and must, as a minimum, include monitoring and management of:

1. Quality;
2. General construction progress;
3. Outstanding issues, concerns, problems;
4. Status of tendering and contract award;
5. Risk;
6. Site health and safety performance;
7. Environmental performance;
8. Major accomplishments over the preceding reporting period; and
9. Planned major activities for the next reporting period

The report is also to include as appendices:

1. A monthly cost report tracking and predicting construction costs throughout the duration of the contract. This cost report will be attached as an appendix to the Construction Manager Monthly Report and will comply with the requirements of the Construction Manager Monthly Report. Minimum requirements include:
  - a. An updated cost spreadsheet showing cost-to-date (billings and work in progress), authorized Change Orders to date and anticipated changes by contract;
  - b. Commitments (contract awards and contract changes);
  - c. Upcoming contracts with latest cost estimates;
  - d. Construction contingencies;
  - e. Construction allowances;
  - f. Projected cost to complete;
  - g. A list of assumptions, exclusions, issues; and
  - h. A list of significant cost risks;
2. An updated schedule in Gantt chart format tracking progress and forecasting future milestone and completion dates; and
3. The results are to be presented in graphical form (S-curve) comparing cumulative baseline cost (plan) to actual performance and extrapolating to completion identifying time slippage and cost over-runs.

Each section is to identify any gaps between the planned versus actual achievements and provide a recovery strategy as may be applicable.

The Construction Manager must provide a report template and sample report structure for review by the Departmental Representative within six (6) weeks after contract award with a final report format within three (3) weeks of receipt of the Departmental Representative review comments. The accepted report template and structure must be used for all subsequent reports or until such a time that the Construction Manager and the Departmental Representative agree to a revised format. Each report must be delivered in a timely manner as agreed with the Departmental Representative and the Construction Manager Project Manager must be available to discuss the contents of the report and take the necessary actions as may be required to address any concerns by the Project Team.

### **3.9.2 Post-Construction Evaluation Report**

The Construction Manager is to complete and submit to each contractor, with copy to the Departmental Representative, a post-construction evaluation report on completion of each construction contract within one month of contract completion summarizing the contractor's performance considering quality, timeliness, work management, health and safety, co-operation with others, technical capabilities and applied resources. The report is also to identify deficiencies, incomplete work and outstanding issues as may be applicable. A comprehensive cost analysis of the completed contract including award amount, change orders and final contract value is to be attached to the evaluation.

The Construction Manager is to provide an evaluation template to the Departmental Representative with the Tendering Strategy and Process Plan. The contractor evaluation process report, excluding cost analysis, will be incorporated in the tender documents and the completed evaluation, excluding cost analysis, will be provided to the contractors on completion of their contract.

The Construction Manager must maintain a registry of contractor performance as provided in the post-construction evaluation reports.

### **3.10 Operations and Maintenance Manuals**

The extent of Operations and Maintenance Manuals depends on the nature of the work completed on a site. The Construction Manager shall identify the Manual requirements in the Construction Manager's Construction Manual with adjustments as the specific site scope is determined.

Two (2) weeks prior to any scheduled training, submit to Departmental Representative four (4) copies of approved Operations Data and Maintenance Manual compiled as follows:

1. Bind data in vinyl hard cover 3 "D" ring type loose leaf binders for 212 x 275 mm size paper. Binders must not exceed 75 mm thick or be more than 2/3 full.
2. Enclose title sheet labelled "Operation Data and Maintenance Manual", project name, date and list of contents. Project name must appear on binder face and spine.
3. Organize contents into applicable sections of work to parallel project specifications breakdown.
4. Mark each section by labelled tabs protected with celluloid covers fastened to hard paper dividing sheets.

Include following information plus data specified:

1. Maintenance instructions for finished surface and materials;
2. Copies of hardware and paint schedules.
3. Description: Operation of the equipment and systems defining start-up, shut-down an emergency procedures, and any fixed or adjustable set points that affect the efficiency of the operation. Include nameplate information such as make, size, capacity and serial number.
4. Maintenance: Use clear drawings, diagrams or manufacturers' literature which specifically apply and detail the following:
  - i. Lubrication products and schedules;
  - ii. Trouble shooting procedures;



- iii. Adjustment techniques;
  - iv. Operational checks;
  - v. Suppliers names, addresses and telephone numbers and components supplied by them must be included in this section. Components must be identified by a description and manufacturers part number.
5. Guarantees showing:
- i. Name and address of projects.
  - ii. Guarantee commencement date (date of Interim Certificate of Completion).
  - iii. Duration of guarantee.
  - iv. Clear indication of what is being guaranteed and what remedial action will be taken under guarantee.
  - v. Signature and seal of Guarantor.
  - vi. Additional material used in project listed under various Sections showing name of manufacturer and source of supply.
6. Spare parts: List all recommended spares to be maintained on site to ensure optimum efficiency. List all special tools appropriate to unique application. All parts/tools detailed must be identified as to manufacturer, manufacturer part number and supplier (including address).

Include one complete set of final shop drawings (bound separately) indicating corrections and changes made during fabrication and installation.

As Built drawings and O&M manual shall be converted, where necessary, into Portable Document File (PDF) format permit for viewing using Acrobat reader.

## **4 Construction Management Services**

### **4.1 General**

The Construction Manager will participate during all Project Phases including Requirement Analysis, Design Concept, Design Development, Construction Documents, Tendering, Construction and Post as follows:

- 1. Advisory Services;
- 2. Sub-Contracting Authority; and
- 3. General Contractor and Constructor.

Due to the size, locations and complexity of the Work there may be significant overlap of the project phases. As an example, some sites may be in the design stage while others under construction. Although the Construction Manager will be involved at each site for all phases, the Constructor responsibilities will apply only when a site is under construction. As Constructor, the Construction Manager will have care and custody of the Work site and must assume responsibility and be accountable for the personnel and equipment at the Work site. The Construction Manager is to cooperate fully with the waterway operating personnel and any and all conflict with the operating personnel must be immediately brought to the attention of the Departmental Representative.

There may be an overlap of the phases with multiple construction packages being developed, tendered and constructed at any one time thus the Construction Manager may be required to fill all three roles concurrently.

The Construction Manager must:

1. Assign and make available qualified staff for the duration of the Work.
2. Ensure assigned personnel have the authority to take decisions on behalf of the Company.
3. Ensure continuity of key personnel and maintain a dedicated working team
4. Have an in-depth understanding of the project requirements and comprehensive knowledge of the services to be provided under the contract.
5. Work constructively to ensure a collaborative and cooperative team approach with knowledgeable and timely input and contribution.
6. Undertake and complete the Work defined herein.

#### **4.2 Advisory Services - General**

The Construction Manager must act as an advisor to the Departmental Representative on construction matters throughout the duration of the Contract and have the appropriate staff available to provide timely input as the project evolves. The Construction Manager staff must be knowledgeable in all areas of construction as applicable to this project including but not limited to: waterway rehabilitation; heavy civil construction; equipment and personnel management; waste, dust and water management; waste haulage; construction health and safety; environmental due diligence; cost, time and quality management, current market conditions; local construction industry; applicable regulatory requirements and codes; cost estimating and scheduling.

In this capacity, and in addition to the specified deliverables, the Construction Manager must participate in meetings, review reports and provide comment as requested by the Departmental Representative. The Construction Manager must advise the Departmental Representative in writing of any disagreements or conflicts with other stakeholders with regards to their participation as construction experts which may result in an adverse impact on project delivery (cost, time and/or quality).

##### **4.2.1 Cost Estimating**

The Construction Manager must name a Cost Estimator to provide construction cost estimates and participate in value engineering initiatives throughout the duration of the project as detailed in the Construction Manager Construction Cost Management Plan.

The Construction Manager must review all available information including construction documents prepared by the Design Consultant, project documentation and other documents as may be appropriate and have an understanding of the constraints and complexities of the Work. The Construction Manager will be required to provide Class B and Class A construction cost estimates for individual sub-contracts prior to tender as well as overall construction costs including risk allowances and contingencies for the total work defined herein. The Construction Manager must update the construction cost and prepare the cost appendix for the monthly report.

##### **4.2.2 Time (Planning and Scheduling)**

The Construction Manager must develop a Construction Schedule using the Critical Path Method (CPM) incorporating all the Work at all the sites included in the contract in accordance with the Construction Manager Construction Cost Management Plan. The Consultant will provide, through the Departmental Representative, the required design task information (description, duration and dependencies) to allow the Construction Manager to integrate the design schedule with the construction schedule. The Construction Manager is to track progress on all tasks and take assertive action to maintain the base-line schedule. The Construction Manager is to name a Construction Planning Manager who is fully familiar with all aspects of project planning, scheduling and construction sequencing and responsible for developing the schedule, tracking progress, identifying slippage, recommending recovery plans as may be required, updating the construction schedule and preparing the schedule appendix for the monthly report.

The construction schedule must be developed, maintained and presented applying best industry practices and standards for a project of this size and complexity. A draft Construction Schedule must be submitted as an attachment to the draft Construction Time Management Plan. Once accepted by the Departmental Representative the agreed schedule must become the base-line for the Work subject to change only with the approval of the Departmental Representative. An updated construction schedule is to be an appendix to the monthly report with explanation of any deviations from the base-line schedule and proposed schedule recovery strategy.

#### **4.2.3 Scope Management**

The Construction Manager must become familiar with the overall scope of the Work and implement the Construction Manager Construction Scope Management Plan. The Construction Manager must remain abreast of changed requirements which may have an impact on the project and immediately notify the Departmental Representative in writing of any potential increases, decreases or changes in the Work that could impact on project delivery (cost, time and/or quality).

#### **4.2.4 Risk Management**

The Construction Manager will provide support to the project team in identifying risks throughout the project life cycle, including review of the Project Risk Management Plan and analysis as well as participation in risk management meetings as organized by the Departmental Representative. The Construction Manager must mitigate construction risk as detailed in the Construction Manager Construction Risk Management Plan throughout the duration of the Work and apply lessons learned as may be applicable to future work packages. Any significant changes to the construction risk profile must be brought to the attention of the Departmental Representative with recommended mitigation measures and options. The Construction Manager must ensure that sub-contractors understand their risks and that they do not deflect risks that rightly belong to them under the terms of their contract.

#### **4.2.5 Quality Management**

The Construction Manager must implement the Construction Manager Construction Quality Management Plan applying best industry practices and standards for a project of this size and complexity to ensure that the appropriate quality standards are achieved. The Construction Manager is to name a Construction Quality Manager responsible for the implementation of the Construction Manager Construction Quality Management Plan. The Construction Manager must retain primary responsibility for construction quality and ensure that quality management requirements are included in all sub-contracts.

The Construction Manager must ensure that quality is front and centre at all sites throughout the construction work and achieve design intent and consistency. The nature of the Work will allow for applying lessons learned and continuous improvements in methodology and construction activities.

#### **4.2.6 Documentation**

The Construction Manager is required to maintain a copy of the latest version of all project documents related to this contract at their site offices including the Procedures Manual, Site Specific and Construction Management Plans, reports generated under this contract, minutes of meetings and a full set of construction documents in order to effectively manage the Work. The Construction Manager must make available (viewing only) these documents to authorized stakeholders as may be requested by the Departmental Representative during site visits, inspections and meetings.

The Construction Manager must provide the Departmental Representative copies of all construction documentation in a timely manner including but not limited to: tender submissions; sub-contract awards; sub-contract administration documentation including minutes of meetings, requests for payment, surety contracts, insurance and WSIB certificates, and other contractual correspondence; approved shop drawings and submittals; as-built (red-line) drawings and specifications; and sub-contract close out documentation. All documents must be accompanied by a suitable transmittal with list of attachments and dates.

#### **4.3 Advisory Services – By Project Phase**

The Construction Manager must undertake the following tasks and provide appropriate deliverables as a minimum during the Project Phases specified below. Additional tasks or subtask may be identified as the project develops. Specific tasks and/or deliverables for one Phase may be advanced or deferred to another Phase as pre-authorized by the Departmental Representative when shown to be of benefit to the project. The following is a summary only and other tasks and/or deliverables may apply as defined in the Construction Manual and various Project Plans.

The Construction Manager will be required to coordinate and collaborate with up to four (4) Design Consultants and One (1) Prime Consultant during Requirement Analysis, Design Concept, Design Development and Construction Documents Phases of the project. The Construction Manager will be required to coordinate and collaborate with only one (1) Prime Consultant during the Tender, Construction and Post Construction Phases of the project

##### **4.3.1 Requirement Analysis Phase**

The objective of the Requirement Analysis Phase is to ensure that the Project Team has the opportunity to obtain and review all relevant documentation, fully understand the project requirements, develop an implementation strategy and satisfy the Departmental Representative that the work will comply with project objectives. The Construction Manager is to:

1. Obtain and review all available information including project documentation, plans, processes and investigative reports;
2. Visit and inspect the project site and surrounding areas to:
  1. Become familiar with the site's geographical and hydrological features;
  2. Obtain any additional detailed data that may be required to supplement information contained in existing documentation;
  3. Identify any local issues and constraints that may impact project implementation;

4. Identify potential locations and constraints related to site access and temporary installations including coffer dams and water diversion systems
3. Attend and participate in project presentations;
4. Attend and participate in Project and Design meetings;
5. Research market conditions with regards to availability of suitable materials and qualified trades to deliver the project within given parameters;
6. Develop a preliminary construction strategy (construction package composition and timing, trade contractor requirements);
7. Collaborate with the Consultant in the preparation of a preliminary project Work Breakdown Structure (WBS) and schedule compliant with project milestone dates;
8. Collaborate with the Consultant with a review of the project budget and cash flow projections; and
9. Review proposed additional investigation plans developed by the Consultant and advise on suitability, cost and schedule.

#### **4.3.2 Design Concept Phase**

The objective of this Phase is to explore design options and analyse them against priorities, project objectives and constraints. The Consultant will translate the Requirements Analysis Report into design criteria and parameters and develop as a minimum three (3) options for each installation which meet the requirements. Each option is to be advance to allow comparison and selection of the most effective rehabilitation restoration approach. Out of this process the Consultant will recommend the best option to proceed to Design Development. The Construction Manager is to:

1. Establish construction methodology including resource and equipment requirements, trade coordination, sequencing, number and structure of construction packages, etc.;
2. Develop procedures and forms for pre-construction site conditions surveys and pre-construction conditions reports;
3. Establish requirements for physical access to sites, site facilities requirements and organization;
4. Provide advice and recommendations on construction feasibility, availability of materials and suitable trades, time requirements, costs, risks and benefits for all design options being considered by the Consultant. Generally three options meeting project criteria will be identified for each installation;
5. Attend and participate in partnering sessions, project meetings, design meetings, design charrettes, value engineering workshops and presentations;
6. Collaborate with the Consultant in the preparation of an operations and maintenance (O&M) Criteria report; and
7. Collaborate with the Consultant with a review and update of the project budget, cash flow projections and schedule.

#### **4.3.3 Design Development Phase**

The objective of this Phase is to further develop the selected option presented at the Design Concept Phase for each installation. The Consultant will develop the design option selected for refinement and produce Design Development Documents to describe the scope, quality and

cost of the project in sufficient detail to: define the details of design components, systems and materials, for all applicable disciplines, and confirm their compliance with codes, standards and all other Project Requirements; identify and assess potential risks, and recommend mitigation measures; facilitate the reviews, discussions and decisions relating to the design; and obtain the necessary approvals to proceed to the development of Construction Documents. The Construction Manager is to:

1. Provide updates regarding availability of materials and qualified trades and possible market changes;
2. Finalize construction strategy (construction package composition and timing, trade contractor requirements);
3. Provide advice and recommendations on design issues as these relate to constructability and have significant impacts on cost, schedule and quality;
4. Collaborate with the Consultant to ensure the design incorporates and responds to the Construction Manual;
5. Review the Design Development drawings and specifications for constructability and coordination and advise on improvements and/or adjustments;
6. Collaborate with the Consultant in the preparation of the Consultant's Class C construction cost estimate and cash flow update;
7. Prepare, in consultation with the Consultant, a comprehensive project schedule with gap analysis and recovery plan as may be necessary; and
8. Attend and participate in project meetings, design meetings, design charrettes, value engineering workshops and presentations.

#### **4.3.4 Construction Documents Phase**

The objective of the Construction Documents phase is to prepare tender and construction documents (drawings and specifications) detailing the site requirements allowing contractors to competitively tender and complete the necessary work. The Construction Manager is to:

1. Prepare and maintain construction schedules including task identification, durations and dependencies as well as track progress;
2. Attend and participate in project meetings, design meetings, design charrettes, value engineering workshops and presentations;
3. Ensure that the design and construction documents incorporate the Construction Manual and various Project Plans
4. Review tender and construction documents at 66% and 99% for bid-ability, constructability and compliance with stated project objectives, recommend modifications, and identify risk elements;
5. Ensure that the construction documents adequately include for risk mitigation measures as defined in the Project Risk management Plan;
6. Estimate construction costs, Class 'B' and 'A' based on 66% and 100% completed construction documents respectively;
7. Undertake gap analysis for cost and schedule deviations, arrange for project team meetings and establish need for, and develop recovery strategies and plans in collaboration with the Consultant;

8. Update cash flow requirements;
9. Identify requirements for equipment and materials with long delivery schedules and recommend pre-ordering;
10. Advise on quality requirements for the various sub-contracts and supply arrangements.
11. Advise on standard requirements for tender documents including insurance and contract surety (tender, performance and payment bonding);
12. Prepare tender strategy and Invitation to Tender (ITT) documents (other than technical documents, drawings and specifications) including pricing form, tender instructions, sub-contract general conditions, surety and insurance requirements.

#### **4.3.5 Tender Stage**

The objective of the Tendering Phase is to obtain fair pricing for the defined work through competitive tendering and awarding contracts to undertake and complete the work. A number of construction packages each with one or more sub-contracts have been anticipated in the preliminary planning process. The Construction Manager is to competitively tender the Work as would a General Contractor to obtain best value for the Crown using the tender drawings and specifications prepared by the Consultant. The Construction Manager's team, including non-arms-length entities and subcontractors and suppliers named in the proposal, will not be permitted to submit tenders on any of the construction packages or parts thereof. The tendering and sub-contract award process is to be in accordance with the approved Construction Manager Tendering Strategy and Process Plan referenced above.

The Construction Manager must undertake the following tasks as a minimum during the tendering stage of the Work. Additional tasks or subtask may be identified as the project develops.

1. Undertake final contract document (100% complete) bid-ability reviews;
2. Develop tender strategy specific to each construction package;
3. Prepare requests for tenders and issue tender documentation including drawings and specifications prepared by the Consultant;
4. Prepare or adjust the Class 'A' construction cost estimates for each tender package based on the 100% tender documents;
5. Coordinate and administer pre-tender site visits;
6. Receive and review questions from tenderers and prepare responses as may be appropriate;
7. Issue tender amendments as may be required;
8. Receive and evaluate tenders including confirmation of contract surety, insurance and tender compliance;
9. Apply for and confirm funding for each proposed contract award; and
10. Award contracts.

#### **4.3.6 Construction Phase**

Advisory Services during the Construction Phase is limited to providing advice related to significant scope changes and modifications due to unexpected site conditions requiring re-

design. All other services under this Phase are to be provided as defined in Construction Services below.

#### **4.3.7 Post Construction Phase**

There are no Advisory Services required during the Post Construction Phase. All services under this Phase are to be provided as defined in Post Construction Services below.

### **4.4 Construction Services**

The Construction Manager will undertake Constructor responsibilities and provide all General Contractor services including limited Division 1 requirements as defined by the National Master Specification (NMS) and specifically pre-authorized by the Departmental Representative. The Construction Manager's services will not include Trade Work. The Contractor shall not use its own forces, the forces of a non-arms-length entity nor the forces of subcontractors and suppliers named in the proposal to provide Trade Work unless the Contractor has been specifically authorized to do so in writing by Canada.

Generally, the provision of labour, materials and equipment for general site requirements identified in the project Brief as Division 1 work, other than that required under C. Percentage Construction Fee, will be tendered either as a component of a trade subcontract or as a site services subcontract. The Construction Manager and the Construction Manager's team, including non-arms-length entities and subcontractors and suppliers named in the proposal, may only provide these services when specifically pre-authorized in writing by Canada. Division 1 work not undertaken by the CM will be included in the specifications prepared by the Consultant for each construction package. The extent of Division 1 work, if any, to be done by the Construction Manager will be established with the Procedures Manual.

The Construction Manager must undertake the following tasks as a minimum during the construction stage of the Work. Additional tasks or subtask may be identified as the project develops.

1. Deliver the completed Work within the agreed cost and schedule to the level of quality expected by the Client and defined herein;
2. Maintain complete and accurate records of all construction activity, weather conditions, public and operational interface and other matters as they may impact on the construction. Provide copies of all records to the Departmental representative on request;
3. Provide suitable, cost effective insurance and contract surety for the overall construction requirements;
4. Obtain and manage appropriate insurance and contract surety from all contractors and subcontractors for each construction package;
5. Apply for, obtain, document and maintain all required permits, licenses and approvals and ensure compliance to stated requirements. Provide inspection and completion certification confirming compliance with the requirements of the Authority having jurisdiction as may be requested;
6. Establish, implement, enforce and document occupational health and safety requirements, as detailed in the Construction Manager Construction Health and Safety



and Related Plans, at all sites while under construction. The Construction Manager, as Constructor, will have care and custody of the site including fire prevention and response;

7. Establish, implement, enforce and document environmental requirements, as detailed in the Construction Manager Environmental Management and Related Plans, at all sites while under construction;
8. Participate with site operations liaison and coordination;
9. Delineate each construction site, establish security protocols for construction activities and implement appropriate site security;
10. Provide, operate, maintain and remove temporary site facilities including utility hook ups, water, sanitation units, telephone, heating and cooling as may be required and not included in a tendered package. The facilities must include office and storage space for Construction Manager site staff, an additional seating station for the Departmental Representative, and a document and meeting area for construction meetings;
11. Delineate, secure and maintain the Work site and laydown areas with appropriate barriers and signage where not included in a tendered package, and remove on completion;
12. Arrange and coordinate utility locates, inspections, lock outs, etc.;
13. Coordinate and document site access and inspections by authorized stakeholders;
14. Provide, install, maintain and remove signage related to traffic control, public safety and continued safe use of the waterway as required and not included in a tendered package;
15. Coordinate and direct contractors, sub-contractors and suppliers in such a way as to minimize conflict and disruption of waterway operations;
16. Hold and chair bi-weekly site meetings to discuss and manage construction and site issues;
17. Arrange for and document inspections by authorities having jurisdiction;
18. Provide testing services as directed by the Departmental Representative and coordinate site access to undertake sampling and monitoring as may be appropriate. Provide secure sample storage as required;
19. Maintain site logs;
20. Track all deviations from the construction drawings and specifications on an ongoing basis using information provided by subcontractors and suppliers as well as site observations. The deviations are to be clearly noted on a copy of the original construction documents and must be made available to the Departmental Representative on request;
21. Prepare, receive review and Process construction submittals (shop drawings, product information, certificates, warrantee documents, etc.);
  - i. Track all submittals using the Tracking Form to be provided by the Prime Consultant,
  - ii. Provide six (6) copies of each submittal to the Departmental Representative with a transmittal clearly identifying the documents referencing the Specification Section and Article,

- iii. Ensure that submittals generated or received by the Construction Manager have been reviewed internally for compliance with the design and contractual requirements,
  - iv. Review of the submittals by either the Departmental Representative and/or the Prime Consultant is for the sole purpose of ascertaining compliance with the general design concept and does not relieve the Construction Manager of responsibility for the accuracy of the submission or suitability of the subject material or equipment.
  - v. The submittal process is not to be used as a vehicle to change or modify the design or products specified;
22. Review, process and respond to Requests for Information (RFIs) from subcontractors and suppliers;
- i. Forward the RFI to the Departmental Representative if it involves technical or design issues not addressed in the contract. If not, address the concern with the subcontractor or supplier,
  - ii. Review the response from the Departmental Representative and if in agreement, forward to the subcontractor or supplier. If not in agreement, resolve the issue with the Departmental Representative, and
  - iii. Track all RFIs and maintain a log identifying date received, response and resolution;
23. Review, process and respond to Site instructions (SIs) issued by the Prime Consultant;
- i. Determine the impact of the SI and advise the Departmental Representative accordingly, and
  - ii. Instruct the subcontractor or supplier accordingly;
24. Review, process and respond to Contemplated Change Notices (CCNs) issued by the Prime Consultant;
- i. Determine the impact of the CCN including cost and schedule. Get costing from subcontractors and suppliers as necessary,
  - ii. Submit the cost and schedule impact to the Departmental Representative detailing labour, materials and disbursements and identifying any possible alternatives, and
  - iii. Costs are to be based on rates and formulas provided in the contract, subcontracts and purchase orders. Where rates and formulas are not available cost submissions are to be fair and reasonable.
  - iv. The Departmental Representative may, at his sole discretion, cancel, modify or re-issue the CCN;
25. Receive and process Change Orders as received from the Departmental Representative;
- i. Issue Change Orders to subcontractors and suppliers as appropriate,
  - ii. The work subject to a Change Order is not to proceed until authorized by the contract Authority,
  - iii. Document and track all contract changes and provide documentation to the Departmental Representative on request, and
  - iv. Report contract changes including cost and schedule impacts in the monthly project report.

26. Undertake field measurements and quantity calculations where payment for work complete by contractors is based on unit prices or per-diem rates;
27. Receive, review and process sub-contractor progress billings and payments;
28. Track construction progress, identify slippage, prepare and implement recovery strategies;
29. Track construction scope and costs, identify potential for cost increases and budget threats, develop alternatives and implement authorized action;
30. Undertake a construction quality control program to ensure compliance with project objectives and design intent;
31. Maintain a clean, obstruction free and safe site throughout the Work. Make every effort to avoid unsightly site conditions for public scrutiny;
32. Make sure that the site, including work and laydown areas, are restored to “as before” conditions on completion;
33. Identify and mitigate site and contractual conflicts and establish a conflict resolution process;
34. Undertake deficiency inspections, record and document findings, coordinate completion of deficiencies and accept the completed Work on behalf of the Departmental Representative;
35. Cooperate with the Prime Consultant and others during the performance of the final acceptance of each site;
36. Protect the work in progress and finished work until the work area has been accepted as complete and vacated by the Construction Manager.
37. Make final payment and release of holdback to contractors, subcontractors and suppliers only after confirmation of total completion of the Work under any given contract and final acceptance by the Departmental Representative; and
38. Compile and make available project documentation related to construction.

#### **4.4.1 Commissioning**

The Construction Manager must undertake the following commissioning tasks as a minimum during the construction stage of the Work where it is determined that a commissioning process is appropriate. Additional tasks or subtask may be identified as the project develops.

1. Manage the commissioning process for any equipment installations and processes as may be required;
2. Schedule commissioning activities to ensure availability of testing agencies, witnesses, affected trades, and Commissioning Team members as may be appropriate;
3. Administer and manage independent testing and documentation as may be required;
4. Obtain copies from suppliers and subcontractors of all test results, equipment documentation and manuals as may be appropriate;
5. Verify that all information and results provided comply with manufacturers submitted shop drawings and performance specifications;
6. Validate that all tests and measurements are in accordance with applicable standards, guidelines and/or accepted manufacturers performance measurements;

7. Follow up on any non-compliant installations and/or failed tests and verify corrective measures have been taken;
8. Arrange for witnessing tests as may be appropriate and document accordingly;
9. Complete and sign off all verification reports and compile a comprehensive Commissioning Manual on an ongoing basis;
10. Organize and chair Commissioning Team meetings as may be required including preparing agenda, taking and issuing meeting minutes;
11. Advise Commissioning Team members of any issues, concerns, delays or other developments which may have project impacts;
12. Establish operator training requirements and coordinate training including arranging for qualified instructors and suitable training materials;
13. Establish environmental mitigations related to commissioning;

#### **4.5 Post Construction**

The Construction Manager must ensure that the Work has been complete in accordance with the functional requirements, client expectations, intent of the design and in compliance with the construction documents and provide all the appropriate construction documentation available for the project record. The Post Construction tasks will apply to each work package and sub-contract as the Work is completed. The Construction Manager must undertake the following tasks as a minimum during the post construction stage of the Work. Additional tasks or subtask may be identified as the project develops.

1. Obtain from contractors and suppliers all product and installation documentation including product data and operations information, warranties, guarantees and other post-construction commitments, organize material and deliver to the Departmental Representative.
2. Gather and provide all necessary construction information including 'red-line' drawings, accepted shop drawings, equipment specification documentation, etc., and submit to the Departmental Representative for delivery to the Prime Consultant so as to prepare detailed record drawings identifying the extent of the Work and final restoration conditions.
3. The Construction Manager is also to assist the Prime Consultant and other stakeholders with project closeout including, but not limited to, preparing and submitting construction information with details of significant events, lessons learned, and sub-contractor evaluations.

##### **4.5.1 Warranties and Rectification of Defects in Work**

Without restricting the requirements set forth in R2830D GC3.12:

1. The Construction Manager shall assemble all manufacturers, suppliers and contractors guarantees and warranties on a site-by-site basis, review and confirm documentation is complete and comprehensive and in compliance with contractual requirements. Follow up on any deficiencies;
2. Warranty periods are to start on the date of certification of substantial performance and are for the durations specified in the contract documents;

3. All deficiencies in the work subject to warranty will be reported by the Departmental Representative to the Construction Manager. The Construction Manager will coordinate supplier and contractor responses including repairs and replacement as may be appropriate, confirm completion of the deficiencies and report to the Departmental Representative.
4. The Construction Manager shall be responsible for attending all warranty site meetings; and
5. At approximately (10) months from the commencement of the warranty period, the Construction Manager shall arrange with the Departmental Representative, the Prime Consultant, the Client and others as may be appropriate for an inspection of the facility to determine all deficiencies to be corrected:
  - i. Prepare a deficiency list for review and acceptance by the Departmental Representative;
  - ii. Provide a schedule indicating when correction of all deficiencies covered under the warranty will be corrected and submit to the Departmental Representative for review and acceptance;
  - iii. Arrange for and correct all identified deficiencies in accordance with the schedule and advise when all deficiencies have been properly corrected;
  - iv. Ensure that all warranty deficiencies are properly corrected in a timely manner.

**End of Terms of Reference**

## **Appendix A - Existing Documentation**