

## **PROJECT BRIEF**

### **PD PROJECT INFORMATION**

#### **PD 1 PROJECT DESCRIPTION**

##### **PD 1.1 Purpose**

- .1 To be in compliance with the Directive for Dam Safety Program of Parks Canada Dams and Water-Retaining Structures, Parks Canada is required to complete a Dams Safety Review for each of the dams in its inventory on a scheduled basis. This will be the first Dam Safety Review for the dam included in this project and will start the process of regular reviews of this structure.

##### **PD 1.2 Description**

- .1 A hydro-technical study to support current and future Dam Safety Reviews will be undertaken as part of this contract on the Spruce River Diversion Dam if local studies do not already exist for this site. If a study does not exist that satisfies the needs of the Dams Safety Review, a hydro-technical study will be undertaken on the watershed feeding the dam to determine flood flow estimates and hydrographs at the dam face.
- .2 A Dam Safety Review, in accordance with the Dam Safety Guidelines, 2007 of the Canadian Dam Association and the Directive for Dam Safety Program of Parks Canada Dams and Water-Retaining Structures of Parks Canada Agency, is to be undertaken at the Spruce River Diversion Dam.
- .3 Given the scope of the work included in this project, the Consultants will be required to draw upon their hydro-technical and dam safety review experience and include any information that they determine applicable to the thorough development of the Hydro-Technical studies and Dam Safety Reviews for the dam in their proposal.

## **PD 2 PROJECT INTRODUCTION AND BACKGROUND**

### **PD 2.1 USER DEPARTMENT**

- .1 The Client Park , referred to throughout the Project Brief, will be the following for the dam reviewed:

- a. Spruce River Diversion Dam: Prince Albert National Park

### **PD 2.2 PROJECT BACKGROUND**

#### **.1 Spruce River Diversion Dam**

##### **a. Watershed Description**

- i. The dam is located in central Saskatchewan just south of the Canadian Shield and along the east boundary of Prince Albert National Park. Anglin Lake is irregular in shape consisting of several lobes. It is approximately 3 km wide at the maximum and about 13 km in overall length. The volume of the water impounded has an estimated capacity of 41,875 m<sup>3</sup>.
- ii. The catchments area around the lake is estimated to be 615 sq km.

##### **b. Dam Description**

- i. The dam is a zoned earthfill dam embankment; approximate 243 m in length, 6.1 m in height and 6.1 m in width at the crest; with granular filter blanket, stoplog concrete chute and gated riparian. It is situated on federal land inside Prince Albert National Park boundary. It can be accessed from the Anglin Lake Subdivision at Jacobson's bay by travelling approximately 5 km west and south on secondary paved and gravel roads (Hwy 953).
- ii. The dam was built by the Federal Government in 1960 to regulate flow on the Spruce River and provide additional water for diversion to Emma and Christopher Lake to maintain lake levels for recreational purposes. The dam's prime function was to provide flow regulation and forest protection.

### **PD 2.3 DESIGN CODE AND REGULATIONS**

- .1 The standards, codes and regulations to be used for the inspection, design and construction of the dams and water retaining structures shall be the latest edition of the following (including all amendments, supplements and revisions thereto)

- a. Dam Safety Guidelines 2007 and Technical Bulletins, from the Canadian Dam Association, ISBN 978-0-7726-5802-9;
  - b. Parks Canada Directive for Dam safety Program of Parks Canada Dams and Water-Retaining Structures;
  - c. National Building Code of Canada;
  - d. Provincial Occupational Health and Safety Regulations;
  - e. Canada Labour Code (including latest revisions of all regulations)
  - f. Provincial Codes and Statutes when applicable.
- .2 In the event of contradictions between the provincial codes and the Parks Canada Directive, then the more rigorous code will take precedence.
- .3 In the event of any conflicts or discrepancies between the Dam Safety Guidelines 2007 and Parks Canada Directive for Dam safety Program of Parks Canada Dams and Water-Retaining Structures the Parks Canada Directive will take precedence.
- .4 The Consultant has the option of consulting other regulations, standards and codes as he deems necessary to complete the work under this project.

#### **PD 2.4 REVIEW ENGINEER AND CONSULTANT TEAM**

- .1 The Dam Safety Review needs to be headed by a registered professional engineer supported by a multidisciplinary team with background in design, construction, performance analysis and operation of dams.
- .2 The lead engineer appointed by the consulting firm on this project will assume the responsibility of the Review Engineer, and as such will be responsible for the final content of the Dam Safety Review. Furthermore, the Review Engineer, must declare prior to the beginning of the investigation whether or not he has been involved in any other work associated with the dam under review in this Project Brief.
- .3 The Consultant team for this project must be capable of providing the following services:
  - a. Structural engineering;
  - b. Civil engineering;
  - c. Dam safety engineering;
  - d. Hydrology and Hydraulics engineering;
  - e. Geotechnical engineering.
- .4 Furthermore, in addition to the above, depending of the result of the dam classification review, a seismologist specialist may be required to evaluate the earthquake parameters.

## **PD 2.5 CONSULTANT CONTRACT APPROACH**

- .1 The following Required Services (RS) are the overall Consultant Services which may be required to deliver this project.
  - a. RS 1 - PROJECT BRIEF REVIEW AND RECOMMENDATIONS
  - b. RS 2 – HYDRO TECHNICAL
  - c. RS 3a – DAM SAFETY REVIEW (Without Dam Break Analysis)
  - d. RS 3b – DAM BREAK ANALYSIS (if required)
  - e. RS 4 – EMERGENCY PREPAREDNESS PLAN (EPP)
  - f. RS 5 – EMERGENCY RESPONSE PLAN (ERP)
- .2 For each dam, the Consultant shall submit a separate price for each item that can be then utilized to amend the Contract should it be deemed, through the progress of the work, that a particular item is no longer required or covered off by the work performed for other items in the Contract.

## **PD 2.6 SCHEDULE**

- .1 The Consultant is to prepare a detailed schedule in MS Project format showing the durations and milestones for each of the phases shown in section PD 3.5. and submit as part of the deliverables identified in the Required Services (RS) section.
- .2 Weather permitting, all field work is to commence the week of October 21, 2013. The final report must be submitted no later than March 30, 2014.

## **PD 2.7 EXISTING DRAWINGS AND DOCUMENTATION**

- .1 The existing drawings and documents provided by the Client department for this project are to be treated as reference material only. PCA cannot ensure their completeness and accuracy. As such the Consultant is responsible to review and confirm all information and inform PCA of any discrepancies.
- .2 Existing documents:
  - a. RMI inspection documents from park for each dam
  - b. Layout sheet for each dam
  - c. Dam Data Sheet for each dam
  - d. Application of the PCA Dam Safety Directive and Engineering Inspection Report for each dam

## **PA PROJECT ADMINISTRATION**

### **PA 1.1 GENERAL**

- .1 The following administrative requirements apply during all phases of the project delivery
- .2 Requirements described in this project brief are read in conjuncture with the requirements mentioned in the Request for Proposal.

### **PA 1.2 PROJECT MANAGEMENT**

- .1 The Project Authority assigned by PCA to the project is the Departmental Representative
- .2 The Departmental Representative is the liaison amongst and between the Consultant and the National Park in which the dam resides.
- .3 The Departmental Representative administers the project and exercises continuing control over the project at all times.
- .4 Unless directed otherwise by the Departmental Representative, the Consultant obtains all Federal requirements and approvals necessary for the work from the Departmental Representative.

### **PA 1.3 HEALTH AND SAFETY**

#### **.1 GENERAL REQUIREMENTS**

The Consultant must:

- a. Develop written Site-Specific Health and Safety Plan (SSHSP) based on hazard assessment prior to beginning any field work and continue to implement, maintain, and enforce plan through all phases of the project.
  - i. The SSHSP needs to cover all activity of the Consultant team (consultant personnel, sub-consultant and contractors).
- b. The Consultant shall incorporate in his SSHSP and abide any additional constraint or safety requirement imposed by the PCA for accessing and using Parks Canada property or part there of.
- c. Coordinate field work with Parks Canada activity on or adjacent to the project site.
- d. Provide all required Personnel Protective Equipment, equipment and material as required to meet the intent of the safety requirement set in the SSHSP or as required by the Provincial Occupational Health and Safety Legislation.

- e. The Consultant shall be responsible for health and safety for all of their team on site, and for protection of general public and government employee adjacent to site to the extent that they may be affected by conduct of the field work.
- f. Prior to starting field work, attend a Safety Briefing meeting with Parks Canada.
- g. Daily tailgate meetings are required at the project site. Where appropriate, Parks Canada Operation staff are to participate in the daily tailgate meetings. Records of tailboard meetings are to be submitted to the Departmental Representative on a daily basis.

## **.2 REFERENCE CODES AND STANDARDS**

- a. Canada Labour Code
- b. NBC 2010, Division B, Part 8 Safety Measures at Construction and Demolition Sites
- c. Workplace Safety and Insurance Act, 1997
- d. Provincial statutes and authorities

## **.3 SUBMITTALS**

- a. Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of field work. Health and Safety Plan must be developed for each dam site separately and is to include:
  - i. Results of site specific safety hazard assessment.
  - ii. Mitigation and precaution measures that will be implemented as a results of safety and health risk or hazard analysis for site tasks and operations.
  - iii. Consultants' Team Safety Communication Plan.
  - iv. Contingency and Emergency Response Plan addressing standard operating procedures specific to the project site to be implemented during emergency situations. Where applicable, coordinate plan with existing Parks Canada Emergency Response requirements and procedures provided by Departmental Representative.
- b. In addition to the SSHSP the following documents shall also be submitted:
  - i. A copy of the Consultant Team WSIB Clearance Certificates.
  - ii. Occupational health and safety training and certification records: the Consultant must provide documentation verifying all members of the Consultant team have received the appropriate safety training including equipment operation training as required to perform the specific field work.
- c. Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns either accepting or requesting improvements.
- d. Departmental Representative's review of Consultant's final SSHSP should not be construed as approval and does not reduce the Consultant's overall responsibility for construction Health and Safety at the project site.

#### **PA 1.4 LINES OF COMMUNICATION**

- .1 Unless otherwise direct by the PCA Departmental Representative, conduct all project communication through the Departmental Representative only.
- .2 Formal contact between the Consultant and the PCA Project Team, which includes the National Park Representative, shall be through the Departmental Representative. Direct communication between members of the PCA Project Team on routine matters is required to enable discussion and resolution of technical issues. However, no communication shall alter the terms of the project scope, budget, or schedules unless directed in writing by the Departmental Representative.

#### **PA 1.5 MEDIA**

- .1 The Consultant shall not respond to requests for project related information or questions from the media. Such inquiries are to be directed to the Departmental Representative.

#### **PA 1.6 GENERAL PROJECT DELIVERABLES**

- .1 Where deliverables and submissions include summaries, reports, network diagrams, drawings, plans, specifications or finish schedules submit deliverables as follows:
  - a. Hard copies: four (4) English
  - b. Electronic format: three (3) copies English. The electronic deliverables shall be provided using Microsoft applications.
  - c. Alternatively, the Consultant may submit all work in Adobe Acrobat \*.pdf format except for Network Diagrams which must be submitted in their original electronic format
  - d. All drawings will be generated and distributed in the format using layering and file transfer protocols as prescribed in the 'Parks Canada Electronic Document Standards'.

#### **PA 1.7 ACCEPTANCE OF PROJECT DELIVERABLES**

- .1 While PCA acknowledges the Consultant's obligations to meet project requirements; the project delivery process entitles PCA to review work. PCA reserves the right to reject undesirable or unsatisfactory work. The Consultant must obtain Departmental Representative acceptances during each of the project stages.
- .2 Acceptances indicate that based on a general review of material for specific issues, the material is considered to comply with governmental and departmental objectives and practices, and that overall project objectives are being satisfied.
- .3 The acceptance does not relieve the Consultant of professional responsibility for the work and compliance with the Contract.
- .4 PCA acceptances do not prohibit rejection of work, which is determined to be unsatisfactory at later stages of review. If progressive inspection and reporting development or time / cost / risk updates or technical investigation reveals that earlier acceptances must be withdrawn, the

Consultant is responsible for correcting work and re-submitting for acceptance at the Consultant's cost.

- .5 Acceptances by the Client / Users and other agencies and levels of government must be obtained to supplement PCA acceptances. The Consultant shall assist the Departmental Representative in securing all such acceptances and adjust all documentation as required by such authorities when securing acceptance.

#### **PA 1.8 COORDINATION WITH SUB-CONSULTANTS**

- .1 Throughout all phases of the project, assume responsibility for coordinating the work of any Sub-consultants and specialists retained by the Consultant.
- .2 Ensure clear, accurate and ongoing communication of inspection work, reporting, budget, and scheduling issues including changes - as they relate to the responsibilities of all Sub-consultants and specialists from initial base building reviews to post construction reports.
- .3 Co-ordinate input for the Departmental Representative's Risk Management Plan.
- .4 Co-ordinate the Quality Assurance process ensuring submissions of Sub-consultants are complete and signed-off by the designated senior reviewer.
- .5 Ensure Sub-consultants provide adequate site inspection services and attend all required meetings.

#### **PA 1.9 MEETINGS AND PROGRESS REPORTS**

- .1 The Departmental Representative will conduct a face to face project start-up meeting with the Consultant and Client Park representatives to go over required procedures for working within a National Park and environmental concerns that must be addressed as part of the work. At the start-up meeting the Consultant will be prepared to provide a presentation indicating the approach to be taken to complete the works including identification of the principles involved, preliminary schedule for the various components of the works, and to identify any concerns or additional information that may be required to complete the works.
- .2 The Departmental Representative shall receive a Progress Report by e-mail every two (2) weeks throughout the entire project development and implementation period from the Consultant indicating the following:
  - a. Current status of project
  - b. Planned activities and work
  - c. Issues

**d.** Impacts on Schedule and Budget (if any).

**.3** At the request of the Departmental Representative, a conference call may be requested with the Consultant and including the Park Client Representatives to review progress in the project and to discuss plans or issues that may be coming forward.

**.4** For all meetings, the Consultant shall:

- a.** Attend the meetings,
- b.** Record the issues and decisions and,
- c.** Prepare and distribute minutes within two (2) working days of the conference call.

## **RS REQUIRED SERVICES**

### **RS 1 PROJECT BRIEF REVIEW AND RECOMMENDATIONS**

#### **RS 1.1 GENERAL**

- .1 The Consultant shall review and assess existing documentation, available water level records, and other relevant data , and determine what additional information will be required to complete the various aspects of the work for each dam identified in the Project Brief.
- .2 The Consultant will use the Review to determine if all the components defined as deliverables are required or if any may be combined or eliminated from the works (such as whether or not a Dam Break Analysis is required or if there is a need to prepare an Emergency Preparedness Plan, based on the type of dam being reviewed) for each dam.

#### **RS 1.2 DELIVERABLES**

- .1 A Detail Dam Inspection Program report for each dam identified for Review, consisting but not limited to the following:
  - a. Safety Plan
  - b. Project Control System Plan
  - c. Environmental Protection Plan
  - d. List of Inspection Equipment to be used
  - e. List of Inspection Team
  - f. Detail comprehensive plan for doing the inspection and producing the various components required for the Dam Safety Review
  - g. A determination as to what components will be required to complete the Review
  - h. Detailed schedule for project
  - i. Contact list

## **RS 2 HYRDO-TECHNICAL STUDY**

### **RS 2.1 SCOPE OF SERVICES**

- .1 Review and access existing documentation and available water level records on file at National Park Administration Office in the Park where the dam is located.
- .2 To facilitate a consistent approach to Dam Safety Reviews, hydro-technical models and corresponding peak flood flows and hydrographs will be developed at the dam location for the watershed being studied.
- .3 Then apply the flood flow estimates to specific Dams Safety Reviews identified in this Statement of Work.
- .4 Establish the peak flood flows and hydrographs are to be established for the 2, 5, 10, 20, 50, 100, 500, 1000 and 10,000 year return period floods, and Probable Maximum Flood (PMF). The PMF will be estimated based on the best information available (i.e., local PMP information and hydrological modeling). The Consultant should detail their approach to determining the PMFs in their proposal.
- .5 Document historical high water levels and flows (if available) and compared to the above design floods. The analysis must be provided on CD ROM so that it can be used in further Dam Safety Reviews and studies. The findings must be presented in a separate flood flow estimate report with sufficient detail to present and explain the model, data, and flood flow estimates.

### **RS 2.2 DELIVERABLE**

- .1 As part of the Dam Safety Review, provide flood flows estimates and hydrographs. Results must be summarized, and the recommended flood flows justified.
- .2 Computer models used in the analysis, input and output shall be provided on CD ROM so that it can be used in further Dam Safety Reviews and studies.
- .3 Present the findings with sufficient detail explain the model, data, and flood flow estimates.
- .4 Ensure the output from the study has sufficient detail and appropriate format so engineering consultants contracted to undertake future DSR's can readily apply it to their studies. Instructions must also be provided to permit its application in future Dam Safety Reviews. The Consultant will submit four hard copies and one electronic copy (pdf format) of the flood flow estimate report.

### **RS 2.3 PRESENTATIONS**

- .1 The Consultant team shall deliver presentations for the Hydro-technical Study Report to PCA and the Client Park.

### **RS 3 DAM SAFETY REVIEW**

#### **RS 3.1 GENERAL**

- .1 In general terms the scope of the Dam Safety Review (DSR) for each dam identified will cover all aspects required to demonstrate that:
  - a. The dam is safe, operated safely and maintained in a safe condition;
  - b. Surveillance is adequate to detect any developing safety problem;
  - c. Emergency preparedness plans, when required, and emergency response plans are in place;
- .2 Any deficiencies are to be identified by the Reviewing Engineer and reported.
- .3 A Dam Break Analysis may or may not be required as part of the Dam Safety Review for each Dam, depending on the dam and the circumstances surrounding the dam. The pricing for the Dam Safety Review is broken up into two sections:
  - a. RS 3a: Cost to do the Dam Safety Review with no Dam Break Analysis
  - b. RS 3b: Cost to perform Dam Break Analysis (if required)
- .4 When writing the final report, accepted standards for each requirement should be presented as well as what was found for each dam. The purpose of this is to be able to assess how this dam meets the current acceptable standards for dams.

#### **RS 3.2 PRE-FIELD INSPECTION**

- .1 Review of existing drawings, reports and documents of structures for each dam. What records that exist will be located in the Client Park Asset Management office for the particular dam being reviewed.
- .2 Be familiar with the CDA Dam Safety Guidelines and the Directive for Dam Safety Program of Parks Canada Agency for Dams and Water-Retaining Structures for structures owned by Parks Canada.
- .3 Prior to going into the field, ensure that the requirements for the Detailed Dam Inspection Report (RS 1.2.1) have been prepared and submitted for each dam being inspected.

#### **RS 3.3 SITE INSPECTION**

- .1 **Field Inspection Records:**

The Consultant must:

  - a. For each dam, in addition to the dam structure itself, the Consultant shall inspect and document the condition of railings, fencing, log booms, signage, etc. and recommend appropriate measures to correct unsafe conditions, and provide associated cost estimates.
  - b. The Consultant shall prepare an AutoCad based drawing showing the plan and elevation layouts of the dam. The drawing shall be a metric dimensioned drawing including all pertinent measurements of all features associated with the dam.

- c. A detailed structural inspection of the dam and the site will be undertaken to assess existing conditions, confirm material used for construction, foundation condition and contact, and to collect other pertinent information deemed relevant to the dam safety review.
- d. Plans, drawings and photographs as appropriate shall be prepared to document the location, type, and extent of deterioration and/or problem areas. The Consultant shall identify the probable cause or causes of such deterioration (e.g. freeze thaw action, ice damage, seepage, alkali-silica reaction, settlement, etc.).
- e. The Consultant shall document the important features found at the site. The points of interest are to be electronically annotated using circles or arrows with appropriate captions outside the body of the photograph in the white page margins.
- f. The site inspection shall include a survey both upstream and downstream, to photograph and document existing development & infrastructure that could be adversely affected (including flooding, erosion or ice damage) by the operation of the dam or by an uncontrolled release.
- g. Perform a topographic survey to the extent as to confirm any “as-Built” drawing information and to add into the drawings any information that was found to be missing. Such information may include critical elevations, adjacent buildings, intake structures, outlets, roads, etc. The updated plans must be prepared showing locations and reference numbers of potentially affected development or infrastructure, and a spreadsheet used to summarize data.
- h. The Consultant shall review existing operation and surveillance procedures and policies, emergency preparedness plan and emergency response plan (if they exist) for information purposes. As part of the Dam Safety Review Report, the Consultant shall discuss the status of these reports and provide information on any deficiencies.
- i. The Consultant will be able to discuss operational or maintenance concerns with Parks Canada Asset Management staff and Province of Saskatchewan’s Water Security Agency. These discussions will be essential for the development of an Operation, Maintenance and Surveillance (OMS) Manual(s) for the dam (RS 5).

## **.2 Geological Survey**

The Consultant must:

- a. Carry out a geological survey (non-intrusive) and study to identify geological features that could affect the stability of the structure.
- b. Map seepage areas downstream of the dam and estimate flow rates. For earth & rock fill portions of the dam (embankment), the Consultant shall assess and document any evidence of piping or seepage (including an estimate of the rate), and any evidence of heaving, settlement or slope movement.

## **.3 Operator and Public Safety**

- a. The Consultant shall verify that public safety and security issues at the dam have been addressed taking into consideration CDA recommended practice. Deficiencies with mitigation recommendations shall be documented in the Dam Safety Review Report.
- b. The Consultant shall review operation safety procedures for the dam. Safety procedures and equipment for the existing dam operation are to be evaluated against the Canada Labour Code, the Provincial authorities’ Health Safety Act and Parks Canada Agency Occupational

## Health and Safety Program and Policies

### **.4 Emergency Condition Reporting Requirement**

- a. Report to the Departmental Representative any serious deficiencies identified in the site inspections related to the Occupational Health & Safety Act (OHSA) or public safety. Also, provide the Departmental Representative, with a proposed immediate course of action to be taken.
- b. Within 24 hours of the verbal report, provide a written report to the Department Representative.
- c. The Consultant is to provide recommended remedial measures and associated cost estimates in a brief supplementary report.

### **.5 Dam Classification Review**

#### **a. Preliminary Dam Classification**

- i. Based on available data (e.g. characteristics of the dam, reservoir, watershed, topography, discharge facilities, downstream development, recreational activities, historical flooding, etc.) and appropriate simplified analyses, the Consultant shall review the preliminary assigned Dam Classification for the dam.
- ii. Result of the review needs to be presented to PCA before proceeding with any analysis work for the Confirmation of the Dam Classification.

#### **b. Confirmation of Dam Classification**

- i. The Dam Classification for the dam will be determined in accordance with the Parks Canada Directive for Dam Safety Program of Parks Canada Dams and Water-Retaining Structures, based on the classification criteria as set out in the directive.
- ii. The Dam Classification will include the following Tasks:
  1. determine the hydrologic & hydraulic conditions under which the dam would be assumed to fail. This should consider infrequent floods under reasonable dam operation; and frequent floods with the discharge capacity of the dam impaired due to ice, debris, inaccessibility, etc.
  2. assessing the potential for loss of life and property damage, if any, under initial conditions (i.e. prior to dam failure);
  3. if required, use an appropriate numerical dam break model, such as HEC-RAS, to simulate the downstream effects of failure of the dam, including flood peak or flood wave immediately downstream of the dam;
  4. assess the incremental effects on life, property and the environment as a result of dam failure. This will require generating detailed information on peak flood levels, time of flood arrival, and time to flood peak (from initiation of the dam break). The estimation of expected loss of life shall be as defined by USBR's "A Procedure for Estimating Loss of Life Caused by Dam Failure" (DSO-99-06), or an acceptable equivalent. A monetary estimate of incremental economic damage/loss due to dam failure is required.
  5. determine and identify a classification for each of the "sunny day" and incremental

"flood" failure conditions. The higher of the two classifications will be the governing classification for the dam.

6. determine the final classification of the dam structure, considering the incremental effects of failure of the dam using the criteria set out in the Parks Canada Directive for Dam safety Program of Parks Canada Dams and Water-Retaining Structures.
- iii. As part of the report provide a discussion of the assumption and approach used to determine the Dam Classification. As a minimum the discussion needs to cover:
    - Population at risk and potential Loss of Life;
    - Property and Economic Losses
    - Environmental Loss, downstream and upstream if applicable;
    - Cultural and Heritage Losses
    - Incremental and Total Consequences

**c. Determination of Inflow Design Flood (IDF) and Dam Break Analysis**

- i. The Consultant shall establish the IDF flow parameters at each dam and shall assess the adequacy of the hydraulic characteristics at each dam under IDF conditions, including the following specific tasks:
  1. Using the hydro-technical model developed under RS 2, determine and plot the inflow & outflow hydrographs (as per Flood Flow Estimate section)
  2. determine and plot the variation of head levels with time during the IDF;
  3. determine and plot the sensitivity of the peak headwater and tailwater levels to inflows, as a percentage of the IDF (if applicable);
  4. assess the adequacy of the available freeboard each dam, and embankment locations under normal and peak IDF conditions by determining wind set-up and wave run-up.
- ii. The Consultant shall perform a dam break analysis (where required) at each dam for the purpose of confirming and /or determining the Dam Classification and IDF and for producing a set of river-based inundation maps showing the worst-case inundation due to failure of the dam. These maps shall be at a suitable scale for use in the Emergency Preparedness Plan (EPP) if required.
- iii. Where the Dam Classification is clear, based on the preliminary assessment, the dam break analysis may no be required.

**d. Seismic Parameters**

- i. Should the Dam Classification require it, assess the earthquake parameter.
  1. Given their preliminary assigned Dam Classification and based on the guidelines as described in the Parks Canada Directive for Dam Safety Program, the required earthquake parameters for site are available from the Geological Survey of Canada
- ii. Consider that this work if required will be managed as an amendment to this contract.

**e. Earth Embankment Assessment**

- i. For the assessment of the embankments, analyze the embankment to determine the integrity of the dam under standard loading conditions. Combinations of loading are categorized by their likelihood of occurrence. Unusual loads due to flood and earthquake events should also be considered. The assessment of the earth embankments will include:
  1. the stability of the embankment under normal operations with steady state seepage;
  2. the stability of the dam under applicable seismic load conditions;
  3. the embankment stability under IDF conditions including the effect of overtopping on its overall stability;
  4. embankment stability under condition, such as rapid drawdown;
  5. seepage, piping and heaving potential
- ii. Assess the need for a further assessment. Develop a detailed field investigation program, as required, to undertake underwater inspection, subsurface sampling, piezometer installation, destructive & none-destructive testing, and laboratory analysis as required. This shall include details on sub-consultants to be used (if any), costs involved, additional stability analysis with results from the field investigation program, test locations, etc. for approval by Departmental Representative.
  1. Implementation of the detailed field investigation program will be managed for a particular dam as an amendment to this contract and the costs are not to be included for the purposes of this proposal.
- iii. Determine if the dam satisfies the CDA guidelines.
- iv. Prioritize deficiencies and recommend measures to address deficiencies identified in the site inspection and the stability analysis.
- v. Provide repairs recommendations and estimated costs
- vi. Recommend appropriate timelines for implementation based on operator & public safety considerations.
- vii. As part of the report, includes all assumption , parameters and calculation for the stability analysis of the embankments.

**f. Deliverables**

- i. Status Reports
  1. Submit brief (i.e., 1 page), weekly progress reports to PCA by e-mail each Friday summarizing the progress in the past week, the plan for the next week, and any difficulties encountered. The last weekly progress report for each month will also contain a budget summary of the progress to date, budget variance and estimate to completion.
- ii. Supplementary Critical Safety Issues Report

1. Serious deficiencies identified in the site inspections related to the Occupational Health & Safety Act (OHSA) or public safety are to be identified immediately with recommended remedial measures and associated cost estimates in a brief supplementary report to PCA. The Consultant will submit three hard copies and one electronic copy (pdf format) of a critical safety issue report.

**iii. Dam Safety Review Report for the dam:**

1. The Consultant shall prepare a detailed Dam Safety Review Report for the dam upon completion of the study. A draft report is to be forwarded to Departmental Representative for review prior to finalizing. The final report will be prepared after written comments from the Departmental Representative are satisfactorily addressed.
2. Provide two (2) hard copies of the draft report and four (4) hard copies of the final Dam Safety Report. Also provide three (3) CD-ROMs containing the final report, photographs, drawing in AutoCAD and pdf format.
3. The Dam Safety Report shall cover all aspects of the Dam Safety Review. The content of the report will be based on CDA Dam Safety Guidelines and will include but not necessarily be restricted to:
  - a. Title Page
  - b. Covering memorandum
  - c. Project Team
  - d. Site Photo
  - e. Executive Summary
  - f. Recommendation Table and Cost Estimate
  - g. Report
    - i. Introduction
      1. Purpose and Objectives
      2. Site Description / Location
    - ii. Background Information
      1. General
      2. Background
        - a. General
        - b. Construction / Repair History
        - c. Geological and Geotechnical Characteristics
        - d. Operation
      3. Drawing
        - a. Site layout (consultant to provide a topographical AutoCAD drawing of site)
        - b. As-found drawing of the dam (consultant shall measure all dam dimensions and create border-titles-scaled drawings (AutoCAD format) showing the plan view, and upstream profile, a downstream profile, appropriate section details and any text notes for clarification)
    - iii. Inspection and Deficiencies
      1. Record of Observation

- a. Review of the dam structure
      - b. Review of operation procedures
      - c. Review of operation and public safety
      - d. Geotechnical aspect
    2. Review of existing operation procedures and policies, OMS, EPP, and ERP documents
  - iv. Dam Classification Review
    1. Review of preliminary assigned Dam Classification
    2. Dam Break Analysis and Inundation Mapping
    3. Confirmation of Dam Classification
  - v. Dam Safety Analysis
    1. Hydro-Technical
      - a. Description of watershed
      - b. IDF / PMF assessment
    2. Hydraulic Capacity
      - a. Operational procedures
      - b. Dam discharge capacity
      - c. Discharge analysis / Operating Rule Curve
      - d. Adequacy of Discharge Capacity
      - e. Freeboard and Wave Action
    3. Stability Assessment Analysis
  - vi. Recommendation
    1. Recommendation for additional studies
    2. Recommendation for rehabilitation / repair and their priority
    3. Cost estimate of the rehabilitation / repair work
  - vii. Conclusion
  - viii. Appendices
- iv. Presentations
1. The Consultant team shall deliver presentations for the Dam Safety Review Report for each dam to PCA and the Client Park.

## **RS 4 EMERGENCY PREPAREDNESS PLAN**

### **RS 4.1 SCOPE OF SERVICES**

- .1 If required, the Consultant shall develop an Emergency Preparedness Plan (EPP) for each dam in accordance to the CDA. The level of detail shall be commensurate with the potential for upstream and downstream damages and loss of life. Potential emergency conditions at the dam should be evaluated and contingency plans established. Liaison with other stakeholders within the watershed (i.e. hydro power owners, municipalities, and Provincial Ministries of Environment/Natural Resources) will be required to ensure co-ordination and consistency of the EPP.
- .2 The scope and complexity of the EPP will be consistent with the classification of the dam, and the type of the downstream impacts.
- .3 The format of the EPP shall be approved by the Departmental Representative prior to its development to ensure consistency throughout its operation sectors.

### **RS 4.2 DELIVERABLE**

- .1 The Consultant shall prepare a detailed EPP for the dam reviewed. Draft reports are to be forwarded to the Departmental Representative for review prior to finalizing. The final report will be prepared after written comments from the Departmental Representative are satisfactorily addressed.
- .2 Colour schemes for EPP covers and charts will follow Parks Canada standards that will be provided upon contract award. Reference charts will be laminated.
- .3 Provide two (2) hard copies of the draft report and four (4) hard copies of the final EPP Manual for each dam. Also provide three (3) CD-ROMS containing the final EPP manual in pdf format for each dam site.

## **RS 5 EMERGENCY RESPONSE PLAN**

### **RS 5.1 SCOPE OF SERVICES**

- .1 The Consultant shall develop an Emergency Response Plan (ERP) for each dam reviewed in accordance to the CDA. The level of detail shall be commensurate with potential for upstream and downstream damages and loss of life. Potential emergency conditions at the dam should be evaluated and contingency plans established. Liaison with other stakeholders within the watershed (i.e. hydro power owners, municipalities, and Provincial Ministries of Environment/Natural Resources) will be required to ensure co-ordination and consistency of the ERP.
- .2 The scope and complexity of the ERP will be consistent with the classification of the dam, and the type of the downstream impacts.
- .3 The format of the ERP shall be approved by the Departmental Representative prior to its development to ensure consistency throughout its operation sectors.

### **RS 5.2 DELIVERABLE**

- .1 The Consultant shall prepare a detailed ERP for each dam reviewed. Draft reports are to be forwarded to the Departmental Representative for review prior to finalizing. The final report will be prepared after written comments from the Departmental Representative are satisfactorily addressed.
- .2 Colour schemes for ERP covers and charts will follow Parks Canada standards that will be provided upon contract award. Reference charts will be laminated.
- .3 Provide two (2) hard copies of the draft report and four (4) hard copies of the final ERP Manual for each dam. Also provide three (3) CD-ROMS containing the final EPP manual in pdf format for each dam site.