PWGSC/TPSGC

REQUEST FOR PROPOSAL

FOR

ENVIRONMENT CANADA

FOR

CANADIAN WEATHER RADAR REPLACEMENT SOLUTION (CWRRS)

THIS DOCUMENT CONTAINS SECURITY REQUIREMENTS

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PART 1 - GENERAL INFORMATION

1.1 Introduction

The bid solicitation is divided into seven parts plus attachments and annexes, as follows:

Part 1 General Information: provides a general description of the requirement;

Part 2 Bidder Instructions: provides the instructions, clauses and conditions applicable to the bid solicitation;

Part 3 Bid Preparation Instructions: provides bidders with instructions on how to prepare their bid;

Part 4 Evaluation Procedures and Basis of Selection: indicates how the evaluation will be conducted, the evaluation criteria that must be addressed in the bid, and the basis of selection;

Part 5 Certifications: includes the certifications to be provided;

Part 6 Security, Financial and Other Requirements: includes specific requirements that must be addressed by bidders; and

Part 7 Resulting Contract Clauses: includes the clauses and conditions that will apply to any resulting contract.

The Annexes include the Statement of Work, the Price Schedule, the Security Requirements Check List, the Insurance Requirements, the Federal Contractors program for employment equity certification and the Task Authorization Form 572.

1.2 Summary

(i) Environment Canada's Meteorological Service of Canada (MSC) has a requirement for the supply, delivery and installation of twenty (20) weather radar systems with associated infrastructure. The requirement also includes the documentation as well as related training and project management services. In addition, there are irrevocable options for the supply, delivery and installation of up to an additional thirteen (13) weather radar systems with associated infrastructure including documentation, training and the project management services. The optional specialized professional services will be required on an as and when requested basis. The Contract Period will be from Contract award to March 31, 2023 with the option to extend the contract for two (2) additional one-year periods.

(ii) There are security requirements associated with this requirement. For additional information, consult Part 6 - Security, Financial and Other Requirements, and Part 7 - Resulting Contract Clauses. For more information on personnel and organization security screening or security clauses, bidders should refer to the Industrial Security Program (ISP) of Public Works and Government Services Canada (http://ssi-iss.tpsgc-pwgsc.gc.ca/index-eng.html) website".

(iii) As per the Integrity Provisions under section 01 of Standard Instructions 2003, bidders must provide a list of all owners and/or Directors and other associated information as required. Refer to section 4.21 of the Supply Manual for additional information on the Integrity Provisions.

(iv) The requirement is subject to the Agreement on Internal Trade (AIT).

(v) The Federal Contractors Program (FCP) for employment equity applies to this procurement; see Part 5 - Certifications, Part 7 - Resulting Contract Clauses and the annex titled *Federal Contractors Program for Employment Equity - Certification*."

1.3 Debriefings

Bidders may request a debriefing on the results of the bid solicitation process. Bidders should make the request to the Contracting Authority within 15 working days from receipt of the results of the bid solicitation process. The debriefing may be in writing, by telephone or in person.

1.4 Conflict of Interest

Bidders are advised to refer to Conflict of Interest provisions at Article 18 of SACC 2003 (dated 2014-09-25), Standard Instructions – Goods or Services – Competitive Requirements available on the PWGSC Website https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual/1/2003/19#conflict-of-interest

PART 2 - BIDDER INSTRUCTIONS

2.1 Standard Instructions, Clauses and Conditions

All instructions, clauses and conditions identified in the bid solicitation by number, date and title are set out in the *Standard Acquisition Clauses and Conditions Manual* (https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual) issued by Public Works and Government Services Canada.

Bidders who submit a bid agree to be bound by the instructions, clauses and conditions of the bid solicitation and accept the clauses and conditions of the resulting contract.

The 2003 (2014-09-25) Standard Instructions - Goods or Services - Competitive Requirements, are incorporated by reference into and form part of the bid solicitation.

Subsection 5.4 of 2003, Standard Instructions - Goods or Services - Competitive Requirements, is amended as follows:

Delete: 60 days
Insert: 280 days

2.2 Submission of Bids

Bids must be submitted only to Public Works and Government Services Canada (PWGSC) Bid Receiving Unit by the date, time and place indicated on page 1 of the bid solicitation.

Due to the nature of the bid solicitation, bids transmitted by facsimile to PWGSC will not be accepted.

2.3 Enquiries - Bid Solicitation

All enquiries must be submitted in writing to the Contracting Authority no later than 15 calendar days before the bid closing date. Enquiries received after that time may not be answered.

Bidders should reference as accurately as possible the numbered item of the bid solicitation to which the enquiry relates. Care should be taken by bidders to explain each question in sufficient detail in order to enable Canada to provide an accurate answer. Technical enquiries that are of a proprietary nature must be clearly marked "proprietary" at each relevant item. Items identified as “proprietary” will be treated as such except where Canada determines that the enquiry is not of a proprietary nature. Canada may edit the question(s) or may request that the Bidder do so, so that the proprietary nature of the question(s) is eliminated and the enquiry can be answered to all bidders. Enquiries not submitted in a form that can be distributed to all bidders may not be answered by Canada.

2.4 Applicable Laws

Any resulting contract must be interpreted and governed, and the relations between the parties determined, by the laws in force in Ontario.

Bidders may, at their discretion, substitute the applicable laws of a Canadian province or territory of their choice without affecting the validity of their bid, by deleting the name of the Canadian province or territory specified and inserting the name of the Canadian province or territory of their choice. If no change is made, it acknowledges that the applicable laws specified are acceptable to the bidders.

PART 3 - BID PREPARATION INSTRUCTIONS

3.1 Bid Preparation Instructions

(a) Canada requests that bidders provide their bid in separately bound sections as follows:

(i) Section I: Technical Bid (4 hard copies and 4 USB Drive soft copies)

(ii) Section II: Financial Bid (2 hard copies and 2 USB Drive soft copies)

(iii) Section III: Certifications (2 hard copies and 2 USB Drive soft copies)

(iv) Section IV: Additional Information (2 hard copies)

If there is a discrepancy between the wording of the soft copy and the hard copy, the wording of the hard copy will have priority over the wording of the soft copy.

Prices must appear in the financial bid only. No prices must be indicated in any other section of the bid.

(b) Canada requests that bidders follow the format instructions described below in the preparation of their bid:

(i) use 8.5 x 11 inch (216 mm x 279 mm) paper;
(ii) use a numbering system that corresponds to the bid solicitation.

(c) In April 2006, Canada issued a policy directing federal departments and agencies to take the necessary steps to incorporate environmental considerations into the procurement process Policy on Green Procurement (http://www.tpsgc-pwgsc.gc.ca/ecologisation-greening/achats-procurement/politique-policy-eng.html). To assist Canada in reaching its objectives, bidders should:

(i) use 8.5 x 11 inch (216 mm x 279 mm) paper containing fibre certified as originating from a sustainably-managed forest and containing minimum 30% recycled content; and

(ii) use an environmentally-preferable format including black and white printing instead of colour printing, printing double sided/duplex, using staples or clips instead of cerlox, duotangs or binders.

(d) **Joint Venture Experience:**

If the bid is submitted on behalf of a joint venture, except where expressly provided otherwise, at least one member of a joint venture Bidder must meet any given mandatory requirement of the solicitation. Joint venture members cannot pool their abilities to satisfy any single mandatory requirement of the solicitation. Wherever substantiation of a mandatory requirement is required, the Bidder is requested to indicate which joint venture member satisfies the requirement. Any Bidder with questions regarding the way in which a joint venture bid will be evaluated should raise such questions through the Enquiries process as early as possible during the solicitation period.

Example: A bidder is a joint venture consisting of members X, Y and Z. If a solicitation requires: (a) that the bidder have 3 years of experience providing maintenance services, and (b) that the bidder have 2 years of experience integrating hardware with complex networks, then each of these two requirements can be met by a different member of the joint venture. However, for a single requirement, such as the requirement for 3 years of experience providing maintenance services, the bidder cannot indicate that each of members X, Y and Z has one year of experience, totaling 3 years. Such a response would be declared non-responsive.

3.2 Section I: Technical Bid

In their technical bid, bidders should demonstrate their understanding of the requirements contained in the bid solicitation and explain how they will meet these requirements. Bidders should demonstrate their capability and describe their approach in a thorough, concise and clear manner for carrying out the work.

The technical bid should address clearly and in sufficient depth the points that are subject to the evaluation criteria against which the bid will be evaluated. Simply repeating the statement contained in the bid solicitation is not sufficient. In order to facilitate the evaluation of the bid, Canada requests that bidders address and present topics in the order of the evaluation criteria under the same headings. To avoid duplication, bidders may refer to different sections of their bids by identifying the specific paragraph and page number where the subject topic has already been addressed.

3.3 Section II: Financial Bid

3.3.1 Bidders must submit their financial bid in Canadian Dollar and in accordance with Attachment 4 – Bidder's Pricing Table. The total amount of applicable Taxes must be shown separately.

3.3.2 Exchange Rate Fluctuation

C3011T (*2013-11-06*), Exchange Rate Fluctuation

3.4 Section III: Certifications

Bidders must submit the certifications required under Part 5.

3.5 Section IV: Additional Information

3.5.1 Financial Capability Requirement

Bidders must submit the financial information in accordance with subsection 6.2.1 of Part 6.

PART 4 - EVALUATION PROCEDURES AND BASIS OF SELECTION

4.1 Evaluation Procedures

(a) Bids will be assessed in accordance with the entire requirement of the bid solicitation including the Technical and Financial evaluation criteria and Verification process. There are 2 steps in the evaluation process, which are described in Attachment 1 – Evaluation Methodology and Basis of Selection.

(b) An evaluation team composed of representatives of Canada will evaluate the bids on behalf of Canada. Canada may hire any independent consultant, or use any government resources, to evaluate any bid. Not all members of the evaluation team will necessarily participate in all aspects of the evaluation.

(c) PWGSC has engaged a fairness monitor for this procurement. The fairness monitor will not be part of the evaluation team, but will observe the evaluation of the bids with respect to Canada's adherence to the evaluation process described in this bid solicitation.

4.1.1 Technical Evaluation

(a) **Mandatory Technical Criteria:**

(i) Each bid will be reviewed for compliance with the mandatory requirements of the bid solicitation. Any element of the bid solicitation that is identified specifically with the words "must" or "mandatory" is a mandatory requirement. Bids that do not comply with each and every mandatory requirement will be declared non-responsive and will not be given any further consideration.

(ii) The mandatory technical criteria are described in Attachment 2 - Mandatory Evaluation Criteria.

(b) **Point Rated Technical Criteria**

(i) A bid meeting all the mandatory requirements will be rated by assigning a score to the rated requirements, which are identified in the bid solicitation by the word "rated" or by reference to a score. Bidders who fail to submit complete bids with all the information requested by the bid solicitation will be rated accordingly. The point-rated technical criteria are described in Attachment 3 – Point-Rated Evaluation Criteria.

(ii) Canada may continue with the evaluation of the rated requirement in an event where clarification is sought from a Bidder in relation to a mandatory requirement. In this case Canada may decide not to delay the evaluation of the rated requirements while waiting for clarification on some of the mandatory requirements. Once it is confirmed that the Bidder does not meet all the mandatory requirements, the evaluation of the rated requirement will be stopped and the Bidder will be given no further consideration.

4.1.2 Financial Evaluation

(a) The Financial Evaluation process is described in Attachment 1 - Evaluation Methodology and Basis of Selection and the following SACC Manual Clause:

SACC Manual Clause A0220T (2014-06-26), Evaluation of Price - Bid

(b) The final evaluated price will be calculated in accordance with Attachment 4 – Bidder's Pricing Table.

4.1.3 Verification Process

(a) The Verification Process is described in Attachment 1 – Evaluation Methodology and Basis of Selection.

4.2 Basis of Selection

Please refer to Attachment 1 – Evaluation Methodology and Basis of Selection.

PART 5 - CERTIFICATIONS

Bidders must provide the required certifications and associated information to be awarded a contract.

The certifications provided by bidders to Canada are subject to verification by Canada at all times. Canada will declare a bid non-responsive, or will declare a contractor in default in carrying out any of its obligations under the Contract, if any certification made by the Bidder is found to be untrue, whether made knowingly or unknowingly, during the bid evaluation period or during the contract period.

The Contracting Authority will have the right to ask for additional information to verify the Bidder's certifications. Failure to comply and to cooperate with any request or requirement imposed by the Contracting Authority may render the bid non-responsive or constitute a default under the Contract.

5.1 Certifications Precedent to Contract Award

The certifications listed below should be completed and submitted with the bid but may be submitted afterwards. If any of these required certifications is not completed and submitted as requested, the Contracting Authority will inform the Bidder of a time frame within which to provide the information. Failure to comply with the request of the Contracting Authority and to provide the certifications within the time frame specified will render the bid non-responsive.

5.1.1 Integrity Provisions - Associated Information

By submitting a bid, the Bidder certifies that the Bidder and its Affiliates are in compliance with the provisions as stated in Section 01 Integrity Provisions - Bid of Standard Instructions 2003. The associated information required within the Integrity Provisions will assist Canada in confirming that the certifications are true.

5.1.2 Federal Contractors Program for Employment Equity - Bid Certification

By submitting a bid, the Bidder certifies that the Bidder, and any of the Bidder's members if the Bidder is a Joint Venture, is not named on the Federal Contractors Program (FCP) for employment equity "FCP Limited Eligibility to Bid" list (http://www.labour.gc.ca/eng/standards_equity/eq/emp/fcp/list/inelig.shtml) available from Employment and Social Development Canada (ESDC) - Labour's website.

Canada will have the right to declare a bid non-responsive if the Bidder, or any member of the Bidder if the Bidder is a Joint Venture, appears on the "FCP Limited Eligibility to Bid "list at the time of contract award.

Canada will also have the right to terminate the Contract for default if a Contractor, or any member of the Contractor if the Contractor is a Joint Venture, appears on the "FCP Limited Eligibility to Bid" list during the period of the Contract.

The Bidder must provide the Contracting Authority with a completed annex Federal Contractors Program for Employment Equity - Certification, before contract award. If the Bidder is a Joint Venture, the Bidder must provide the Contracting Authority with a completed annex Federal Contractors Program for Employment Equity - Certification, for each member of the Joint Venture.

5.1.3 OEM Certification

(a) Any Bidder that is not the Original Equipment Manufacturer (OEM) for every item of hardware proposed as part of its bid is required to submit the OEM's certification regarding the Bidder's

authority to provide the OEM's hardware, which must be signed by the OEM (not the Bidder). No Contract will be awarded to a Bidder who is not the OEM of the hardware it proposes to supply to Canada, unless the OEM certification has been provided to Canada. Bidders are requested to use the OEM Certification Form included with the bid solicitation. Although all the contents of the OEM Certification Form are required, using the form itself to provide this information is not mandatory. For Bidders and OEMs who use an alternate form, it is in Canada's sole discretion to determine whether all the required information has been provided. Alterations to the statements in the form may result in the bid being declared non-responsive.

(b) If the hardware proposed by the Bidder originates with multiple OEMs, a separate OEM certification is required from each OEM.

(c) For the purposes of this bid solicitation, OEM means the manufacturer of the hardware, as evidenced by the name appearing on the hardware and on all accompanying documentation.

5.1.4 Software Publisher Certification and Software Publisher Authorization

(a) If the Bidder is the Software Publisher for any of the proprietary software products it bids, Canada requires that the Bidder confirm in writing that it is the Software Publisher. Bidders are requested to use the Software Publisher Certification Form included with the bid solicitation. Although all the contents of the Software Publisher Certification Form are required, using the form itself to provide this information is not mandatory. For bidders who use an alternate form, it is in Canada's sole discretion to determine whether all the required information has been provided. Alterations to the statements in the form may result in the bid being declared non-responsive.

(b) Any Bidder that is not the Software Publisher of all the proprietary software products proposed in its bid is required to submit proof of the Software Publisher's authorization, which must be signed by the Software Publisher (not the Bidder). No Contract will be awarded to a Bidder who is not the Software Publisher of all of the proprietary software it proposes to supply to Canada, unless proof of this authorization has been provided to Canada. If the proprietary software proposed by the Bidder originates with multiple Software Publishers, authorization is required from each Software Publisher. Bidders are requested to use the Software Publisher Authorization Form included with the bid solicitation. Although all the contents of the Software Publisher Authorization Form are required, using the form itself to provide this information is not mandatory. For Bidders and Software Publishers who use an alternate form, it is in Canada's sole discretion to determine whether all the required information has been provided. Alterations to the statements in the form may result in the bid being declared non-responsive.

(c) In this bid solicitation, "Software Publisher" means the owner of the copyright in any software products proposed in the bid, who has the right to license (and authorize others to license or sub-license) its software products.

PART 6 - SECURITY, FINANCIAL AND OTHER REQUIREMENTS

6.1 Security Requirements

(a) The Canadian Designated Security Authority (DSA) (Canadian DSA) is the International Industrial Security Directorate (IISD), Public Works and Government Services Canada (PWGSC). The Canadian DSA reserves the right to conduct compliance visits at its sole discretion, to ensure compliance with the below listed security measures.

(b) The Foreign recipient Contractor defined as an individual or legal entity possessing the legal capacity to enter into a contract, shall provide confirmation of compliance with the below terms and condition, in writing, to the Canadian DSA, prior to the execution of the works, services or performance, of which requires or involves access to Canadian restricted sites/assets.

(c) The Foreign Contractor shall not begin the work, services or performance until the Canadian DSA is satisfied that all contract security requirement conditions have been met. Canadian DSA confirmation shall be provided, in writing, to the foreign recipient Contractor in an Attestation form , to provide confirmation of compliance and authorization for services to be performed.

(d) The Foreign recipient Contractor personnel SHALL NOT ENTER Government or Contractor sites without an escort. An escort is defined as “a Government of Canada” or “Contractor” employee who holds the appropriate Personnel Security Clearance at the required level.

(e) The Foreign Contractor will ensure that its Chief Executive Officer (CEO) or Senior Official of the company will appoint a Contract Security Officer (CSO) and an Alternate Contract Security Officer (ACSO) in order to ensure compliance with all contracting security requirements.

(f) The Government of Canada reserves the right to deny access to Canadian Restricted sites and/ or assets to a Foreign Contractor for cause.

(g) The Foreign recipient Contractor visiting Canadian Government, under this contract, will submit a Request for Visit form to the Departmental Security Officer of the DEPARTMENT OF ENVIRONMENT CANADA.

(h) Subcontracts which contain security requirements are NOT to be awarded without the prior written permission of the Canadian DSA, in accordance with the National Policies of Canada.

(i) The Foreign recipient Contractor must comply with the provisions of the Security Requirements Check List attached at Annex C - SRCL.

Note to bidder: Canada will conduct the Supply Chain Security Information (SCSI) assessment only to the Top Ranked Bidder identified from Step 1 of Evaluation Process described in Attachment 1 – Evaluation Methodology and Basis of Selection. The Top Ranked Bidder is required to be compliant with all the requirements contained in subsection 6.1.1 and 6.1.2 of Part 6.

6.1.1 Non-Disclosure Agreement

By submitting a response, the Bidder agrees to the terms of the non-disclosure agreement below (the “**Non-Disclosure Agreement**”):

(a) The Bidder agrees to keep confidential any information it receives from Canada regarding Canada's assessment of the Bidder's Supply Chain Security Information (the "**Sensitive Information**") including, but not limited to, which aspect of the Supply Chain Security Information is subject to concern, and the reasons for Canada's concerns.

(b) Sensitive Information includes, but is not limited to, any documents, instructions, guidelines, data, material, advice or any other information whether received orally, in printed form or otherwise and whether or not that information is labeled as classified, proprietary or sensitive.

(c) The Bidder agrees that it will not reproduce, copy, divulge, release or disclose, in whole or in part, in whatever way or form any Sensitive Information to any person other than a person employed by the Bidder who has a security clearance commensurate with the level of Sensitive Information being accessed, without the prior written consent of the Contracting Authority. The Bidder agrees to immediately notify the Contracting Authority if any person, other than those permitted by this Article, accesses the Sensitive Information at any time.

(d) All Sensitive Information will remain the property of Canada and must be returned to the Contracting Authority or destroyed, at the option of the Contracting Authority, if requested by the Contracting Authority, within 30 days following that request.

(e) The Bidder agrees that a breach of this Non-Disclosure Agreement may result in disqualification of the Bidder at RFP stage, or immediate termination of the resulting Contract. The Bidder also acknowledges that a breach of this Non-Disclosure Agreement may result in a review of the Bidder's security clearance and review of the Bidder's status as an eligible bidder for other requirements.

(f) This Non-Disclosure Agreement remains in force indefinitely.

6.1.2 Supply Chain Integrity Process

A. Definitions

6.1.2.1 The following words and expressions used in this Supply Chain Integrity Process have the following meaning:

- "Products" means any hardware that operates at the data link layer of the OSI Model (Layer 2) and above, any software and Workplace Technology Devices.
- "Workplace Technology Devices" means desktops, mobile workstations such as laptops and tablets, smart phones, phones, and peripherals and accessories such as monitors, keyboards, computer mouse, audio devices and external and internal storage devices such as USB flash drives, memory cards, external hard drives and writable CD and DVD.
- "Product Manufacturer" means the entity which assembles the component parts to manufacture a Product.
- "Software Publisher: means the owner of the copyright of the software, who has the right to license (and authorize others to license/sub-license) its software products.
- "Canada's Data" means any data originating from the Work, any data received in contribution to the Work or that is generated as a result of the delivery of security, configuration, operations, administration and management services, and any data that is transported or stored by the contractor or any subcontractor as a result of performing the Work.

- "Work" means all the activities, services, goods, equipment, matters and things required to be done, delivered or performed by the Contractor under the resulting contract.

B. Supply Chain Security Information (SCSI) Requirements

Bidders must submit, with their Response either on the RFP closing date or within 10 days of a written request by Contracting Authority prior to Contract award, the following SCSI:

6.1.2.2 **IT Product List**: Bidders must identify the Products over which Canada's Data would be transmitted and/or stored that will be used and/or installed to perform any part of the Work described in the resulting contract, as well as the following in regards to each Product:

(a) Location: identify where the Product is interconnected within any given network for Canada's Data (identify the service delivery points or nodes, such as points of presence, third party locations, data centre facilities, operations center, security operations center, internet or other public network peering points, etc.);

(b) Product Type: identify the generally recognized description used by Industry such as appliance, hardware, software, etc. Components of an assembled Product, such as a module or card assembly, must be provided for all layer 3 internetworking devices;

(c) IT Component: identify the generally recognized description used by Industry such as firewall router, switch, server, security appliance, etc.;

(d) Product Model Name or Number: identify the advertised name or number of the Product by the Product Manufacturer;

(e) Description and Purpose of the Product: identify the advertised description or purpose by the Product Manufacturer of the Product and the intended usage or role in the Work described in the resulting contract;

(f) Identify the Product Manufacturer and/or Software Publisher;

(g) Name of Subcontractor refers to the subcontractor that will provide the Product.

It is requested that the Bidders indicate their legal name on each page and insert a page number as well as the total number of pages. Bidders are also requested to insert a separate row for each Product. Bidders are requested not to repeat multiple iterations of the same Product (e.g. if the serial number and/or the color is the only difference between two Products, they are considered the same Product with regards to SCSI).

6.1.2.3 **Network Diagrams**: one or more conceptual network diagrams that collectively show the complete network proposed to be used to deliver the services described in the Statement of Work. The network diagrams are only required to include portions of the Bidder's network (and its subcontractor' network(s)) over which Canada's Data, would be transmitted in performing any resulting contract. As a minimum the diagram must show:

a) The following key nodes for the delivery of the services under the resulting contract of this solicitation process, if applicable the role of the Bidder or subcontractor;

   i. Service delivery points;

   ii. Core network

   iii. Subcontractor network (specifying the name of the subcontractor as listed in the List of Subcontractors);

b) The node interconnections, if applicable

c) Any node connections with the Internet; and

d) For each node, a cross-reference to the product that will be deployed within that node, using the line item number from the IT Product List.

6.1.2.4 **List of Subcontractors**: The Bidder must provide a list of any subcontractors that could be used to perform any part of the Work (including subcontractors affiliated or otherwise related to the Bidder) pursuant to any resulting contract. The list must include at a minimum:

a) The name of the subcontractor;

b) The address of the subcontractor's headquarters;

c) The portion of the Work that would be performed by the subcontractor; and

d) The location(s) where the subcontractor would perform the Work.

This list must identify all third parties who may perform any part of the Work, whether they would be subcontractors to the Bidder, or subcontractors to subcontractors of the Bidder down the chain. Any subcontractor that could have access to Canada's Data must be identified. For the purposes of this requirement, a third party who is merely a supplier of goods to the Bidder, but who does not perform any portion of the Work, is not considered to be a subcontractor. Subcontractors would include, for example, technicians who might be deployed or maintain the Bidder's solution. If the Bidder does not plan to use any subcontractors to perform any part of the Work, the Bidder is requested to indicate this in its response.

It is requested that Bidders indicate their legal name on each page, insert a page number as well as the total number of pages. Bidders are also requested to insert a separate row for each subcontractor and additional rows as may be necessary.

C. Assessment of Supply Chain Security Information

6.1.2.5 Canada will assess whether, in its opinion, the Supply Chain Security Information creates the possibility that the Bidder's solution could compromise or be used to compromise the security of Canada's equipment, firmware, software, systems or information.

6.1.2.6 In conducting its assessment:

(a) Canada may request from the Bidder any additional information that Canada requires to conduct a complete security assessment of the Supply Chain Security Information. The Bidder will have 2 working days (or a longer period if specified in writing by the Contracting Authority) to provide the necessary information to Canada. Failure to meet this deadline will result in the response being disqualified.

(b) Canada may use any government resources or consultants to conduct the assessment and may contact third parties to obtain further information. Canada may use any information, whether it is included in the response or comes from another source, that Canada considers advisable to conduct a comprehensive assessment of the Supply Chain Security Information.

6.1.2.7 If, in Canada's opinion, any aspect of the Supply Chain Security Information, if used in a solution, creates the possibility that the Bidder's solution could compromise or be used to compromise the security of Canada's equipment, firmware, software, systems or information:

(a) Canada will notify the Bidder in writing (sent by email) and identify which aspect(s) of the Supply Chain Security Information is subject to concern(s) or cannot be assessed (for example, proposed future releases of products cannot be assessed). Any further information that Canada might be able to provide to the Bidder regarding its concerns will be determined based on the nature of the concerns. In some situations, for reasons of national security, it may not be possible for Canada to provide further information to the Bidder; therefore, in some circumstances, the Bidder will not know the underlying reasons

for Canada's concerns with respect to a product, subcontractor or other aspect of the Bidder's Supply Chain Security Information.

(b) The notice will provide the Bidder with one opportunity to submit revised Supply Chain Security Information within the 10 calendar days following the day on which Canada's written notification is sent to the Bidder, (or a longer period specified in writing by the Contracting Authority).

(c) If the Bidder submits revised Supply Chain Security Information within the allotted time, Canada will perform a second assessment. If Canada determines that any aspect of the Bidder's revised Supply Chain Security Information could compromise or be used to compromise the security of Canada's equipment, firmware, software, systems or information, no further opportunities to revise the Supply Chain Security Information will be provided and the response will be disqualified.

6.1.2.8 By participating in this process, the Bidder acknowledges that the nature of information technology is such that new vulnerabilities, including security vulnerabilities, are constantly being identified. Also, the Bidder acknowledges that Canada's security assessment does not involve the assessment of a proposed solution. As a result:

(a) qualification pursuant to this RFP does not constitute an approval that the products or other information included as part of the Supply Chain Security Information will meet the requirements of the subsequent bid solicitation or any resulting contract or other instrument that may be awarded as a result of any subsequent bid solicitation;

(b) qualification pursuant to this RFP does not mean that the same or similar Supply Chain Security Information will be assessed in the same way for future requirements;

(c) at any time during the subsequent bid solicitation process, Canada may advise a Bidder that some aspect(s) of its Supply Chain Security Information has become the subject of security concerns. At that point, Canada will notify the Respondent and provide the Bidder with an opportunity to revise its Supply Chain Security Information, using the same process described above.

(d) during the performance of a subsequent contract, if Canada has concerns regarding certain products, designs or subcontractors originally included in the Supply Chain Security Information, the terms and conditions of that contract will govern the process for addressing those concerns.

6.1.2.9 Any Bidder that has qualified under this RFP will be required, when responding to any subsequent bid solicitation under this solicitation process, to propose a solution consistent with the final version of the Supply Chain Security Information it submitted with its response to this RFP (subject to revision only pursuant to the paragraph below). Except pursuant to the paragraph below, no alternative or additional Products or subcontractors may be proposed in the Bidder's solution. This is a mandatory requirement of this solicitation process. The proposed solution during any subsequent bid solicitation does not need to contain all the Products within the final Supply Chain Security Information.

6.1.2.10 Once a Bidder has been qualified in response to this RFP, no modifications are permitted to the Supply Chain Security Information except under exceptional circumstances, as determined by Canada. Given that not all the exceptional circumstances can be foreseen, whether changes may be made and the process governing those changes will be determined by Canada on a case-by-case basis.

6.2 Financial Capability

6.2.1. Financial Capability: The Bidder must have the financial capability to fulfill this requirement. To determine the Bidder's financial capability, the Contracting Authority may, by written notice to the Bidder, require the submission of some or all of the financial information detailed below during the

evaluation of bids. The Bidder must provide the following information either with the bid or within fifteen (15) working days of the request or as specified by the Contracting Authority in the notice:

a. Audited financial statements, if available, or the unaudited financial statements (prepared by the Bidder's outside accounting firm, if available, or prepared in-house if no external statements have been prepared) for the Bidder's last three fiscal years, or for the years that the Bidder has been in business if this is less than three years (including, as a minimum, the Balance Sheet, the Statement of Retained Earnings, the Income Statement and any notes to the statements).

b. If the date of the financial statements in (a) above is more than five months before the date of the request for information by the Contracting Authority, the Bidder must also provide, unless this is prohibited by legislation for public companies, the last quarterly financial statements (consisting of a Balance Sheet and a year-to-date Income Statement), as of two months before the date on which the Contracting Authority requests this information.

c. If the Bidder has not been in business for at least one full fiscal year, the following must be provided:

   i. the opening Balance Sheet on commencement of business (in the case of a corporation, the date of incorporation); and

   ii. the last quarterly financial statements (consisting of a Balance Sheet and a year-to-date Income Statement) as of two months before the date on which the Contracting Authority requests this information.

d. A certification from the Chief Financial Officer or an authorized signing officer of the Bidder that the financial information provided is complete and accurate.

e. A confirmation letter from all of the financial institution(s) that have provided short-term financing to the Bidder outlining the total of lines of credit granted to the Bidder and the amount of credit that remains available and not drawn upon as of one month prior to the date on which the Contracting Authority requests this information.

f. A detailed monthly Cash Flow Statement covering all the Bidder's activities (including the requirement) for the first two years of the requirement that is the subject of the bid solicitation, unless this is prohibited by legislation. This statement must detail the Bidder's major sources and amounts of cash and the major items of cash expenditures on a monthly basis, for all the Bidder's activities. All assumptions made should be explained as well as details of how cash shortfalls will be financed.

g. A detailed monthly Project Cash Flow Statement covering the first two years of the requirement that is the subject of the bid solicitation, unless this is prohibited by legislation. This statement must detail the Bidder's major sources and amounts of cash and the major items of cash expenditures, for the requirement, on a monthly basis. All assumptions made should be explained as well as details of how cash shortfalls will be financed.

6.2.2 If the Bidder is a joint venture, the financial information required by the Contracting Authority must be provided by each member of the joint venture.

6.2.3 If the Bidder is a subsidiary of another company, then any financial information in 1. (a) to (f) above required by the Contracting Authority must be provided by the ultimate parent company. Provision of parent company financial information does not by itself satisfy the requirement for the provision of the financial information of the Bidder, and the financial capability of a parent cannot be substituted for the financial capability of the Bidder itself unless an agreement by the parent company to sign a Parental Guarantee, as drawn up by Public Works and Government Services Canada (PWGSC), is provided with the required information.

6.2.4 **Financial Information Already Provided to PWGSC**: The Bidder is not required to resubmit any financial information requested by the Contracting Authority that is already on file at PWGSC with the Contract Cost Analysis, Audit and Policy Directorate of the Policy, Risk, Integrity and Strategic Management Sector, provided that within the above-noted time frame:

a. the Bidder identifies to the Contracting Authority in writing the specific information that is on file and the requirement for which this information was provided; and

b. the Bidder authorizes the use of the information for this requirement.

It is the Bidder's responsibility to confirm with the Contracting Authority that this information is still on file with PWGSC.

6.2.5 **Other Information**: Canada reserves the right to request from the Bidder any other information that Canada requires to conduct a complete financial capability assessment of the Bidder.

6.2.6 **Confidentiality**: If the Bidder provides the information required above to Canada in confidence while indicating that the disclosed information is confidential, then Canada will treat the information in a confidential manner as permitted by the *Access to Information Act*, R.S., 1985, c. A-1, Section 20(1) (b) and (c).

6.2.7 **Security**: In determining the Bidder's financial capability to fulfill this requirement, Canada may consider any security the Bidder is capable of providing, at the Bidder's sole expense (for example, an irrevocable letter of credit from a registered financial institution drawn in favour of Canada, a performance guarantee from a third party or some other form of security, as determined by Canada).

PART 7 - RESULTING CONTRACT CLAUSES

The following clauses and conditions apply to and form part of any contract resulting from the bid solicitation.

7.1 Statement of Work

The Contractor must perform the work in accordance with Annex A – Statement of Work and the Contractor's technical bid entitled_____, dated_____.

7.1.1 Optional Goods, and/or Services

The Contractor grants to Canada the irrevocable option to acquire the goods, services and infrastructure as described in Annex A – Statement of Work under the same conditions and at the prices and rates stated in the Annex B – Pricing Schedule of the Contract. The Contracting Authority may exercise the option within 90 days before any commencement of work by sending a written notice to the Contractor.

7.1.2 Task Authorization

The Work or a portion of the Work to be performed under the Contract will be on an "as and when requested basis" using a Task Authorization (TA). The Work described in the TA must be in accordance with the scope of the Contract.

7.1.2.1 Task Authorization Process

(a) The TA process will be used for the deliverables described in Appendix B – Radar Infrastructure and Construction Deliverables and Appendix F – Specialized Professional Services Deliverables of Annex A – SOW.
(b) The Project Authority will provide the Contractor with a description of the task using the "Task Authorization" form specified in Annex E.
(c) The TA will contain the details of the activities to be performed, a description of the deliverables, and a schedule indicating completion dates for the major activities or submission dates for the deliverables. The TA will also include the applicable basis (bases) and methods of payment as specified in the Contract.
(d) The Contractor must provide the Project Authority, within 5 calendar days or within a time to be agreed and approved by Project Authority, of its receipt, the proposed total estimated cost for performing the task and a breakdown of that cost, established in accordance with the Basis of Payment specified in the Contract.
(e) The Contractor must not commence work until a TA authorized by the Project Authority has been received by the Contractor. The Contractor acknowledges that any work performed before a TA has been received will be done at the Contractor's own risk.

7.1.2.2 Task Authorization Limit

The Project Authority may authorize individual task authorizations up to a limit of $ _____CAD *(to be determined at Contract Award)*, Applicable Taxes excluded, inclusive of any revisions.

Any task authorization to be issued in excess of that limit must be authorized by the Contracting Authority before issuance.

7.1.2.3 Canada's Obligation - Portion of the Work - Task Authorizations

Canada's obligation with respect to the portion of the Work under the Contract that is performed through task authorizations is limited to the total amount of the actual tasks performed by the Contractor.

7.1.2.4 Periodic Usage Reports - Contracts with Task Authorizations

(a) The Contractor must compile and maintain records on its provision of services to the federal government under authorized Task Authorizations issued under the Contract.

(b) The Contractor must provide this data in accordance with the reporting requirements detailed below. If some data is not available, the reason must be indicated. If services are not provided during a given period, the Contractor must still provide a "NIL" report.

(c) The data must be submitted on a quarterly basis to the Contracting Authority. The quarterly periods are defined as follows:

1st quarter: April 1 to June 30;
2nd quarter: July 1 to September 30;
3rd quarter: October 1 to December 31; and
4th quarter: January 1 to March 31.

(d) The data must be submitted to the Contracting Authority no later than 5 calendar days after the end of the reporting period.

(e) **Reporting Requirement - Details:** A detailed and current record of all authorized tasks must be kept for each contract with a task authorization process. **For each authorized task,** the record must contain:

i. the authorized task number or task revision number(s);
ii. a title or a brief description of each authorized task;
iii. the total estimated cost specified in the authorized Task Authorization (TA) of each task, exclusive of Applicable Taxes;
iv. the total amount, exclusive of Applicable Taxes, expended to date against each authorized task;
v. the start and completion date for each authorized task; and
vi. the active status of each authorized task, as applicable.

(f) For all authorized tasks:

i. the amount (exclusive of Applicable Taxes) specified in the contract (as last amended, as applicable) as Canada's total liability to the contractor for all authorized TAs; and
ii. the total amount, exclusive of Applicable Taxes, expended to date against all authorized TAs.

7.2 Standard Clauses and Conditions

All clauses and conditions identified in the Contract by number, date and title are set out in the Standard Acquisition Clauses and Conditions Manual(https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual) issued by Public Works and Government Services Canada.

7.2.1 General Conditions

2030 (2014-09-25), General Conditions - Higher Complexity - Goods, apply to and form part of the Contract.

7.2.2 Supplemental General Conditions

4001 (2015-04-01), Supplemental General Conditions, Hardware Purchase, Lease and Maintenance, apply to and form part of the Contract;

4003 (2010-08-16), Supplemental General Conditions, Licensed Software, apply to and form part of the Contract;

4004 (2013-04-25), Supplemental General Conditions, Maintenance and Support Services for Licensed Software, apply to and form part of the Contract;

4006 (2010-08-16), Supplemental General Conditions, Contractor to Own Intellectual Property Rights in Foreground apply to and form part of the Contract; and

4010 (2012-07-16), Supplemental General Conditions, Services Higher Complexity, apply to and form part of the Contract;

7.2.3 General Provisions – Construction Services

The following provisions only apply to the Task Authorization Process in accordance with subsection 7.1.2.1 for Radar Infrastructure and Construction Services Deliverables identified in Appendix B.

General Condition (GC) 1 R2810D (2015-02-25) - General Provisions - Construction Services

7.3 Security Requirements

Definitions to the Security Requirements:

- “Product” means any hardware that operates at the data link layer of the OSI Model (layer 2) and above, any software and Workplace Technology Devices.
- “Workplace Technology Devices” means desktops, mobile workstations such as laptops and tablets, smart phones, phones, and peripherals and accessories such as monitors, keyboards, computer mouse, audio devices and external and internal storage devices such as USB flash drives, memory cards, external hard drives and writable CD or DVD.
- “Canada’s Data” means any data originating from the Work, any data received in contribution to the Work or that is generated as a result of the delivery of security, configuration, operations, administration and management services, and any data that is transported or stored by the contractor or any subcontractor as a result of performing the Work.
- "Work" means all the activities, services, goods, equipment, matters and things required to be done, delivered or performed by the Contractor under the resulting contract.

7.3.1 Supply Chain Integrity Process: The Parties acknowledge that a Supply Chain Integrity Process assessment was a key component of the procurement process that resulted in the award of this Contract. In connection with that assessment process, Canada assessed the Contractor’s Supply Chain Security Information (SCSI) without identifying any security concerns. The following SCSI was submitted:

(a) an IT Product List;

(b) a list of subcontractors; and

(c) network diagram(s).

The Parties also acknowledge that security is a critical consideration for Canada with respect to this Contract and that on-going assessment of SCSI will be required throughout the Contract Period. This Article governs that process.

7.3.2 Assessment of New SCSI: During the Contract Period, the Contractor may need to modify the SCSI information contained. In that regard:

(a) The Contractor, starting at contract award, must revise its SCSI at least once a month to show all changes made, as well as all deletions and additions to the SCSI that affect the services under the Contract (including Products deployed by its subcontractors) during that period; the list must be marked to show the changes made during the applicable period. If no changes have been made during the reporting month, the Contractor must advise the Contracting Authority in writing that the existing list is unchanged. Changes made to the IT Product List must be accompanied with revised Network Diagram(s) when applicable.

(b) The Contractor agrees that, during the Contract Period, it will periodically (at least once a year) provide the Contracting Authority with updates regarding upcoming new Products that it anticipates deploying in the Work (for example, as it develops its “technology roadmap” or similar plans). This will allow Canada to assess those Products in advance so that any security concerns can be identified prior to the Products being deployed in connection with the services being delivered under the Contract. Canada will endeavour to assess proposed new Products within 30 calendar days, although lengthier lists of Products may take additional time.

(c) Canada reserves the right to conduct a complete, independent security assessment of all new SCSI. The Contractor must, if requested by the Contracting Authority, provide any information that Canada requires to perform its assessment.

(d) Canada may use any government resources or consultants to conduct the assessment and may contact third parties to obtain further information. Canada may use any information, whether it is provided by the Contractor or comes from another source, that Canada considers advisable to conduct a comprehensive assessment of any proposed new SCSI.

7.3.3 Identification of New Security Vulnerabilities in SCSI already assessed by Canada:

(a) The Contractor must provide to Canada timely information about any vulnerabilities of which it becomes aware in performing the Work, including any weakness, or design deficiency, identified in any Product used to deliver services that would allow an unauthorized individual to compromise the integrity, confidentiality, access controls, availability, consistency or audit mechanism of the system or the data and applications it hosts.

(b) The Contractor acknowledges that the nature of information technology is such that new vulnerabilities, including security vulnerabilities, are constantly being identified and, that being the case, new security vulnerabilities may be identified in SCSI that have already been the subject of an SCSI assessment and assessed without security concerns by Canada, either during the procurement process or later during the Contract Period.

7.3.4 Addressing Security Concerns:

(a) If Canada notifies the Contractor of security concerns regarding a Product that has not yet been deployed, the Contractor agrees not to deploy it in connection with this Contract without the consent of the Contracting Authority.

(b) At any time during the Contract Period, if Canada notifies the Contractor that, in Canada’s opinion, there is a Product that is being used in the Contractor’s solution (including use by a subcontractor) that has been assessed as having the potential to compromise or be used to

compromise the security of Canada's equipment, firmware, software, systems or information, then the Contractor must:

i. provide Canada with any further information requested by the Contracting Authority so that Canada may perform a complete assessment;

ii. if requested by the Contracting Authority, propose a mitigation plan (including a schedule), within 10 business days, such as migration to an alternative Product. The Contracting Authority will notify the Contractor in writing if Canada approves the mitigation plan, or will otherwise provide comments about concerns or deficiencies with the mitigation plan; and

iii. implement the mitigation plan approved by Canada.

(c) This process applies both to new Products and to Products that were already assessed pursuant to the Supply Chain Integrity Process assessment by Canada, but for which new security vulnerabilities have since been identified.

(d) Despite the previous Sub-article, if Canada determines in its discretion that the identified security concern represents a threat to national security that is both serious and imminent, the Contracting Authority may require that the Contractor immediately cease deploying the identified Product(s) in the Work. For Products that have already been deployed, the Contractor must identify and/or remove (as required by the Contracting Authority) the Product(s) from the Work according to a schedule determined by Canada. However, prior to making a final determination in this regard, Canada will provide the Contractor with the opportunity to make representations within 48 hours of receiving notice from the Contracting Authority. The Contractor may propose, for example, mitigation measures for Canada's consideration. Canada will then make a final determination.

7.3.5 Cost Implications:

7.3.6 Any cost implications related to a demand by Canada to cease deploying or to remove a particular Product or Products will be considered and negotiated in good faith by the Parties on a case-by-case basis and may be the subject of a Contract Amendment, However, despite any such negotiations, the Contractor must cease deploying and/or remove the Product(s) as required by Canada. The negotiations will then continue separately. The Parties agree that, at a minimum, the following factors will be considered in their negotiations, as applicable:

(a) with respect to Products already assessed without security concerns by Canada pursuant to an SCSI assessment, evidence from the Contractor of how long it has owned the Product;

(b) with respect to new Products, whether or not the Contractor was reasonably able to provide advance notice to Canada regarding the use of the new Product in connection with the Work;

(c) evidence from the Contractor of how much it paid for the Product, together with any amount that the Contractor has pre-paid or committed to pay with respect to maintenance and support of that Product;

(d) the normal useful life of the Product;

(e) any "end of life" or other announcements from the manufacturer of the Product indicating that the Product is or will no longer be supported;

(f) the normal useful life of the proposed replacement Product;

(g) the time remaining in the Contract Period;

(h) whether or not the existing Product or the replacement Product is or will be used exclusively for Canada or whether the Product is also used to provide services to other customers of the Contractor or its subcontractors;

(i) whether or not the Product being replaced can be redeployed to other customers;

(j) any training required for Contractor personnel with respect to the installation, configuration and maintenance of the replacement Products, provided the Contractor can demonstrate that its personnel would not otherwise require that training;

(k) any developments costs required for the Contractor to integrate the replacement Products into the Service Portal, operations, administration and management systems, if the replacement Products are Products not otherwise deployed anywhere in connection with the Work; and

(l) the impact of the change on Canada, including the number and type of resources required and the time involved in the migration.

7.3.7 Additionally, if requested by the Contracting Authority, the Contractor must submit a detailed cost breakdown, once any work to address a security concern identified under this Article has been completed. The cost breakdown must contain an itemized list of all applicable cost elements related to the work required by the Contracting Authority and must be signed and certified as accurate by the Contractor's most senior financial officer, unless stated otherwise in writing by the Contracting Authority. Canada must consider the supporting information to be sufficiently detailed for each cost element to allow for a complete audit. In no case will any reimbursement of any expenses of the Contractor (or any of its subcontractors) exceed the demonstrated out-of-pocket expenses directly attributable to Canada's requirement to cease deploying or to remove a particular Product or Products.

7.3.8 Despite the other provisions of this Article, if the Contractor or any of its subcontractors deploys new Products that Canada has already indicated to the Contractor are the subject of security concerns in the context of the Work, Canada may require that the Contractor or any of its subcontractors immediately cease deploying or remove that Product. In such cases, any costs associated with complying with Canada's requirement will be borne by the Contractor and/or subcontractor, as negotiated between them. Canada will not be responsible for any such costs.

7.3.9 General:

(a) The process described in this Article may apply to a single Product, to a set of Products, or to all Products manufactured or distributed by a particular supplier.

(b) The process described in this Article also applies to subcontractors. With respect to cost implications, Canada acknowledges that the cost considerations with respect to concerns about subcontractors (as opposed to Products) may be different and may include factors such as the availability of other subcontractors to complete the work.

(c) Any service levels that are not met due to a transition to a new Product or subcontractor required by Canada pursuant to this Article will not trigger a Service Credit, nor will a failure in this regard be taken into consideration for overall metric calculations, provided that the Contractor implements the necessary changes in accordance with the migration plan approved by Canada or proceeds immediately to implement Canada's requirements if Canada has determined that the threat to national security is both serious and imminent.

(d) If the Contractor becomes aware that any subcontractor is deploying Products subject to security concerns in relation to the Work, the Contractor must immediately notify both the Contracting Authority and the Technical Authority and the Contractor must enforce the terms of its contract with its subcontractor. The Contractor acknowledges its obligations pursuant to General Conditions 2035, Subsection 8(3).

(e) Any determination made by Canada will constitute a decision with respect to a specific Product or subcontractor and its proposed use under this Contract, and does not mean that the same Product or subcontractor would necessarily be assessed in the same way if proposed to be used for another purpose or in another context.

7.3.10 Subcontracting related to IT Supply Chain

(a) Despite the General Conditions, none of the Work may be subcontracted (even to an affiliate of the Contractor) unless the Contracting Authority has first consented in writing. In order to seek the Contracting Authority's consent, the Contractor must provide the following information:

i. the name of the subcontractor;

ii. the portion of the Work to be performed by the subcontractor;

iii. the Designated Organization Screening or the Facility Security Clearance (FSC) level of the subcontractor;

iv. the date of birth, the full name and the security clearance status of individuals employed by the subcontractor who will require access to Canada's facilities;

v. completed sub-SRCL signed by the Contractor's Company Security Officer for CISD completion; and

vi. any other information required by the Contracting Authority.

(b) For the purposes of this Article, a "subcontractor" does not include a supplier who deals with the Contractor at arm's length whose only role is to provide telecommunications or other equipment or software that will be used by the Contractor to provide services, including if the equipment will be installed in the backbone or infrastructure of the Contractor.

7.3.11 Change of Control related to IT Supply Chain

At any time during the Contract Period, if requested by the Contracting Authority, the Contractor must provide to Canada:

a. an organization chart for the Contractor showing all related corporations and partnerships; for the purposes of this Sub-article, a corporation or partnership will be considered related to another entity if:

i. they are "related persons" or "affiliated persons" according to the Canada *Income Tax Act;*

ii. the entities have now or in the two years before the request for the infor*mation had a fid*uciary relationship with one another (either as a result of an agency arrangement or any other form of fiduciary relationship); or

iii. the entities otherwise do not deal with one another at arm's length, or ea*ch of them does* not deal at arm's length with the same third party.

b. a list of all the Contractor's shareholders; if the Contractor is a subsidiary, this information must be provided for each parent corporation or parent partnership, up to the ultimate owner; with respect to any publicly traded corporation, Canada anticipates that the circumstances in which it would require a complete list of shareholders would be unusual and that any request from Canada for a list of a publicly traded corporation's shareholders would normally be limited to a list of those shareholders who hold at least 1% of the voting shares;

c. a list of all the Contractor's directors and officers, together with each individual's home address, date of birth, birthplace and citizenship(s); if the Contractor is a subsidiary, this information must be provided for each parent corporation or parent partnership, up to the ultimate owner; and

d. any other information related to ownership and control that may be requested by Canada.

If requested by the Contracting Authority, the Contractor must provide this information regarding its subcontractors as well. However, if a subcontractor considers this information to be confidential, the Contractor may meet its obligation by having the subcontractor submit the information directly to the Contracting Authority. Regardless of whether the information is submitted by the Contractor or a subcontractor, Canada agrees to handle this information in accordance with Subsection 22(3) of General Conditions 2035 (General Conditions – Higher

Complexity – Services), provided the information has been marked as either confidential or proprietary.

7.3.12 The Contractor must notify the Contracting Authority in writing of:

(a) any change of control in the Contractor itself;

(b) any change of control in any parent corporation or parent partnership of the Contractor, up to the ultimate owner; and

(c) any change of control in any subcontractor performing any part of the Work (including any change of control in any parent corporation or parent partnership of the subcontractor, up to the ultimate owner).

The Contractor must provide this notice by no later than 10 business days after any change of control takes place (or, in the case of a subcontractor, within 15 business days after any change of control takes place). Where possible, Canada requests that the Contractor provide advance notice of any proposed change of control transaction.

7.3.13 In this Article, a “change of control” includes but is not limited to a direct or indirect change in the effective control of the corporation or partnership, whether resulting from a sale, encumbrance, or other disposition of the shares (or any form of partnership units) by any other means. In the case of a joint venture Contractor or subcontractor, this applies to a change of control of any of the joint venture’s corporate or partnership members. In the case of a Contractor or subcontractor that is a partnership or limited partnership, this requirement also applies to any corporation or limited partnership that is a partner.

7.3.14 If Canada determines in its sole discretion that a change of control affecting the Contractor (either in the Contractor itself or any of its parents, up to the ultimate owner) may be injurious to national security, Canada may terminate the Contract on a “no-fault” basis by providing notice to the Contractor within 90 days of receiving the notice from the Contractor regarding the change of control. Canada will not be required to provide its reasons for terminating the Contract in relation to the change of control, if Canada determines in its discretion that the disclosure of those reasons could itself be injurious to national security.

7.3.15 If Canada determines in its sole discretion that a change of control affecting a subcontractor (either in the subcontractor itself or any of its parents, up to the ultimate owner) may be injurious to national security, Canada will notify the Contractor in writing of its determination. Canada will not be required to provide the reasons for its determination, if Canada determines in its discretion that the disclosure of those reasons could itself be injurious to national security. The Contractor must, within 90 days of receiving Canada’s determination, arrange for another subcontractor, acceptable to Canada, to perform the portion of the Work being performed by the existing subcontractor (or the Contractor must perform this portion of the Work itself). If the Contractor fails to do so within this time period, Canada will be entitled to terminate the Contract on a “no-fault” basis by providing notice to the Contractor within 180 days of receiving the original notice from the Contractor regarding the change of control.

7.3.16 In this Article, termination on a “no-fault” basis means that neither party will be liable to the other in connection with the change of control or the resulting termination, and Canada will only be responsible for paying for those services received up to the effective date of the termination.

7.3.17 Despite the foregoing, Canada’s right to terminate on a “no-fault” basis will not apply to circumstances in which there is an internal reorganization that does not affect the ownership of the ultimate parent corporation or parent partnership of the Contractor or subcontractor, as the case may be; that is, Canada does not have a right to terminate the Contract pursuant to this Article where the Contractor or subcontractor continues, at all times, to be controlled, directly or indirectly, by the same ultimate owner. However, in any such case, the notice requirements of this Article still apply.

7.4 Term of Contract

7.4.1 Period of the Contract

The period of the Contract is from date of Contract to March 31, 2023 inclusive.

7.4.2 Option to Extend the Contract

The Contractor grants to Canada the irrevocable option to extend the term of the Contract by up to two (2) additional one (1) year period(s) under the same conditions. The Contractor agrees that, during the extended period of the Contract, it will be paid in accordance with the applicable provisions as set out in the Basis of Payment and in accordance with the price set out in Optional Deliverables of Annex B - Pricing Schedule.

The Contracting Authority will advise the Contractor of the extension by sending a written notice to the Contractor at least 90 calendar days before the contract expiry date. The extension will be evidenced for administrative purposes only, through a contract amendment.

7.5 Authorities

7.5.1 Contracting Authority

The Contracting Authority for the Contract is:

Long Pan
Supply Team Leader
Public Works and Government Services Canada
Ontario Region – Acquisitions and Compensation
33 City Centre Drive, Suite 480C, Mississauga, Ontario, L5B 2N5
Government of Canada

Telephone: 905 - 615 - 2076
Facsimile: 905 - 615 - 2023
E-mail address: long.pan@tpsgc-pwgsc.gc.ca

The Contracting Authority is responsible for the management of the Contract and any changes to the Contract must be authorized in writing by the Contracting Authority. The Contractor must not perform work in excess of or outside the scope of the Contract based on verbal or written requests or instructions from anybody other than the Contracting Authority.

7.5.2 Project Authority

(To be confirmed at Contract Award)

The Project Authority is the representative of the department or agency for whom the Work is being carried out under the Contract and is responsible for all matters concerning the technical content of the Work under the Contract. Technical matters may be discussed with the Project Authority; however, the Project Authority has no authority to authorize changes to the scope of the Work. Changes to the scope of the Work can only be made through a contract amendment issued by the Contracting Authority.

7.5.3 Contractor's Representative

(To be confirmed at Contract Award)

7.6 Payment

7.6.1 Basis of Payment – Firm Price, Firm Unit Price(s) or Firm Lot Price(s)

For the Work described in Annex A - Statement of Work:

In consideration of the Contractor satisfactorily completing its obligations under the Contract, the Contractor will be paid a *firm price(s)* of $_____ (*to be inserted at contract award*). Customs duties are included and Applicable Taxes are extra.

For the firm price portion of the Work only, Canada will not pay the Contractor for any design changes, modifications or interpretations of the Work unless they have been approved, in writing, by the Contracting Authority before their incorporation into the Work.

7.6.2 Basis of Payment - Limitation of Expenditure - Task Authorizations

The Contractor will be reimbursed for the costs reasonably and properly incurred in the performance of the Work specified in the authorized Task Authorization (TA), as determined in accordance with the Annex B – Pricing Schedule, to the limitation of expenditure specified in the authorized TA.

Canada's liability to the Contractor under the authorized TA must not exceed the limitation of expenditure specified in the authorized TA. Customs duties are included and Applicable Taxes are extra.

No increase in the liability of Canada or in the price of the Work specified in the authorized TA resulting from any design changes, modifications or interpretations of the Work will be authorized or paid to the Contractor unless these design changes, modifications or interpretations have been authorized, in writing, by the Contracting Authority before their incorporation into the Work.

7.6.3 Limitation of Expenditure – Cumulative Total of all Task Authorizations

(a) Canada's total liability to the Contractor under the Contract for all authorized Task Authorizations (TAs), inclusive of any revisions, must not exceed the sum of $ _____(*To be confirmed at Contract Award*). Customs duties are included and Applicable Taxes are extra.

(b) No increase in the total liability of Canada will be authorized or paid to the Contractor unless an increase has been approved, in writing, by the Contracting Authority.

(c) The Contractor must notify the Contracting Authority in writing as to the adequacy of this sum:
- (i) when it is 75 percent committed, or
- (ii) four (4) months before the contract expiry date, or
- (iii) as soon as the Contractor considers that the sum is inadequate for the completion of the Work required in all authorized TAs, inclusive of any revisions,

whichever comes first.

(d) If the notification is for inadequate contract funds, the Contractor must provide to the Contracting Authority, a written estimate for the additional funds required. Provision of such information by the Contractor does not increase Canada's liability.

7.6.4 Milestone Payments

Canada will make milestone payments in accordance with Milestones Payment Schedule for Deliverables detailed in the Annex B - Pricing Schedule of the Contract and the payment provisions of the Contract if:

(a) an accurate and complete claim for payment using the form PWGSC-TPSGC 1111, Claim for Progress Payment, and any other document required by the Contract have been submitted in accordance with the invoicing instructions provided in the Contract;
(b) all the certificates appearing on form PWGSC-TPSGC 1111 have been signed by the respective authorized representatives;
(c) all work associated with the milestone and as applicable any deliverable required has been completed and accepted by Canada.

7.6.5 Single Payment - Task Authorization

Canada will pay the Contractor upon completion and delivery of the Work in accordance with the payment provisions of the Contract if:

(a) an accurate and complete invoice and any other documents required by the Contract have been submitted in accordance with the invoicing instructions provided in the Contract;
(b) all such documents have been verified by Canada;
(c) the Work delivered has been accepted by Canada.

7.6.6 Time Verification

Time charged and the accuracy of the Contractor's time recording system are subject to verification by Canada, before or after payment is made to the Contractor. If verification is done after payment, the Contractor must repay any overpayment, at Canada's request.

7.7 Invoicing Instructions – Progress Payment Claim

1. The Contractor must submit a claim for payment using form PWGSC-TPSGC 1111, Claim for Progress Payment. Each claim must show:

   i. all information required on form PWGSC-TPSGC 1111;
   ii. all applicable information detailed under the section entitled "Invoice Submission" of the general conditions;
   iii. a list of all expenses;
   iv. the description and value of the milestone claimed as detailed in the Contract.

   Each claim must be supported by:

   i. a copy of time sheets to support the time claimed as applicable;
   ii. a copy of the invoices, receipts, vouchers as applicable.

2. The Contractor must prepare and certify one original and two (2) copies of the claim on form PWGSC-TPSGC 1111, and forward it to the Project Authority identified under the section entitled "Authorities" of the Contract for appropriate certification after inspection and acceptance of the Work takes place. The Project Authority will then forward the original and one (1) copy of the claim to the Contracting Authority for certification and onward submission to the Payment Office for the remaining certification and payment action.

3. The Contractor must not submit claims until all work identified in the claim is completed.

7.8 Certifications

7.8.1 Compliance

The continuous compliance with the certifications provided by the Contractor in its bid and the ongoing cooperation in providing associated information are conditions of the Contract. Certifications are subject to verification by Canada during the entire period of the Contract. If the Contractor does not comply with any certification, fails to provide the associated information, or if it is determined that any certification made by the Contractor in its bid is untrue, whether made knowingly or unknowingly, Canada has the right, pursuant to the default provision of the Contract, to terminate the Contract for default.

7.8.2 Federal Contractors Program for Employment Equity - Default by the Contractor

The Contractor understands and agrees that, when an Agreement to Implement Employment Equity (AIEE) exists between the Contractor and Employment and Social Development Canada (ESDC)-Labour, the AIEE must remain valid during the entire period of the Contract. If the AIEE becomes invalid, the name of the Contractor will be added to the "FCP Limited Eligibility to Bid" list. The imposition of such a sanction by ESDC will constitute the Contractor in default as per the terms of the Contract.

7.9 Applicable Laws

The Contract must be interpreted and governed, and the relations between the parties determined, by the laws in force in Ontario.

7.10 Priority of Documents

If there is a discrepancy between the wording of any documents that appear on the list, the wording of the document that first appears on the list has priority over the wording of any document that subsequently appears on the list.

(a) the Articles of Agreement;
(b) the supplemental general conditions 4001(2015-04-01) Hardware Purchase, Lease and Maintenance;
(c) the supplemental general conditions 4003 (2010-08-16) Licensed Software;
(d) the supplemental general conditions 4004 (2013-04-25) Maintenance and Support for Licensed Software;
(e) the supplemental general conditions 4006(2010-08-16) Contractor to Own Intellectual Property Rights in Foreground Information;
(f) the supplemental general conditions 4010 (2012-07-16) Services – Higher Complexity;
(g) the general conditions 2030 (2014-09-25) General Conditions – Higher Complexity – Goods,
(h) the general condition (GC) 1 R2810D (2015-02-25) - General Provisions - Construction Services
(i) Annex A – Statement of Work (SOW);
(j) Annex B – Pricing Schedule;
(k) Annex C – Security Requirements Check List (SRCL);
(l) Annex D – Insurance Requirements;
(m) the signed Task Authorizations (including all of its annexes, if any); and
(n) the Contractor's bid dated _____. *(to be inserted at Contract Award)*

7.11 Foreign Nationals (Canadian Contractor *OR* Foreign Contractor)

(To be confirmed at Contract Award)

SACC Manual clause A2000C *(2006-06-16)* Foreign Nationals (Canadian Contractor)

OR

SACC Manual clause A2001C *(2006-06-16)* Foreign Nationals (Foreign Contractor)

7.12 Insurance – Specific Requirements

(a) The Contractor must comply with the insurance requirements specified in Annex D – Insurance Requirements. The Contractor must maintain the required insurance coverage for the duration of the Contract. Compliance with the insurance requirements does not release the Contractor from or reduce its liability under the Contract.

(b) The Contractor is responsible for deciding if additional insurance coverage is necessary to fulfill its obligation under the Contract and to ensure compliance with any applicable law. Any additional insurance coverage is at the Contractor's expense, and for its own benefit and protection.

(c) The Contractor must forward to the Contracting Authority within ten (10) days after the date of award of the Contract, a Certificate of Insurance evidencing the insurance coverage and confirming that the insurance policy complying with the requirements is in force. For Canadian-based Contractors, coverage must be placed with an Insurer licensed to carry out business in Canada, however, for Foreign-based Contractors; coverage must be placed with an Insurer with an A.M. Best Rating no less than “A-”. The Contractor must, if requested by the Contracting Authority, forward to Canada a certified true copy of all applicable insurance policies.

7.13 SACC Manual Clause

SACC Manual clause A9068C (2010-01-11) Government Site Regulations

SACC Manual clause B1501C (2006-06-16) Electrical Equipment

ANNEX A:
STATEMENT OF WORK

FOR

CANADIAN WEATHER RADAR REPLACMENT SOLUTION (CWRRS)

FOR

ENVIRONMENT CANADA

Table of Contents

GLOSSARY, DEFINITIONS, AND APPLICABLE DOCUMENTS

Definitions of Technology Readiness Levels (TRL)

TRL 1 Basic principles observed and reported: Transition from scientific research to applied research. Essential characteristics and behaviors of systems and architectures. Descriptive tools
are mathematical formulations or algorithms.

TRL 2 Technology concept formulated: Applied research. Theory and scientific principles are focused on specific application area to define the concept. Characteristics of the application are described. Analytical tools are developed for simulation or analysis of the application.

TRL 3 Analytical and experimental critical function and characteristic proof-of concept: Proof of concept validation. Active Research and Development (R&D) is initiated with analytical and laboratory studies. Demonstration of technical feasibility using breadboard or brassboard implementations that are exercised with representative data.

TRL 4 Component and subsystem validation in laboratory environment: Standalone prototyping implementation and test. Integration of technology elements. Experiments with full-scale problems or data sets.

TRL 5 System, subsystem, and component validation in relevant environment: Thorough testing of prototyping in representative environment. Basic technology elements integrated with reasonably realistic supporting elements. Prototyping implementations conform to target environment and interfaces.

TRL 6 System and subsystem model or prototyping demonstration in a relevant end-to-end environment (ground or space): Prototyping implementations on full-scale realistic problems. Partially integrated with existing systems. Limited documentation available. Engineering feasibility fully demonstrated in actual system application.

TRL 7 System prototyping demonstration in an operational environment (ground or space): The radar system exists and functions in conditions similar to those it will encounter in ongoing operations (for example: unattended for several days, outside controlled lab conditions). All major components are fully integrated and most are identical or easily scalable to the system being proposed. For example, the antenna may be smaller and therefore the drive motors less powerful, but the system can be scaled using the radar equation and standard engineering calculations for verification purposes. The antenna control, transmitter, receiver, and data processor are all in place in their final or near-final form. The system is no longer under development and is ready for operational deployment except for thorough documentation and implementation of all finalized components.

TRL 8 Actual system completed and "mission qualified" through test and demonstration in an operational environment (ground or space): The radar system has been assembled completely in its final form and has been successfully run in a fully operational environment; including running 24/7 unattended (no intervention) for at least 2 weeks and successfully gathering radar data in the required formats. Engineering and technical documentation is complete. User documentation, training materials and other supports to operations are being finalized. The system is ready for field deployment and will operate 24/7 with some initial

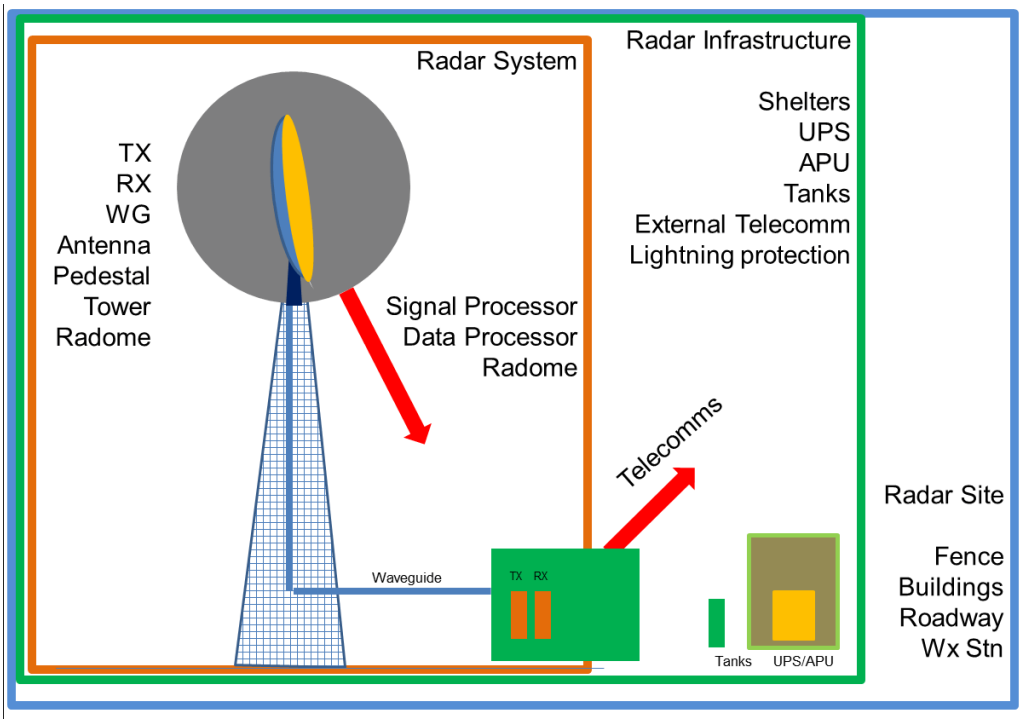
minimal intervention to address minor issues. This may result in a loss of up to 50% of operational time over the first 30 days after the new system is powered up.

TRL 9 Actual system "mission proven" through successful mission operations (ground or space): The radar system has reached its finalized production and installation phase where installation and operation are routine. All documentation, training and support are in place. The system operates 24/7 with minimal intervention. Any final adjustments on-site result in less than 15% data loss over the first 30 days after the new system is powered up.

GLOSSARY

Acronym or Expression	Definition
Aa	Achieved Availability (Aa) is a measure of availability under ideal conditions. Aa assumes that an end item is unavailable only when corrective and preventive maintenance are being performed. Ideal conditions exist when the stipulated tools, parts, skilled manpower, manuals, support equipment and other required support items are available. Aa excludes delays such as ready time, supply downtime, administrative downtime, etc. Aa may be expressed as a percentage by the following formula: Aa = (1 – (CM + PM) / Ts) x 100, where Ts = specified operating time (8760 hours annually) CM = Corrective Maintenance (annual hours) PM = Preventive Maintenance (annual hours)
APU	Auxiliary Power Unit
BCP	Business Continuity Plan
Bias	Difference between the estimate of the mean versus the true mean
BITE	Built In Test Equipment
CARDS	Canadian Radar Decision Support system. Also known as URP. CARDS is the term used outside of EC
CMD	Clutter mitigation detection is a technique that uses the texture of the data to determine whether ground clutter is present and then apply the GMAP filter
Corrected Reflectivity	Reflectivity with ground clutter removed
Critical Failure	A failure resulting in radar data loss or degradation (no useable standard products available) that cannot be repaired without a visit to the site
CSR	Clutter to Signal Ratio
CWRRP	Canadian Weather Radar Replacement Project – the overall project, including contracts, work performed by Canada, and other activities and agreements
CWRRS	Canadian Weather Radar Replacement Solution – the deliverables of this Contract

Acronym or Expression	Definition
Data	A generic term for digital information
Data Processor	A computer that packs the moment data from the signal processor with meta data to produce ray, sweep and volume scan data
days	Unless otherwise specified “days” means calendar days
dB	Decibel = 10 log of a non-dimensional quantity
dBm	Decibel of milliwatt; that is, normalized to 1 milliwatt
dBZ	Decibel of reflectivity
DMS Radar Archive	Data Management System. This is the planned archive of the radar data
Dual PRF	A technique to extend the unambiguous maximum combining two rays at two different PRF's.
EC	Environment Canada
EC Radar Servers	Regional (creates all products but uses a limited number of radars) or national radar servers (creates a limited number of products but uses all radars) that a part of the National Applications computing infrastructure. This is known as URP or CARDS
Echoes First Trip	Echoes received before the transmission of the subsequent pulse
Echoes Multiple Trip	Echoes received after the transmission of the subsequent pulse
Echoes Second Trip	Echoes received after the transmission of the subsequent pulse and before the next pulse after that
ECP	Engineering Change Proposal
ECR	Engineering Change Request
Equivalent Radar	or “radar with equivalent characteristics”: This is a radar with equipment similar enough to the offered radar system such that adjustment of the documented evidence can be done using the standard radar equation – that is: equation 4.35, Doviak and Zrnic, 1984
FFT	Fast Fourier Transform
FFT Processing	Frequency domain processing of time series data to remove ground clutter, in this case. Also known as spectral processing
First Article	The first radar system to be delivered installed and tested. This system represents

Acronym or Expression	Definition
	the concrete proof and demonstration of the specific solution to be provided by the Contractor meets the requirements of the Contract.
GMAP	Gaussian Model Adaptive Processing. A technique to remove ground clutter adaptively by characterizing the ground clutter using a Gaussian shape and using an appropriate width of the ground clutter filter in spectral domain.
Graphical Definition of 1. Radar System 2. Radar Infrastructure 2. Radar Site	
H	Horizontal polarization = horizontal transmit and receive
H,V	Horizontal or Vertical Polarization on transmit; reception is the same
H+V	Simultaneous Horizontal and Vertical Polarization on transmit and horizontal and vertical on reception. Also known as hybrid scanning, Simultaneous Transmit and Receive (STAR) or Simultaneous Transmit and Simultaneous Receive (STSR) or Slant 45
HVAC	Heating, Ventilating, and Air Conditioning
Hz	Hertz
I	In-phase
I,Q	In-phase, Quadrature
IF	Intermediate frequency
IM/IT	Information Management/Information Technology
K_{DP}	Specific differential phase

Acronym or Expression	Definition
Klystron	A high power amplifier coherent transmitter
LCM	Life Cycle Management
LDR	Linear Depolarization Ratio
L.E.D.	Light Emitting Diode
LRU	Line Replaceable Unit
Magnetron	A non-coherent power oscillator transmitter
MDS	Minimum Detectable Signal
Metadata	Data about data
Mode of a PDF	The peak value of a Probability Distribution Function (PDF)
Moment	Estimates from a randomly varying signal (also known as In-Phase-Quadrature or time series data). Weather signal power is the zeroth moment of the Doppler spectrum. Mean Doppler velocity is the first moment of the power-normalized spectra
MRP	Mobile Repair Parties
MSC	Meteorological Service of Canada - EC
MTBCF	Mean Time Between Critical Failures, defined as the statistical mean time between critical failures (see definition of “critical failure”)
MTBF	Mean Time Between Failure, defined as the statistical mean time between system failures requiring maintenance or repair activities
MTTR	Mean time to repair, defined as the mean of the distribution of repair time for individual failures. The summation of active repair times during a given period of time divided by the total number of malfunctions during the same time interval. This definition applied to components as well as the whole system
NADM Radar Archive	National Archive and Data Management Radar Archive - A legacy archive system of the Data Analysis and Archive Division for radar raw data and limited products
NinJo workstation	http://www.ninjo-workstation.com/. A workstation for operational forecasters developed and supported by an international consortium of meteorological services and IT companies
NRP	National Radar Program
NWP	Numerical Weather Prediction
Nyquist Range	The maximum range of the first trip echo
Nyquist Velocity	The maximum unambiguous velocity
Nyquist	The maximum unambiguous velocity using the dual-PRF or staggered PRT technique

Acronym or Expression	Definition
Velocity Extended	
O&M	Operations and Maintenance Funding
O/S	Operating System
OHS	Occupational Health and Safety
OPERA ODIM H5	OPerational European RAdar: OPERA Data and Information Management. An information model to facilitate international radar data exchange.
Operational	1. Radar is functioning within acceptable tolerances 2. Radar passed on-site Performance Acceptance 3. Data flowing to GoC Servers 4. Data being processed and products produced 5. Approved and certified for use by forecasters complete with BCP, 24/7/365 support. (This may or may not imply that forecasters are trained or certified to use Doppler or dual-polarization products.) 6. Each radar is part of an operational radar network when it is considered available without interruption, 24 hours per day, 7 days per week, and 365 days per year with over 95% data availability. The radar may have service disruption as a result of scheduled maintenance, upgrades, and emergency repair. Minimum standards of overall reliability and a business continuity plan (BCP) are established and enforced.
PC	Personal Computer
PDF	Probability Distribution Function: A distribution of values used to define the mean (average), mode (peak), median (middle value) and spread of the estimates of the value
Phase Diversity	A generic term for exploiting the phase of the transmit pulse. In this context, it is used to statistically process a series of pulses to determine the “trip” of the echo in range
Phase Modulation	A generic term indicating that the phase of the transmit pulse is “set” or controlled in a pre-determined manner. In this context, the sequence of phases are known and processed to generate an output where the various “trips” of the echo can be identified and extracted
PPI	Plan Position Indicator
Precision	In the context of data value resolution, precision is expressed as quantization (see below) NOT as a reference to the number of significant digits
PRF	Pulse Repetition Frequency
Products	Anything derived from data
PRT	Pulse Repetition Time

Acronym or Expression	Definition
Pulse Compression	A technique to use a low power long pulse as an alternative to a high power short pulse using a frequency modulated wave form
Pulse Pair Processing	Processing consecutive pulses of time series data (I,Q) where various lags of the auto-correlation function are used for Doppler velocity moment estimation
Q	Quadrature
QMS	Quality Management System
Quantization	Data value resolution and related to the encoding of a parameter and the number of bits to represent the value. For example, if we have 8 bit data or 256 values (from 0 to 255) and we encode reflectivity as dBZ = (N-64)/2 where N is the 8 bit data. Then the denominator (2) indicates that we have reflectivity at a quantization level of 0.5 dB
Radar Control Processor	A computer that interacts and coordinates with various radar electronics to control the configuration of the radar and manage the data acquisition
Radar Data Acquisition Processor	Works with the Radar Control Processor and Radar Signal Processor to acquire the moment data, perform data quality checks, collate data into rays, sweeps, volume scans, and meta data to create data files and products. This stores data locally. It may transmit data out to external systems for further processing and visualization. It may perform the processing and visualization itself
Radar Signal Processor	A computer (previously specialized high speed CPUs) that acquires the time series data or voltages processes it to produce a reduced volume of data called “moments”. It works closely with the Radar Control Processor and Data Acquisition Processor
Radar system	This includes but not limited to the tower, lightning protection, antenna, pedestal, radome, transmitter, receiver, waveguide, signal generators, power meters, signal processor, radar control computer, data processor and data acquisition computer. The ‘radar system’ does not include the telecommunications system nor does it include the EC radar server and visualization systems
Random Phase	A technique to retrieve the second trip echo exploiting the random phase of the transmit pulse from an incoherent magnetron transmitter. See phase modulation for coherent transmitter
Raw data	There are various versions of raw data: 1. Level 0: Analog data – post IF, pre A to D converted data; 2. Level 1: Post A to D converted data, Time Series; and, 3. Level 2: Moment data packed as rays, sweeps or volumes
Reflectivity	6th moment of the Drop Size Distribution Z
RF	Radio Frequency
RHI	Radar Height Indicator
S&T	Science and Technology Branch - EC

Acronym or Expression	Definition
Scan Cycle Time	A nominal time duration where a repeated scanning sequence has been completed
Sheltered equipment	Refers to the Radar system equipment that requires HVAC control systems to function appropriately. It does not include equipment within the radome. This is equipment that is nominally conceived to work in a shirt sleeve environment. The equipment in the radome is not normally considered sheltered equipment but may be in the case of receivers or computers mounted on the antenna in the radome
SNR	Signal to noise ratio
Solid State	Technology that is totally composed of transistors
SOP	Standard Operating Procedures
Spectral Processing	Fast Fourier Transform of a sequence of samples (time series) to estimate Fourier coefficients. It is used in this context to remove ground clutter
Spectral width	The width of the Doppler spectrum
SQI	Signal Quality Index
SSC	Shared Services Canada
Staggered PRT	Similar to dual PRF except the data is collected in one ray
Standard Deviation	Spread of the estimate of the probability distribution function. In this case, it is same as σ (not 2 σ)
STAR	Simultaneous Transmit and Receive
SZ2	Sachinananda and Zrnic 64/8 phase coding
TIES	Technical Investigation and Engineering Support
Time Domain Processing	Processing time series data as a sequence for parameter estimation. Compare to transforming a time series into the spectral domain
Time Series	In-phase, Quadrature data or data as a function of time.
Turnkey	Ready for immediate operation and use. No further assembly required by Canada. All components are well integrated and designed for a trained non-expert to operate and maintain
Unsheltered equipment	Equipment that does not require HVAC to operate or function. For example: Tower, Radome, Lightning protection, stairs
Upgrade	Adding the dual-polarization technique to an existing radar
UPS	Uninterruptable Power Supply
URP	Unified Radar Processing system EC radar data processor. Also known as CARDS.

Acronym or Expression	Definition
	URP is internal to EC.
V	velocity
Variance	In this context it is the same as standard deviation (σ) and not the technically correct square of the standard deviation (σ^2)
W	Doppler spectrum width (see spectral width)
WBS	Work Breakdown Structure
Workstation	A computer with display and keyboard
Z_{DR}	Differential reflectivity
Z_h	Horizontal power
Z_v	Vertical power
ρ_{hv}	Cross-polar correlation
Φ_{dp}	Differential Phase

APPLICABLE DOCUMENTS

The following documents form part of the SOW. Unless otherwise specified, the applicable version is the most recent published version at the time of RFP posting.

Publisher	Name
Industry Canada	RSS-102, Radio Frequency (RF) Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands).
Health Canada	Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 KHz to 300 GHz – Safety Code 6
Treasury Board of Canada	Canada Labour Code Part II Canada Occupational Health and Safety Regulations
Transport Canada, Civil Aviation Rules	Standard 621.19: Standard Obstruction Markings
Canada	Hazardous Product Act of Canada http://laws-lois.justice.gc.ca/eng/acts/H-3/

Publisher	Name
Canadian Standards Association	• Standard CAN/CSA T529-95: "Telecommunications Cabling Systems in Commercial Buildings"; • Standard CAN/CSA-T528-93: "Design Guidelines for Administration of Telecommunications Infrastructure in Commercial Buildings"; • Standard CAN/CSA-T530-99: "Building Facilities, Design Guidelines for Telecommunications"; • Standard CAN/CSA-T527: "Grounding and Bonding for Telecommunications in Commercial Buildings"; • Standard CAN/CSA S37-13: “Antennas, towers, and antenna-supporting structures”; • Standard CAN/CSA 221-15 “Canadian Electrical Code”; and, • Standard CAN/CSA-B72-M87 (R2013) “Installation Code for Lightning Protection Systems.
CENELEC European Committee for Electrotechnical Standardization	• BS EN 62305-1:2011 Protection against lightning. General Principles • BS EN 62305-2:2006 Protection against lightning. Risk Management • BS EN 62305-3:2011 Protection against lightning. Physical damage to structures and life hazard • BS EN 62305-4:2011 Protection against lightning. Electrical and electronic systems within structures
FAA US Federal Aviation Administration	• FAA-STD-019e Lightning and surge protection, grounding, bonding, and shielding requirements for facilities and electronic equipment, Section 4.2.3.6 Lightning protection for antenna towers
International Standards Organization	ISO 3864-2 Graphical Symbols – Safety Colors and Safety Signs – Part 2: Design Principals for Product Safety Labels
National Research Council of Canada	National Building Code http://www.nrc-cnrc.gc.ca/eng/publications/codes_centre/2010_national_building_code.html
Canadian Commission on Building and Fire Codes	National Fire Code (NFC) of Canada
Industry Canada	National Spectrum Policy and Standards (www.strategis.ic.gc.ca)
Gourley et al, 2006	Jonathan J. Gourley, Pierre Tabary, Jacques Parent du Chatelet, 2006 : Data Quality of the Meteo-France C-Band Polarimetric Radar, *Journal of*

Publisher	Name
	Atmospheric and Oceanic Technology, Volume 23, Issue 10 (October 2006) pp. 1340-1356
Joe et al, 2003	P. Joe, P. T. May , 2003: Correction of Dual PRF Velocity Errors for Operational Doppler Weather Radars, *Journal of Atmospheric and Oceanic Technology,* Volume 20, Issue 4 (April 2003) pp. 429-442
Joe et al, 1998	Joe, P., D. Hudak, C. Crozier, J. Scott, M. Falla, R. Passarelli, A. Siggia, 1998: Signal Processing and Digital IF on the Canadian Doppler Radar Network, Cost 75 Final International Seminare on Advanced Radar Systems, 23-27 March 1998, Locarno, Switzerland
Joe, P. and S. Lapczak, 2002:	Joe, P. and S. Lapczak, 2002: Evolution of the Canadian Operational Radar Network, ERAD 2002, Delft, the Netherlands

1.0 INTRODUCTION

1.1 Background

EC has a requirement to replace approximately two-thirds of the Government of Canada's (GOC) current weather radar network and related infrastructure by spring 2023. For locations see Appendix G, Document G1 – Sites.

EC's MSC has provided Canadians with up-to-date information about the weather for over 140 years. To revitalize Canada's weather services, the Government of Canada's Budget 2011 and Budget 2013 announced multi-year funding to further strengthen Canada's meteorological services through new federal infrastructure investments in radars, surface weather and climate monitoring stations. The MSC's networks include radar sites across Canada, as well as infrastructure and instruments that perform ice and wave conditions monitoring, water level monitoring and atmospheric conditions monitoring. EC's national weather forecast and warning system relies on several observation networks to detect changes in the atmosphere and the development of threatening conditions. The monitoring infrastructure includes 30 weather radars plus radar data from McGill University, 84 lightning detection sensors, approximately 1,300 surface weather and climate stations, 70 weather buoys, 56 automated ship observation programs, and 31 stations for launching balloon-borne observations of the upper atmosphere.

Radar enables the observation of precipitation, clear air echoes, and humidity or refractivity fields over an area on various spatial and temporal scales. It is an essential tool for accurate and timely precipitation and severe weather warnings and is integral for understanding precipitation effects on key drainage basins for water management. Assimilation of radar data into global, regional, and local scale computer models is key to improving the quality of weather forecasts and warnings. Extended Doppler range, while maintaining extended velocity and accuracy, is a priority due to the sparse nature of the Canadian radar network. Another important consideration is the need for a narrow beam-width and low-level scans in areas prone to lake effect snow.

EC's network of meteorological radars is an important tool for diagnosing and forecasting some of the most severe and damaging weather that occurs in Canada. Most of the infrastructure and hardware in the network is currently beyond its 25-year life expectancy and is no longer supportable. The network has radars of several different generations, with some of them 30-40 years old. The oldest 19 radars rely on obsolete technology that can no longer be procured, maintained or upgraded. The scarcity of parts is making it increasingly difficult to sustain the network. The radars are encountering more frequent operational problems and failures.

Over the past few years, while planning a radar network rejuvenation, EC has investigated user requirements, surveyed current and developing science and technologies, discussed various options for network design, and performed preliminary cost-benefit analyses. Information has been provided to and obtained from industry through the industry engagement process which consisted of Letter of Intent, Industry Day and one-on-one consultations.

1.2 Objectives

The deliverables of the Contract contribute significantly to the overall CWRRP to replace obsolete systems and upgrade the overall MSC Radar network

Through the CWRRP, Canada intends to achieve:

a. Improvement of up-time and network sustainability through the replacement of the obsolete weather radars with new dual-polarized Doppler weather radars;
b. Extension of the type and quality of the data by adding dual polarization for echo classification (rain vs snow, vs ground clutter), and more accurate and improved quantitative precipitation estimates;
c. The increase of network redundancy through more overlap of Doppler coverage within the network;
d. Improvement of calibration through updated equipment, maintenance and calibration procedures;
e. Stabilization or reduction of maintenance and operating costs of the network; and,
f. Improvement in the life-cycle management planning of the network.

1.2.1 Functionality Objectives

The prime requirement of the radar data is for understanding severe weather and issuing warnings, particularly of rapidly developing significant weather situations. Improved quantitative precipitation estimates are also a goal for improved severe weather warnings, hydrological applications, and data assimilation. Specifically, the requirements can be summarized as follows - (for details see Appendix A, Section 2):

a. Qualitative use for forecasters (primary) and decision-makers (secondary);
b. Detection (e.g., low level snow squalls, storms at long range);
c. Extended Doppler coverage horizontally (~220+km), vertically (10+ elevation angles) and extended velocity (~ 48m/s) for better warnings;
d. Rapid scans (5-6 min) for timely warnings and data assimilation for nowcasting; and,
e. Pattern recognition for convective severe weather warnings.

Quantitative use for precipitation analysis, data assimilation and hydrology

a. Severe weather algorithms;
b. Good quality wind data upstream of critical areas;
c. Known quality information for data assimilation; and,
d. Good quality data (attenuation compensated, target type) for precipitation estimation.

Canada's current weather radar network is a magnetron-based, C-band network with a mix of 0.65 and 1.1 degree antenna. The Doppler range is 112-125km and the spacing of the radars ranges from approximately 200 km to 450 km with an average separation of 300 km. Volume scans are sent every ten (10) minutes and EC has an in-house radar product generator (URP) that produces the various products and views required for forecasters and other users. EC will retain URP for further application development. EC will use the NinJo workstation for data visualization by the forecaster.

1.2.2 Operation and Maintenance Cost Objectives

One of the key goals of the CWRRP is to implement a network that can be maintained in a cost-efficient way at or lower than the current operating and maintenance costs of $4.5M per year for the current network of 30 weather radars. The CWRRS deliverables from the Contract are an important part of the CWRRP achieving this goal. The CWRRP plans to contain or reduce operating and maintenance costs through various means, including the following:

a. Decreasing maintenance issues and visits through robust and reliable equipment;
b. BITE and redundant components;
c. Off-site monitoring, diagnostics, interventions and calibration;
d. Better depot and sparing management;
e. Increased network harmonization (reducing the number of different platforms and configurations); and,
f. More stable data quality and reliability, which could reduce the number of site visits (e.g., from 6 to 2 visits per year).

The current EC network is managed from the Toronto headquarters (HQ) and obtains support from 8 other field office locations across the country. HQ is staffed primarily with engineers and senior technicians and the field offices are staffed with technicians who are trained to support several of our networks, not just radar. On a daily basis the sites run automatically with remote support from our personnel across the country. Technicians are able to log into sites remotely to perform basic functions and the condition of much of the site equipment is monitored with information being sent to a central server that staff can access.

Given the age and maintenance requirements of our existing system, Canada is able to maintain a network average of 97-98% operational availability throughout the year (excluding planned maintenance).

Overall, the level of effort to operate the entire network is the equivalent* of:

- 1 full-time field technician per 3 radars (10 full-time technicians);
- 2 full-time engineers;
- 3 senior HQ technicians (specialists);
- 3 HQ working-level technicians; and
- 1 operations manager

*[*the equivalent of 1 full-time position may mean 2 or 3 people spending part of their time on radar and the rest on other responsibilities]*

A significant maintenance-related cost is travel. Almost all of the sites take 3 or more hours to drive to from the service offices and some take a full day. Some sites are an hour away from the nearest accommodation, which adds to travel time over the course of a week's work. Therefore; the fewer visits – either for preventive maintenance or return-to-service -the better.

Additionally, the cost of shipping parts to the technicians once they have made a diagnosis and the time the technicians spend waiting for the required part is a large cost to the program. The Contract deliverables will provide the ability to diagnose and correct many problems remotely; utilize less-skilled but local staff or contracts for some issues; and avoid sending two staff by minimizing Occupational Health and Safety risks resulting in significantly reduced operating costs.

1.3 Scope

The Contract must replace 19 obsolete Radar systems and infrastructure across Canada and install a new Radar system and infrastructure in northern Alberta at a site to be selected and acquired by Canada.

The Contract must also provide the related project management and all deliverables required for a “turnkey” dual-polarized Doppler weather radar network to be in place and operational by March 31, 2023. The contract includes:

a. Acquisition and installation of Twenty (20) weather Radar systems along with associated infrastructure:
b. Option to purchase up to thirteen (13) additional weather Radar systems along with infrastructure and installation:
c. Appropriate spares based on maintenance and support requirements;
d. Project Management, Training, and Documentation services; and,
e. Specialized Professional Services.

1.4 Contract Phases

The Contract includes 3 phases:

1. Transition-In phase – This phase includes information gathering, site visits, project planning, final system and infrastructure design and approvals;
2. Operational Implementation phase – This phase includes the provision of all the goods and services set out in this Annex A - Statement of Work; and
3. Transition-Out phase – During this phase, the Contractor must, in addition to continuing to perform operational phase activities, assist the Government of Canada with the smooth, efficient and complete transition to a new solution.

1.5 System Overview

The new Radar systems will replace existing Radar systems at the same site unless the Project Authority indicates the requirement for a new site. The Contractor must provide new equipment shelters, radomes and antenna supporting structures. The antenna supporting structures are referred to as “towers” in the Contract. The implementation of the project is to be designed and scheduled to minimize downtime at any given site during the transition between the existing and replacement Radar systems.

1.6 Canada’s Responsibilities

Canada will be responsible for site access and preparation. This includes:

a. Required environmental assessments and clean up prior to Work;
b. Ensuring lease agreements or real estate services are managed;
c. Making power and telecommunications available at a demarcation point on site;
d. Providing safe and secure sites access (private road conditions, adjustment of fencing, escort to restricted areas, management of existing radar, etc); and
e. Decommissioning and removal of obsolete Radar systems and infrastructure.

1.7 Contract Delivery Schedule

A formal face-to-face kick-off meeting in a Canada facility will take place within 30 days after Contract award where the project plan for the contract will be discussed, and the initial Radar system and infrastructure designs will be reviewed.

The first 12-18 months of the Contract will be considered the Transition-in phase, although it may overlap slightly with the Operational Implementation phase if the First Article can be accepted, delivered and successfully tested quickly.

The Operational Implementation phase begins after the success of the First Article. By this point, the overall project plan for the Contract and for the related activities of Canada will be finalized and the installation of 3-6 Radar systems per year must begin.

Project management activities and deliverables will take place throughout the contract. The timing for major training deliverables will be discussed during the Transition-in phase understanding that most training will take place early in the Contract, but not so early as to be ineffective.

Documentation deliverables will have varying schedules depending on the purpose of the documents.

During the Transition-out phase all deliverables will be reviewed for accuracy and completeness. The requirement is to ensure Canada has everything required to fully accept, manage and support a turnkey network of dual-polarized Doppler weather Radar systems and associated infrastructure. This includes, but is not limited to:

a. Engineering drawings and information;
b. Configuration and configuration management documentation;
c. LCM and sparing information;
d. Trained staff and materials or methods to continue training as required; and
e. An adequate level of spares to support the required up-time of the network.

2.0 GENERAL DELIVERABLES

The general deliverables are applicable to all aspects of the Contract.

Number	Description of Deliverables
2.1	**Radar System Deliverables – Appendix A** The Contractor must deliver and install 20 weather Radar systems at the locations described in *Appendix G, Document G1 - Sites* comprising but not limited to: a. Tower; b. Radome; c. Antenna with Pedestal; d. Transmitter; e. Receiver; f. Signal processor; g. Radar control system; and, h. Wave guide and all cabling. All the Radar systems must meet the requirements described in *Appendix A – Radar*

Number	Description of Deliverables
	System Deliverables and be delivered and pass the Technical Performance Test at such time as agreed upon and approved by the Project Authority. The Contractor must provide transition support for: a. Individual Radar systems as they are installed and become operational; and b. The network of new radars as a whole as Canada takes responsibility for managing the network at the end of the contract period. As individual radars are installed and pass technical performance testing, the Contractor remains responsible for operational support and maintenance to the stated performance standards until such time as Canada has the required training, tools, documentation and equipment (including spares) to accept full responsibility for the site. The Contractor must ensure Canada is prepared to assume full responsibility, through the provision of training, documentation, specialized tools, equipment and spares. Management of transition of individual Radar systems will be established as part of detailed Operational Implementation phase planning after contract award. Prior to the end of the Contract period, the Contractor must ensure that: a. all documents are in place and up to date; b. the requisite allotment of spares for life-cycle management have been delivered and tested(as applicable); c. sufficient manufacturer and supplier information has been provided for life-cycle management and future procurements; d. all systems conform to configuration management standards; e. all applicable inspections, certifications and licenses are completed or in place; and, f. a technician training and certification program is in place for continued use by Canada.
2.2	**Radar Infrastructure and Construction Deliverables – Appendix B** In addition to the Radar system deliverables, there are radar infrastructure and construction deliverables at each site. These deliverables include, but are not limited to: a. Tower erection and assembly; b. Radar system installation; c. Testing and validation and any related certifications (CSA approval of tower for example); and, d. Related infrastructure requirements (for example - HVAC, backup power systems). The Contractor must deliver the construction deliverables as described in *Appendix B – Radar Infrastructure and Construction Deliverables*.

Number	Description of Deliverables
2.3	**Project Management Deliverables - Appendix C**
2.3.1	Project Management Processes and Framework Throughout the life of the Contract, the Contractor must deploy an internationally recognized up-to-date project management processes and framework methodology, which has been approved by the Project Authority.
2.3.2	Kick-Off Meeting The Contractor must organize the first face-to-face kick-off meeting within 30 days of Contract award in a Canada facility in Toronto, Ontario.
2.3.3	Implementation Plan The Contractor must submit an Implementation plan. The plan must list all activities, deliverables, dependencies, risks and mitigation strategies, milestone dates, resource assignments and level of effort, assumptions, and the identification of critical dependencies. The implementation plan must cover and identify all activities required to meet the Contract deliverables. The implementation plan must be approved by the Project Authority and Contracting Authority.
2.3.4	Project Management Services The Contractor must execute the implementation plan and provide project management support as described in Appendix C. The Contractor must provide project management services including but not limited to the following: a. Plan and coordinate all project management activities; b. Develop and maintain project budget; c. Provide logistical support including the preparation of agenda and decisions and action items, records of meetings, and facilitate meetings related to project management team and technical team; d. Develop and implement the risk and issue management processes that include but not limited to risk and issue identification, assumptions and constraints, risk mitigation options, and escalation process; e. Develop and implement the process to track significant incidents, action items, and corrective actions upon approval of Project Authority; f. Develop and implement the change and configuration control processes and reporting procedures; g. Establish and implement quality management processes by which the project will be managed; and, h. Analyze, evaluate, and prioritize work in consultation with the Project Authority and conduct a gap analysis of activities and provide feedback to the Project Authority

Number	Description of Deliverables
2.3.5	Regular Reporting (bi-weekly with quarterly summaries) The Contractor must provide reports to the Project Authority that detail its performance achieved against the contract deliverables described in the SOW for the previous period no later than 3 business days after the period end for bi-weekly reports and 10 business days for quarterly summaries.
2.3.6	Status Meetings The Contractor must organize, schedule and conduct weekly meetings at a date and time specified by the Project Authority and based on UTC-4 time zone (Eastern standard time) throughout the Contract period. Meetings will be brief (usually 30 minutes) and held to update the Project Authority on current activities and the status of the contract deliverables.
2.3.7	Strategic Management Quarterly Review This is in addition to the quarterly report summaries and must be scheduled within 12 business days of the end of the relevant quarter. The Contractor must prepare and present to the Project Authority, a strategic review on a quarterly basis including but not limited to the following: a. Status of key problems; b. Status of result in accordance with the implementation plan; c. Issues and proposed solutions; and, d. Risk management status.
2.3.8	Mid-Project Review The Contractor must design and deliver a mid-project review at the time of technical acceptance of the 10th installed Radar System. The purpose of this review is to perform detailed checks and analyses to ensure the implementation plan is on track, to make any adjustments required to the project plan or documentation, and to identify any gaps that may have to be addressed.
2.4	**Training Deliverables – Appendix D** The Contractor must provide training development, documentation and services as described in Appendix D. This includes establishment of a Training Working Group within the first six (6) months of the Transition-In phase.
2.5	**Documentation Deliverables – Appendix E**
2.5.1	The Contractor must develop and deliver the documentation in support of the CWRRS as described in Appendix E. All documentation is subject to review and approval by the Project Authority.
2.5.2	Document Delivery Plan

Number	Description of Deliverables
	Within 60 days of contract award, the Contractor must provide for Project Authority approval a schedule of the documents to be delivered during all phases of the Contract (i.e. Transition-In phase, Operational Implementation phase and Transition-Out phase
2.6	**Specialized Professional Services – Appendix F** The Contractor must provide the specialized services and ensure the resources meet all the qualifications identified in Appendix F – Specialized Professional Services.
2.7	**Language** The Contractor must provide all products and services delivered under the Contract in standard English (Canada or UK) except where the contract specifically states it is required in both official languages (English and French).
2.8	**Governance and Accountability** The Contractor must establish a governance and accountability framework to define the roles, responsibilities, authorities and accountabilities of the service providers and key staff and to manage issue resolution. This framework is to be shared with Canada.
2.9	**Contractor's Representative** The Contractor must identify an individual who will act as its representative and will hold the highest level of resolution and approval authority on behalf of the Contractor. The Contractor's representative must be available during core business hours EST (UTC-4 time zone) at the request of the Contracting and Project Authorities.
2.10	**Contractor's Responsibility for Implementation** The Contractor must implement their solution. Where Canada has not referenced tasks that would typically be required to implement the Contractor's solution, the Contractor is nonetheless responsible for the execution and delivery of those tasks.

APPENDIX A TO ANNEX A

RADAR SYSTEM DELIVERABLES

1.1 General

Each Radar System is defined as including, but is not limited to:

a. Parabolic Antenna;
b. Pedestal;
c. Radome;
d. Tower;
e. Transmitter;
f. Receiver;
g. Antenna and Radar control system;
h. Signal and Data Processors;
i. Built-In Test Equipment ; and
j. Software and Firmware.

1.2 Radar infrastructure is discussed in Appendix B to Annex A – Radar Infrastructure and Construction. The deliverables in both Appendix A and Appendix B are closely related and both should be consulted throughout the Contract.

1.3 The Contractor must provide a Radar System and Infrastructure.

1.4 The First Article Radar System delivered by the Contractor must meet the TRL of 8 or better, and 30 months into the Contract period all Radar systems delivered must meet TRL 9.

1.5 The Contractor must deliver to Canada a turnkey network of Radar Systems and Infrastructure. This includes all of the information required to properly maintain and life-cycle manage the final network of radars. The Contractor must provide a LCM plan based on the available engineering and experience information related to the Radar system and infrastructure design. The LCM plan must be designed to maintain the required Radar system performance over the anticipated 20-25 year design life of the Radar systems. Throughout the duration of the Contract, the Contractor must update the LCM plan based on any new information, changes in configuration, and engineering change requests actioned.

1.6 At the end of the Contract period, as part of Transition-Out Phase, the Contractor must provide and deliver to the Project Authority sufficient spares to establish an inventory up to the level described as the minimum sparing level based on the information and analysis developed over the period of the Contract.

1.7 Scanning Strategies

During user consultations it became clear to EC that product refresh rates of 10 minutes are inadequate for the production and update of public safety watches and warnings by storm prediction centres. With the new Radar systems, EC will institute an operational scanning strategy that will allow full volume scan products, including at least 10 elevation angles, to be produced for the storm prediction centres in less than 6 minutes. The Contractor must provide the system that meets this requirement.

Note: The tables in section 2 below contain technical requirements that are applicable to the deliverables in Appendix B – Radar Infrastructure and Construction.

2.0 Technical Statement of Mandatory Requirements

2.1 Performance Requirements

2.1.1 System Operating Requirements

NOTE: In the following:

a. When moment estimate performance is specified, the radar must be configured as per item 6 below; and,
b. Unbiased estimate means that:
   i. There must be a procedure to estimate the bias;
   ii. There must be a procedure to remove or offset this bias; and,
   iii. This bias must be reported as metadata.

Number		Mandatory Requirements
1		The Radar system and associated infrastructure must be a turnkey installation consisting of the equipment specified in the SOW, installed and tested in accordance with the requirements detailed in the SOW, and ready for operational use.
2		Network Operating Configuration – All radars in the radar network must operate synchronously, simultaneously, and weather information must be processed and transmitted for each radar. In the event of a single radar failure, the other radars in the network must continue to operate and transmit the data to EC data processing and visualization systems.
3		The radar must produce Reflectivity data.
4		The radar must produce Doppler data.
5		The radar must have simultaneous transmit and receive dual-polarization capability.
6		The sensitivity of the radar must have a minimum detectable signal (MDS) of -5 dBZ at 50 km range, 250 m range bins, 1° azimuthal resolution, spinning at 2rpm and equivalent at all ranges (inverse square law relationship).
7		The Radar systems must collect and report radar data (Reflectivity, Doppler and dual-polarized):
	a	from 0.5 km to 240 km (first trip);
	b	at 250 m range bin resolution (at least 960 bins);
	c	at nominal 1° azimuthal resolution;
	d	with 1.0° and 0.5° dual-PRF data sampling or 1.0° staggered PRT sampling; and,
	e	up to 20 km altitude above horn height with 0.1° resolution in elevation scanning.
8		The Radar system must have an extended Nyquist velocity range of 48 m/s, using a 4:3 dual-PRF technique, out to a range of 240 km. Dual-PRF error rates must be less than 4.6% (see Joe et al, 1998 or Joe and May, 2004 for an explanation of this calculation).
9		The Radar system must have a phase noise level of less than 0.2° measured using a delay line.
10		The Radar system must have noise figure of < 2.5 dB.
11		The Radar system must have IF sampling of at least 16 bits.

12	The Radar system must have a cross-polar correlation (ρHV) of 0.995 or higher.
13	The Radar system must provide an unbiased differential reflectivity (Z_{DR}) of 0 dB with a precision of +/- 0.3 dB or less.
14	The Radar system must have a power variance of 2 dB or less.
15	The Radar system must have user configurable multi-trip suppression capability of at least 50 dB for the first trip echo.
16	Ground clutter suppression must be performed using spectral processing.
17	The radar filtering must provide clutter suppression of at least 50 dB.
18	The radar signal processor must produce user-selectable corrected data for at least, but not limited to, the following parameters: Z, Vr, W, SNR, SQI, K_{DP}, Z_{DR}, ρ_{HV}, φ_{dp}. The Radar system must allow the user to configure the processor to apply corrections and adjustments including, but not limited to: Ground clutter rejection; multi-trip suppression; multi-trip recovery; point filter; and, attenuation correction. The system must allow the user must to request uncorrected or corrected data, the difference, or all. These moments must be user configurable and available for both polarizations.
19	The radar signal processor must produce and record time series (I, Q) data.
20	There must be expandable local storage of at least 3 Terabytes of data.
21	The Radar system must allow user adjustable configuration of the radar data to 8 or 16 bit, on a parameter-by-parameter basis.
22	Coordinated Universal Time (UTC) must be used to time stamp radar data and the UTC source must operate to an accuracy and precision of 1 millisecond.
23	The power calibration among radars must have less than 2 dB bias and 1 dB variance.
24	The Radar system must be designed to operate continuously and automatically at an unmanned location under the environmental conditions specified in Appendix G – G3: General Environmental Conditions.
25	The radar receiver must have a dynamic range of > 100 dB@1MHz.
26	The Radar system must provide for solar calibration for antenna alignment and power calibration.
27	The transmitter must operate at a minimum of 4 user-selectable frequencies within the identified band for network operations and interference mitigation of adjacent radars. The frequencies will be managed by EC.

2.1.2 System Monitor and Control requirements

Number	Mandatory Requirements
28	The Contractor must provide COTS computers to control, configure, acquire data, process data and produce real-time products and monitor the Radar system. These computers must meet all applicable IT security requirements and will be verified by Canada's security authorities prior to connection to the network.
29	The Contractor must provide the software publisher certification or the software publisher authorization certification and software support if third party software is provided.
30	The Contractor must provide a system such that access to the local site workstation from remote locations must be via the Government of Canada's telecommunication network which is behind a firewall. Currently, this is done via a secure virtual network connection and the Contractor must provide a system of equal or superior security.
31	Access to the workstation must be via secure password for each authorized user.
32	The radar monitor and control functionality must include mechanisms that enable

		assignment and restriction of control functions to different users.
33		There must be video and audio in the radome to facilitate remote diagnosis of problems and also as additional safety and security features.
34		The operating system for the workstations must be Linux.
35		The workstation display functionality must include but not be limited to:
	a	Time Series and Spectra;
	b	A-scope;
	c	B-scan;
	d	PPI;
	e	RHI; and
	f	Solar Calibration.
36		The Maintenance and Control functions must include but must not be limited to:
	a	Stop and start the Radar system;
	b	enable selection and control of the system configuration and system parameters;
	c	provide system status and performance information;
	d	generate monitoring messages;
	e	fault monitoring and configuration;
	f	display warnings and alerts;
	g	User configurable auto-shutdown in the event of exceeding fault thresholds;
	h	automatic switch over to Auxiliary power in event of power (mains) failure;
	i	Graceful shutdown in the event of APU failure; and,
	j	a minimum of one (1) year's history log of system fault reports and performance data, available for on-screen viewing and as printed reports.
37		The Test and Calibration Utilities must include, but must not be limited to:
	a	auto-calibration function with built-in power meter;
	b	sun calibration for elevation and azimuth pointing calibration;
	c	solar calibration and monitoring for receiver power calibration;
	d	automatic ZDR calibration (bird bath or other); and,
	e	automatic noise measurement.
38		Radar BITE information and alarms must include the following:
	a	Antenna rotation – on or off;
	b	Transmitter radiation – on or off;
	c	System status – available or faulted;
	d	Major sub-system status – available or faulted;
	e	Radar equipment shelter fire status – fire or no fire;
	f	Radar equipment shelter security – alarm or no alarm;
	g	Radar equipment shelter temperature – alarm or no alarm;
	h	Auxiliary Power Unit – generator on, standby or faulted; and
	i	UPS – on, standby or faulted.

2.2 Physical design

2.2.1 Tower Requirements

Number	Mandatory Requirements
39	The antenna and radome assembly at each site must be mounted on a tower.
40	The tower is considered part of the Radar system and must not compromise the ability of the Radar System to meet the operational requirements throughout the specified range of environmental conditions. The tower must have a design life of at

	least 20 years and must be safe from structural failure while bearing the static and dynamic loads imposed by the Radar system and environmental conditions. (See Appendix G – G3: General Environmental Conditions)
41	The elevation of the radar antenna assembly must ensure that the performance requirements of the system are met and take into account local terrain, and man-made obstructions at each site. The Contractor must not change the heights of the feed horns (as compared to the current Radar systems) without prior approval from the Project Authority.
42	The tower must provide access above and below the platform to enable maintenance of the antenna and turning mechanism. The access hatch to the platform level must be large enough to permit personnel safe access for the maintenance of the radar and passage of replacement parts. The access hatch must be lockable with a weather-proof lock.
43	The tower must be equipped with steel stairs from ground level to the staging platform below the radome, and with steel stairs or ladders for entry to the platform level or other areas requiring access for Radar system maintenance.
44	Exterior stairs, walkways and platforms must be of open mesh or grid and have non-slippery surfaces.
45	The tower must be equipped with safety railings at all accessible areas above ground level.
46	The base of the tower must be equipped with an anti-climb system with a lockable access gate and lighting that is automatically turned off during daylight via a photocell or other appropriate mechanism. A power switch located at the base of the tower, inside the access gate, must control lights that illuminate the tower stairways and platform area level. Lighting controlled by the switch must remain on for a minimum of 3 hours unless turned off by the switch. All tower lighting must be L.E.D. where commercial off the shelf solutions are available.
47	The tower-antenna assembly must be equipped with a safety interlock system to prevent powered antenna rotation and RF power transmission while maintenance and inspection activities are taking place on the antenna platform.
48	The tower must be equipped with dual steady burning L.E.D red obstruction lighting. The tower must provide a method to access the obstruction lighting for maintenance purposes. Neither the lights nor the access can be placed such that they degrade either normal operation or vertical pointing for dual-polarization calibration.
49	The tower must be equipped with a powered, mechanical means for raising and lowering of replacement components, materials and tools to the platform level. The lifting mechanism must be rated for raising and lowering a static load that is twice the weight of the heaviest replaceable item on the tower (excluding antenna sail and pedestal). The lifting mechanism must be capable of stopping during a lift or lowering process and holding the static load indefinitely. The mechanism must accommodate the raising and lowering of the largest replaceable item.
50	The tower must be equipped with lightning protection and grounding.
51	The tower must be equipped with voice communications (intercom or telephone) from the platform level to the equipment shelter. The communications system must have both a visual and audible page function.
52	The tower must be designed and constructed such that preventive maintenance, including re-painting or refinishing of externally exposed surfaces, is not required more frequently than every 10 years under normal use.
53	The tower design must be approved by the Project Authority prior to implementation.
54	The tower must be approved, stamped and signed, during the post-construction

	inspection by a licensed professional engineer appropriate for the province where the tower is located.
55	The tower must have a design life of at least 20 years.

2.2.2 Radome Requirements

Number	Mandatory Requirements
56	The radar antenna assembly must be enclosed in a Contractor-provided radome.
57	The two-way radome signal loss must be 0.5 dB or less.
58	The radome must have a rigid construction and a pseudo random panel design and the antenna, tower must be designed to minimize the impact on dual-polarization parameters. The azimuthal Z_{DR} variation at 1.0, 5.0 and 10.0 degree elevations must have a variation less than 0.15dB.
59	The area enclosed by the radome must be equipped with a minimum of eight (8) 120 volt duplex receptacles for general purpose use. These receptacles must be distributed throughout the space.
60	The radome must be constructed of a hydrophobic material, or must have an applied hydrophobic coating which has a minimum service life of three (3) years.
61	The radome physical and electromagnetic performance characteristics must meet performance requirements over the range of required environmental conditions. (See Appendix G – G3: General Environmental Conditions)
62	The Contractor must provide and install an active or passive HVAC system which will maintain the radome conditions appropriate for operation of the equipment. The system must also render the radome environment appropriate for maintenance activities within two (2) hours of initiation 95% of the time. (See Appendix G – G3: General Environmental Conditions)
63	The radome must be weather-tight. Additionally, any openings for ventilation or exhaust must be protected by a screen to minimize insects and dust entering the radome.
64	Radome lighting must be floor-mounted and indirect to avoid being directly in the face of technicians. The lighting must be L.E.D.
65	The radome must have a minimum design life of 20 years.

2.2.3 Antenna Requirements

Number	Mandatory Requirements
66	The antenna must be of a parabolic type and have a design life of at least 20 years.
67	The radar antenna assembly must produce a beam width of 1° or less for a frequency meeting Industry Canada licensing protocols regarding frequency allocation.
68	The antenna and the Radar system must be designed, manufactured and installed to rotate at rates from 0.1 rpm to at least 6 rpm under operational conditions. It must also be designed, manufactured and installed to survive a momentary over-speed condition at the maximum speed of the drive motors.
69	The antenna must have a pointing accuracy of 0.1° or smaller.
70	The antenna must be designed, manufactured and installed to continuously scan at elevations between -2° and 60° and be positioned to 90° for calibration purposes with a maximum elevation of 92°. The antenna must be designed, manufactured and installed to scan continuously from 0° through 360° in azimuth.
71	The antenna side lobes must be -27 dB or less.

72		The Radar system must have a cross-polarization isolation of 32 dB or greater.
73		The antenna must scan in the following user-configurable modes:
	a	Stare (fixed azimuth and elevation);
	b	Sweep (constant elevation angle, varying azimuth);
	c	RHI (constant azimuth, varying elevation); and
	d	Solar Calibration (limited elevation sweeps with accurate timing of rays and 0.1° or better precision of elevation and azimuth read-back angles).
74		The antenna pedestal must include physical locking features to prevent unwanted movement of the azimuth and elevation axes during maintenance activities. The locking features must secure the azimuth axis in at least one position, and the elevation axis in, at least, the 0° and 90° positions. The locking feature must be of sufficient strength to allow climbing and maintenance of the pedestal and antenna mechanism without risk of unintended movement, either under power or not.

2.2.4 Shelter Requirements (excluding radome)

Number	Mandatory Requirements
75	The electronic equipment (other than that in the radome) must be installed within a secure, weather-sealed, temperature-controlled environment at each site. The electronics equipment must be installed in Contractor-provided shelters.
76	The HVAC system must maintain the shelter interior temperature within the range +15° to +28°C and 20% to 80% relative humidity with external environmental conditions as listed in Appendix G, Document G1 – General Environmental Conditions.
77	The shelter must be equipped with HVAC independent redundancy of sufficient capacity to maintain the shelter environment within the thresholds required for all critical equipment when the Radar system is operating. (i.e. even when the system is operating without grid power)
78	The shelter electrical system must be surface-mounted and provide all electrical branch circuits energized from a master power distribution panel mounted on the inside entry wall of the shelter.
79	The shelter internal electrical system must provide a minimum of six (6) non-switched 3-wire 120 volts alternating current (AC) duplex convenience outlets, each outlet fused separately at 15 amperes, which are located near the equipment cabinets.
80	The shelter electrical system must provide a single common grounding system, grounding all metallic parts of the electrical system ground to the exterior grounding terminal.
81	The shelter electrical system must provide an external Ground Fault Circuit Interrupter protected convenience duplex circuit near the shelter entrance.
82	The shelter must be equipped with internal L.E.D. lighting that provides adequate illumination for the performance of maintenance activities.
83	The shelter must be equipped with a locally audible fire and smoke detector that is also monitored, with alarm signals sent to remote monitoring for display and alarm to the operator.
84	The shelter access must be lockable with a weather-protected lock, and the entrance area must be provided with exterior L.E.D. lighting that is automatically turned off during daylight (via photocell or similar). The shelter door must be equipped with a panic bar (“towel bar” rather than “bumper bar”) to allow for quick egress in an emergency.

85	The shelter must have an intrusion and shelter access alarm that is monitored, with alarm signals sent to remote monitoring for display and alarm to the operator.
86	The shelter must be protected from damage from ice falling from the tower, if the shelter location is exposed to such a hazard.
87	The shelter must have a design life of 20 years.

2.3 Interface Characteristics

2.3.1 Electrical Power Interface

Number	Mandatory Requirements
88	The Radar system must operate from 60 Hz electrical power that is provided at the site by Canada. The electrical power must consist of commercial power with Contractor-provided backup generator power (APU). Canada will provide 110/220 volt single phase power.
89	The Contractor must provide an APU, which must start automatically with the loss of grid power and before the UPS battery is depleted. The APU must be designed, manufactured and installed to run the entire radar site for an extended period of time if grid power is lost. The APU must have 24-hours of fuel capacity on-site and be refuelable while the radar is operating in case of an extended loss of grid power. If the fuel storage tanks are not integrated into the design of the APU, the Contractor must provide them.
90	Contractor-provided shelters must provide weather-proofed connection points on the shelter exterior for entry of EC-provided electrical power.
91	The Radar system must be equipped with input power filtration, lightning protection and surge protection. The Radar system must include lightning and surge protection systems.
92	The Radar system must include an online UPS at the radar site and provide conditioned power. The UPS must provide sufficient capacity to sustain radar equipment operation till the APU is able to start up.
93	Through the monitor and control interface, an alert must be generated to indicate the loss of commercial power. The status of the UPS and the status of the APU must be reported at least weekly and technical staff must be able to query status on demand.
94	The Contractor must provide and install a system that must restore the UPS batteries to full charge within 24 hours after restoration of grid power, even in the event of complete UPS battery discharge.
95	The Radar system design must allow electrical isolation of the UPS from the radar equipment, to enable site operation during UPS maintenance. The radar design must provide an automatic bypass mechanism for electrical power should the UPS fail.
96	The Radar system must include electrical power distribution panel(s), complete with circuit breakers, for connection of the radar equipment. An AC power emergency shut-off switch must be provided to disconnect all the power to the sensor site. The shut-off switch must be located in the shelter, adjacent to the entranceway.

2.3.2 EC Monitoring, data Processing and Visualization Systems

Number	Mandatory Requirements
97	EC will continue to use existing forecaster and monitoring displays. The Radar system must interface with Canada's systems via data files and file-based alert

	messages transmitted to Canada's computer system.

2.4 Specialty Engineering

2.4.1 System Robustness

Number	Mandatory Requirements
98	The Radar system must have a MTBCF of greater than 15,000 hours with meeting sensitivity requirements with appropriate preventative maintenance.
99	MTBCF of the transmitter must meet or exceed 15,000 hours while meeting sensitivity requirements.
100	MTBCF of slip rings must exceed 40,000 hours.
101	MTBCF of the main components of the drive system must exceed 15,000 hours.
102	The equipment Achieved Availability (Aa) must each be greater than 97%.
103	The BITE of the Radar System must isolate at least 75% of faults to one LRU and isolate at least 90% of faults to two LRUs.
104	The scheduled preventive maintenance required for the Radar system must not exceed more than 2 visits per year and a total of 24 hours downtime per trip.
105	The MTTR for the Radar system must be no greater than 8 hours from arrival at site with equipment and BITE-identified parts.

2.4.2 Safety

Number	Mandatory Requirements
106	Safety signage must be provided in English and in French at a reasonable size for readability. The Project Authority must approve the French signage.
107	The Contractor must ensure that all safety features and signage comply with or exceed Canadian federal and provincial standards and regulations. Where there may be a conflict between the SOW and current regulations, the Contractor must inform the Project Authority for resolution.
108	Personal Safety: System design must provide for the safety of the personnel engaged in the installation, operation, maintenance, repair or replacement of a complete equipment assembly or component parts.
109	Safety Markings and Signs - Internal Hazards: Hazards internal to a unit must be marked adjacent to the hazards if they are significantly different from those of surrounding items; such as a high voltage terminal in a group of low voltage devices.
110	Safety Markings and Signs - Preferred Locations: Guards, barriers, access doors, covers or plates must be marked to indicate the hazard that may be present upon removal of such devices. Such hazard warnings must remain visible once the guards, barriers, access doors, covers or plates are opened or removed.
111	Voltage Warning Signs: Potentials above 70 volts Root Mean Square (RMS) or direct current (DC) must be marked with a caution or danger sign that conforms to the size, shape and colour outlined in International Standards Organization (ISO) 3864-2 "Graphical Symbols - Safety Colours and Safety Signs - Part 2: Design Principals for Product Safety Labels".
112	Power switches must be designed, selected and located so that accidental contact by personnel will not place the equipment in or out of operation.
113	Power Disconnection: The equipment must be designed so that electrical power may be disconnected and locked out while installing, repairing, adjusting or replacing a

	complete equipment, assembly, or any part of the equipment or assembly.
114	The design must incorporate methods to protect personnel from accidental contact with dangerous voltages during normal operation and routine maintenance.
115	RF radiation hazard control measures in the form of radiation hazard warning signs, barriers, fences and non-bypassable interlocks must be provided in the areas where microwave and radio frequency radiation exposure levels exceed the limits specified in Health Canada Safety Code 6.
116	Protection must be provided to prevent contact with moving mechanical parts such as gears, fans and belts during normal system operation.
117	Equipment design must prevent accidental pulling out of drawers or rack-mounted equipment components that could cause physical injury.
118	Uninterruptible Power Supply batteries must be installed in an enclosure or compartment designed to minimize pressure build-up from heat, gases, liquids or chemicals released during battery operation, charging, deterioration or rupture and prevent such materials from entering the electronic compartment.
119	Connections, polarity, minimum acceptable voltage for equipment operation, nominal voltage and type(s) of batteries required must be marked as applicable in a prominent place on, or adjacent to, the battery compartment.
120	Locations on the pedestal from which a technician could foreseeably be required to perform maintenance or repair that are above the height requiring the use of fall arrest equipment by the Canada Labour Code (CLC) must include accessible CLC-compliant anchoring points for fall arrest harnesses, unless the fall risk has been mitigated by other means.

2.4.3 Human Factors

Number	Mandatory Requirements
121	Spacing around the perimeter of equipment racks must include a minimum clearance of one meter to ensure that there is adequate space for personnel and their equipment so they can safely complete operational and maintenance activities; such as, removal of equipment from sliders and access to rear cabinets.
122	The design of the equipment and structures must provide safe and adequate passageways, hatches, ladders, stairways, platforms, inclines and other provisions of ingress, egress and passage under normal, adverse and emergency conditions.
123	System and infrastructure design must provide an efficient layout of operation and maintenance workplaces, equipment, controls and displays. Open cabinets or drawers cannot create hazards to safety or obstruct emergency egress routes.
124	The design of the shelter; including, but not limited to floor-plan, electrical drawings, and safety features, must be provided to the Project Authority for review and approval prior to fabrication or construction.

2.4.4 Electromagnetic Interference and Compatibility

Number	Mandatory Requirements
125	The Radar system must meet all technical requirements of the Contract while operating within the authorized and approved radar frequencies granted from Industry Canada. The Contractor must ensure that the identified frequencies will be authorized and approved for use by Industry Canada. Canada will be responsible for the administrative work and costs for radio frequency licensing.

2.4.5 Performance as an Integrated Network

Number		Mandatory Requirements
126		In order for the Radar systems in the network to work effectively as a network, they must have near identical performance in many areas. In particular, the Contractor must provide radars that have the same:
	A	sensitivity to within 2 dB;
	B	phase noise performance to within 0.05 degrees;
	C	correlation performance to within 0.003; and
	D	Z_{DR} performance to within 0.1 dB.

2.4.6 Data Model

Number	Mandatory Requirements
127	The radar data must contain metadata that describes the site location and must include but not be limited to: site name, latitude, longitude, ground height, horn height, Radar system description (wavelength, beam width, frequency, losses, lightning protection, all parameters required to compute the radar constant).
128	The radar data must contain radar scan configuration metadata (radar configuration metadata) and must include but not be limited to scan name, polarization mode, pulse repetition frequency, scan strategy and command angles, transmit power, doppler mode (dual PRF), all parameters required to maximum range and velocity, sampling scheme, ground clutter and other filtering schemes, bin and azimuth resolution, sampling schemes and data schemes, maximum ranges of the data in range, sweep and elevation.
129	The radar data must be configurable to be transmitted as entire volumes or as sweeps.
130	The volume data must contain radar, radar configuration and transmission scheme (volume or sweep) metadata.
131	The sweep data must contain radar, radar configuration, transmission scheme (volume or sweep) and sweep sequence metadata.
132	Each ray must be tagged with the time, command and readback angles.
133	The radar volume data must include the BITE, maintenance, status, and alert data.
134	EC will provide and install an automatic weather station reporting temperature, humidity, pressure, wind speed, wind direction, precipitation occurrence and precipitation type. The weather station will be configurable to report at the scan time of the radar (once per scan cycle) and will be reported as a text string. The Contractor must ensure that this data can be recorded and transmitted from the radar site.
135	The radar data must be available in native format and fully documented.
136	Each ray of the dual-PRF velocity must be encoded with the PRF or Nyquist Velocity, the single PRF velocity, the fold number, and the dual-PRF velocity.

2.5 System Acceptance Deliverables

The Contractor must meet the deliverables requirements in this section in order for the Project Authority to accept the systems, infrastructure and network as meeting the technical requirements and as becoming the operational responsibility of the GoC.

The Contractor must meet the deliverables requirements in this section for both:

a. Individual Radar systems as they are installed and become operational; and
b. The network of new radars as a whole as Canada takes responsibility for managing the network at the end of the contract period.

2.5.1 Deliverables for Individual Radar systems

i. As individual radars are installed and pass technical performance testing based on the technical requirements in the Contract, the Contractor remains responsible for operational support and maintenance to the applicable performance standards until such time as the Contractor has provided EC staff with the required training, tools, documentation and equipment (including spares) to accept full responsibility for the radar site.

ii. In order to fulfill the operational support responsibilities outlined in (i) above, the Contractor must be available to monitor the system 24 hours per day each day of the year and must be capable of performing diagnoses, making adjustments and calibrating the system remotely in conjunction with EC staff to ensure that minor problems can be addressed without site visits being necessary. The Contractor must also have the resources in place to dispatch personnel and equipment to a site under their control quickly along with an EC staff escort to meet radar availability requirements.

iii. The details of how the transfer of responsibility will be managed for individual Radar systems will be established as part of the detailed implementation plan and training plan after Contract award.

iv. A list of radars for which Canada assumes control will be established and jointly maintained by the Project Authority and the Contractor. When the Contractor has met the conditions for the transfer of responsibility for an individual radar site, it will be added to this list.

v. Within 30 days of completion of the last radar installation, the Contractor must provide a report that includes, but is not limited to, the following:

    a) A review of the consistency and uniformity of all documentation, hardware, firmware, software;
    b) A review of the state of the Life Cycle Management, Maintenance, Sparing and Change Management systems;
    c) Identification of outstanding issues; and
    d) An implementation plan to address issues identified in the report.

2.5.2 Deliverable for the Radar Network as a whole

Prior to the end of the Contract, the Contractor must ensure that:

a. all documents are in place and up- to-date;
b. the requisite allotment of spares for life-cycle management have been delivered and tested (as applicable);
c. sufficient manufacturer and supplier information is provided for life-cycle management and future procurements;
d. all systems conform to configuration management standards;

e. all applicable inspections, certifications, licenses are completed or in place; and
f. a technician training and certification program is in place.

3.0 Technical Statement of Point-Rated Requirements

3.1 Performance Requirements

3.1.1 System Operating Requirements

Number		Point-Rated Requirements
1		The Radar system should have horizontal-only transmit and dual receive capability.
2		The Radar system should have a solid state transmitter, but must also meet all the sensitivity and performance requirements.
3		The Radar system should have, but not limited to range bin resolutions of 500m, 1 and 2 km.
4		The Radar system should have range bin resolution of 5 km.
5		The Radar system should have dual PRF ratios of 3:2. 5:4 and 7:5.
6		The Radar system should have over-sampling capability.
7		The Radar system should have multi-trip recovery capability for at least the second trip of 50 dB or more.
8		The Radar system should provide the following options for ground clutter suppression: Pulse Pair, GMAP, CMD.
9		The system should have user selectable and configurable:
	a	Electromagnetic Interference Suppression capability;
	b	Wind Turbine Suppression capability; and,
	c	Sea Clutter Suppression capability.
10		The Radar should report absolute phase.
11		The Radar should report refractivity.
12		The signal processor should produce LDR data for horizontal transmit, dual-polarization receive mode.
13		The Radar system should produce moment (processed quantities such as reflectivity, radial velocity) and time series (In-phase and Quadrature) data simultaneously.
14		The Radar system should be able to transmit and process from 8 to at least 256 samples.

3.2 Specialty Engineering

3.2.2 Data Model

Number	Point-Rated Requirements
15	The radar data should be configurable to be transmitted as single rays.
16	The radar moments should be packed on a bin basis.
17	Each ray should be tagged with the command and transmit power
18	Each ray should be tagged by the noise level.
19	The data from the on-site meteorological station should be included as part of the radar data or metadata.
20	The data should be available in OPERA ODIM_H5 format while meeting all of the mandatory data requirements.

APPENDIX B TO ANNEX A

RADAR INFRASTRUCTURE AND CONSTRUCTION DELIVERABLES

Note: The tables in section 2 of Appendix A contain many of the technical specifications for deliverables in this Appendix.

1.0 Deliverables

Number		Radar Infrastructure and Construction Deliverables
1		The Contractor must perform all required geotechnical surveys to applicable provincial and federal standards to confirm required infrastructure engineering specifications at each site. The Contractor must provide Canada with a copy of all surveys.
2		The Contractor must obtain all appropriate climatological information for each site to ensure infrastructure can be designed to meet provincial and federal standards and meet mandatory performance standards in the SOW. The Contractor must provide Canada with a copy of all surveys.
3		The Contractor must design, fabricate, deliver and install twenty (20) self-supporting radar towers of the appropriate height for each site (feed horn height). The towers must meet or exceed the requirements for the Radar system, including data quality performance (that is, the tower must be stable enough that it does not impact the data quality). See Appendix A for tower requirements and Appendix G document G1 – sites for feed horn heights.
4		The design of the self-supporting tower(s) and any required foundation or support must take into consideration, but not be limited to, the technical specifications listed in Appendix A.
5		The Contractor must submit for approval by the Project Authority design drawings for each site that includes, but not be limited to:
	a	site plan;
	b	self-supported tower design including foundation and other support required;
	c	ancillary requirements (electrical and telecom up-grades, UPS/APU); and
	d	comprehensive schematic diagrams for all electrical and mechanical systems.
6		Tower and foundation drawings that include the design specifications must be stamped by a licensed professional engineer appropriate for the province where the tower is to be located.
7		For each site, the Contractor must provide a site work plan that includes the rationale for the design for approval by the Project Authority. The plan must include, but not be limited to:
	a	road access;
	b	actions required as part of the plan;
	c	land area requirements;
	d	soil step and soil capacity;
	e	foundation design/requirements;
	f	site drainage; and
	g	location of any ancillary buildings and equipment including footings or foundations.
8		The Contractor must provide engineering work for the Radar systems. The Contractor must provide an engineering plan that meets the technical requirements and that includes the rationale for the design of the system for approval by the Project Authority. The plan must include, but not be limited to:

	a	tower erection;
	b	antenna and pedestal installation;
	c	radome installation;
	d	Radar system electrical, mechanical, telecommunications; and
	e	any ancillary electrical equipment required for continual 24/7 operations in remote locations.
9		The Contractor must provide lightning protection systems consistent with BS EN 62305 Parts 1-4. Installation recommendations specific to radar towers found in section 4.2.3.6 of the FAA-STD-019e standard must be applied where the BS EN 62305 standard does not offer guidance, or where the FAA standard offers a higher level of protection. The Contractor must provide to the Project Authority for approval, a risk analysis breakdown and lightning protection system plan that meets the technical requirements.
10		The Contractor must provide the Work required for the radar, Radar system, associated infrastructure, and radar site. This includes, but is not limited to the tower, radome, UPS, APU, lightning protection, shelters for Radar system and ancillary equipment and fuel tanks.
11		The Contractor must build the foundation and footings in accordance with tower design specifications and site geotechnical survey results.
12		The Contractor must obtain permits for towers located within a Canadian municipality.
13		The Contractor must develop a schedule for Work for each radar site that must be approved by the Project Authority. There must be minimal “downtime” of radar coverage during the transition between the old and new Radar systems.
14		The Contractor must supervise Work and ensure site safety and security. The Contractor must ensure that the radar site is secured by an appropriate fence or barrier to enclose the site for safety and security reasons during construction and installation work.
15		Work carried out in Canada must adhere to all relevant local, provincial, and federal regulations, standards, building codes and permits. In the case of any conflict or discrepancy, the more stringent requirements must be applied.

2.0 Government of Canada Responsibility

2.1 Grid Power and Telecommunications

Canada will provide the power line and the telecommunications to a demarcation point on the site. This demarcation point is on-site and convenient for the existing sites, and will be made so for new or relocated sites. The power supply is defined (single-phase, 60 to 100 Amps) for each site. Any change from single-phase must be carried out at Contractor’s expense. Any upgrade of amperage or other will be made at EC expense following consultations with the Contractor. Telecommunications upgrades will also be done at EC expense to meet SSC standards and appropriate capacity for dual-polarized radar data.

2.2 Site Access

Canada will be responsible for ensuring adequate road access and any right-of-way permissions to the sites. The Contractor must make the Project Authority aware of access requirements as part of the Final Implementation Plan.

2.3 Site Supervision and Security

Canada employees will be present on site at all times during Work to ensure federal security requirements are met. The EC employee may halt any activity for any reason and will immediately contact the Project Authority. The EC employee is not responsible for supervising the Work under the Contract. The Contractor must not allow any work to take place on federal property without an EC employee present, unless the Project Authority has approved an alternate in writing in advance.

Work hours requiring EC supervision at a site must be planned and communicated to the Project Authority at least 4 weeks in advance for approval. Working hours are normally 8 hours per day Monday to Friday and must not exceed 10 hours per day (including breaks) and 6 days per week (Monday to Saturday), unless otherwise approved by the Project Authority in advance.

APPENDIX C TO ANNEX A

PROJECT MANAGEMENT DELIVERABLES

The Contractor must deliver the following:

1	**Governance and Accountability** A governance and accountability framework that defines roles, responsibilities, accountabilities and reporting relationships of the service providers and key staff. The interface points with Canada must be clearly identified and all contact information must be provided and kept up to date. The framework must also include the processes for interaction between the Project Authority, Contract Authority and the Contractor's organization for issues management and resolution. This framework must be approved by the Project Authority.
2	**Executive Authority** An identified individual who will act as the Executive Authority and who will hold the highest level of resolution and approval authority on behalf of the Contractor. This Executive Authority must be available during core business hours EST (UTC-4) at the request of the Contracting Authority and Project Authority. The Executive Authority must be present at the kick-off meeting, in person or by video-conference. The Executive Authority must also participate in at least 1 Strategic Management Quarterly Review meeting each fiscal year (April 1 to March 31). The Executive Authority must also participate in the Mid-Project Review, in person or by video-conference. The position of Executive Authority will remain throughout the entire contract period. If the individual holding this role must change, the new individual will be introduced (in person or by video-conference) to the GoC team prior to taking the position. If that is not possible, then introduction must be made within 5 business days of assuming the role.
3	**Project Management Team** The Contractor must establish an experienced Project Team. The key roles for personnel include: a. Project Manager; b. Project Administrator; c. Project Engineer; d. Project Analyst; e. Client Liaison; and f. Documentation Control.

	The Contractor must determine how these roles are fulfilled (for example, the Project Administrator may also fill the Analyst role); however, the Contractor must explain clearly how the project team will be set up, the roles and responsibilities, and the qualifications of each of the members filling key roles.
4	**Project Management Methodology** Throughout the life of the Contract, the Contractor must deploy an internationally recognized up-to-date Project Management methodology for delivering the service. Any methodology must be approved by the Project Authority. The methodology must include established processes for, at a minimum: a. Tracking and managing scope, cost, and schedule; b. Change and configuration management; c. Quality management; d. Risk and issues management; and e. Communications.
5	**Kick-Off Meeting** The Contractor must organize a face-to-face kick-off meeting within the first 30 days of Contract award in Toronto, Ontario. The meeting agenda must cover, but not be limited to the following: a. Establishment of the regular meeting and reporting schedule; b. Implementation plan; c. Draft Training Plan; d. Key project team members with roles and responsibilities; e. Initial Radar system and infrastructure designs; and f. Change management process. This does not preclude earlier contact through teleconference, e-mail, web-based technologies or videoconference.
6	**Implementation Plan** The Contractor must submit a preliminary Implementation Plan within 90 days of Contract award for review by the Contracting Authority and the Project Authority. The plan must list all activities, deliverables, dependencies, risks and mitigation strategies, milestone dates, resource assignments and level of effort, assumptions, and the identification of critical dependencies. The implementation plan must cover and identify all activities required to meet contract deliverables including but not limited to the following: a. Transition-In Strategy; b. Project management; i. Work breakdown structure; ii. Project teams, resource roles and responsibilities; iii. Cost and schedule estimates in accordance with radar installation

	milestones; c. Risk management; d. Quality management; e. Security and accreditation; f. Dependencies on the Government of Canada; g. Service level implementation; h. Customizations; i. Change management support (i.e. communications, issue management, and training); and, j. Transition-out Strategy. The Contractor must submit the Final Implementation Plan within 180 days of Contract award. The finalized Implementation Plan must be approved by the Project Authority and Contracting Authority as part of the Transition-In Phase. The Implementation Plan will form the base-line schedule for the Contract deliverables.
7	**Project Management Services** Throughout the duration of the Contract, the Contractor must execute the Implementation Plan and provide the project management support for all contract requirements. The Contractor must ensure that where documentation or processes regarding the project management support requires Project Authority approval; the review period must be reasonable and agreed to by the Project Authority. The Contractor must provide project management services including but not limited to the following: a. Maintaining all project documents related to the Contract; b. Developing a work plan that includes resource requirements (*e.g.,* HR and financial) responsibilities, schedules, timelines, key milestones and deliverables; c. Developing, maintaining, tracking and reporting on project budgets; d. Developing and implementing the risk and issue management processes that include but are not limited to risk and issue identification, assumptions and constraints, risk mitigation options, and escalation process; e. Developing and implementing the process to track significant incidents, action items, and corrective actions; f. Developing and implementing the change and configuration control processes and reporting procedures; g. Establishing and implementing quality management processes by which the project will be managed; h. Analyzing, evaluating, and prioritizing work in consultation with the Project Authority and conducting a gap analysis of activities, providing feedback to the Project Authority; i. Providing logistical support including the preparation of agenda and decisions and action items, records of meetings, and facilitate meetings related to the project management team and technical team; and j. Developing a communication plan for contract implementation.
8	**Regular Reporting (bi-weekly with quarterly summaries)** The Contractor must provide reports to the Project Authority that detail performance

	achieved against the Contract deliverables described in the SOW and the approved Project Implementation Plan (see 6 above) for the previous period no later than 3 business days after the period end for bi-weekly reports and 10 business days for quarterly summaries. The detail of the report must cover: a. Status of operations against Work Breakdown Structure (WBS), established goals, objectives and milestones; b. Activities completed within the reporting period; c. Planned activities for the next reporting period; d. Risks and issues that will require the attention of the Project Manager; e. Corrective actions required; and, f. Cost and schedule performance. These reports must be provided electronically and in a similar format throughout the project to facilitate proper archiving and inter-report comparison. Information from the reports will be made available in mutually agreed-upon formats so that excerpts can be included in various EC- or PWGSC-produced reports.
9	**Status Meetings** The Contractor must organize, schedule and conduct weekly meetings at a date and time specified by the Project Authority and based on UTC-4 time zone (Eastern standard time) throughout the Contract period. Meetings will be brief (usually 30 minutes) and held to update the Project Authority on current activities and the status of the contract deliverables. The Contractor must provide a brief follow-up note on the meeting contents as well as any decisions or actions as a result of discussions.
10	**Strategic Management Quarterly Review** A Strategic Management Quarterly Review must be held in addition to the quarterly report summaries and the Contractor must schedule the meeting to take place within 12 business days of the end of the relevant quarter. The meetings may be held via videoconference, web-based technology, teleconference or in-person. A minimum of one in-person meeting must be arranged per year in the Toronto, Ontario, Canada area. The Contractor must prepare a strategic review and present it to the Project Authority at the Strategic Management Quarterly Review. The review must include the following: a. Status of key problems; b. Status of result in accordance with the Implementation plan; c. Issues and proposed solutions; and d. Risk management status. These meetings must be fully documented by the Contractor including presentations, agenda, attendance, minutes, decisions and action items. The Contractor must provide the documents from these meetings electronically and in a similar format throughout the project to facilitate proper archiving and inter-report comparison. Information from the documents will be made available in mutually agreed-upon formats so that excerpts can be included in various EC- or PWGSC-produced reports.

11	**Mid-Project Review** The Contractor must design and deliver a Mid-Project Review at the time of technical acceptance of the 10th installed Radar system. The purpose of this review is to perform detailed checks and analyses to ensure the Implementation Plan is on track, to make any adjustments required to the project plan or documentation, and to identify any gaps that may have to be addressed. The Mid-Project Review deliverables will include the Transition-Out deliverables described in section 12 (below), sub-sections a, b, and c as of the date of the Mid-Project Review. The Contractor must deliver to the Project Authority and Contracting Authority formal documentation to support the review, an analysis of project progress against the Implementation Plan, and any recommendations for adjustments to the Implementation Plan or Contract deliverables.
12	**Transition-Out Report** Details of the Transition-Out will be discussed during the development of the Implementation Plan. Along with the Radar system specific deliverables listed in Appendix A, section 2.5.2, the Contractor must provide Transition-Out Deliverables which must include: a. Completion and compilation of all reports; for example: 1. Meeting documentation; 2. Change requests and logs; 3. Issue logs; 4. Financial reports; and 5. Deliverables check-lists; b. Project Overview; including: 1. Objectives and results; 2. Scope comparison; and 3. Cost and schedule performance; c. Lessons Learned Report; including: 1. Obstacles encountered; 2. Success of mitigation strategies; and 3. Recommendations for future projects; d. A face-to-face meeting with the Project Team, the Contractor's Executive Authority, the Project Authority and Contracting Authority, and various members of EC and PWGSC senior executive groups.

APPENDIX D TO ANNEX A

TRAINING DELIVERABLES

1.0 General

The Contractor must provide information, documentation and training to EC employees regarding the design, operation, function and characteristics of the Radar system, infrastructure, data, data formats, and all other relevant aspects of the CWRRS. The categories and numbers of employees requiring this service is approximated as follows:

a. Technicians (up to 40);
b. Engineers (up to 10);
c. IT Specialists (up to 10); and
d. Scientists (up to 15).

All training is to take place in Canada and in English unless otherwise agreed to by the Project Authority.

2.0 Duration of training

The Contractor will have better information regarding what training and training duration is required as they know the technology of their offered systems. However, considering the level and quality of training required, Canada anticipates the following minimum training requirements through the duration of the contract:

a. One (1) or two (2) Novice sessions of about 2 weeks in duration;
b. Three (3) or four (4) Operational session of 1-2 weeks in duration;
c. One (1) or two (2) Specialist level sessions of 3-5 days in duration;
d. Two (2) Train the Trainer Sessions of 3-5 days in duration;
e. Two (2) Engineering sessions of 3-5 days in duration;
f. One (1) or two (2) IT sessions of 5 days in duration; and
g. Two (2) or three (3) Radar Science Specialist sessions of 3 days in duration.

3.0 Technical Training

Note – as per Appendix A, section 2.5 – System Acceptance Deliverables: Until technical staff are trained, certified and equipped to support the systems, the Contractor must be responsible for the operational maintenance and support of the installed systems to required performance standards.

The Contractor must provide initial training of ten to twenty (10-20) trainees as well as an ongoing training, certification and refresher program using “train the trainer” approach. The timing of initial group training will be negotiated after Contract award. The initial group of trainees must have received adequate training and certification no later than 24 months after Contract award unless otherwise negotiated and agreed to in writing by the Project Authority.

The maximum number of EC technicians requiring training over the Contract period will be 40 individuals. Training for at least 4 categories of trainees will be required including Novice level, Operational level, Specialist level, and ‘Train the Trainer’ training as detailed below.

3.1 Novice Level

Audience: Technicians with no experience working on Radar systems.

Students will already have the following qualifications as a minimum:

a. A certificate in electronics for a course of study of at least 1000 hours;
b. Experience working on weather equipment other than radar;
c. An initial familiarization course on radar fundamentals including:
    1. Wave propagation;
    2. Microwave principles;
    3. Synchros, Resolvers, and Servo; and
    4. Radar Principles.

3.2 Operational Level

Audience: Technicians certified to work on our current systems (or undertaking the certification program).

Students will already have the following qualifications as a minimum:

a. Those listed above at the Basic Level;
b. CWSR-98 Weather Radar Basic Maintenance Course (See Appendix G, document G2 – Training Plan); and,
c. At least one year experience working as "second technician" on existing Radar systems under the supervision of an experienced technician.

3.3 Specialist Level

Audience: Headquarters Technicians (and Engineers) who rarely perform routine field maintenance, but focus instead on advanced trouble-shooting, development and implementation of new or refined processes, performance tracking, problem analysis, and other specialized tasks.

All students will have advanced electronics or engineering training (2000+ hours) and either all of the above training prerequisites or equivalent training and experience.

3.4 "Train the Trainer" Training

The Contractor must develop, in consultation with the Project Authority, a formal training and certification program that will be used for initial training and ongoing training beyond the duration of the Contract period. This training and certification program must be aimed at the Novice level of trainee.

The Contractor must provide appropriate "Train the Trainer" sessions so that Canada can sustain a technical training and certification program into the future.

4.0 Engineering Staff Training

The Contractor must provide training and information sessions for Engineers who will be supporting the Radar system and infrastructure. There will be an initial three to five (3-5) engineers who will require detailed training on the system or specific aspects of the system. The initial engineering training (minimum three individuals) must be substantially complete by 24

months after contract award unless otherwise negotiated and agreed to in writing by the Project Authority.

5.0 Application Development and Data Management Staff Training

The Contractor must provide training and information sessions for staff who are responsible for application development, data management, Radar system integration with IT infrastructure, and support. There will be an initial three to five (3-5) staff who will need to understand the Radar systems, data and metadata within 6 months of Contract award in order to begin the required integration work.

6.0 Radar Science Specialists Training

Contractor must provide training and information sessions for scientists in both our Operational organization (applied science) and Science and Technology Branch (research). These radar science specialists determine the most effective configuration for radar operations, develop techniques, evaluation and tools for data quality assessment, monitoring, and operational forecasting, for improved operation of the radars (scanning strategies for example) and for applications development and improvement. They also perform detailed analyses and research projects using the radars to further the science and application of remote sensing.

The initial training of 5-10 radar science specialists must take place upon contract award at a date, time and place agreed to by the Project Authority.

7.0 Training Plan

Training will depend on the complexity of the Radar system and the target audience. Within 90 days of contract award, the Contractor must provide a detailed training plan to the Project Authority for review and approval. The training plan must include, but not be limited to:

a. assessment of the training needs by target audience (e.g., level of knowledge and skills, training frequency) to meet the training requirements;
b. Identification of prerequisite knowledge and skills by target audience;
c. training goals and objectives in performance terms and course outline that reflect the intent of instruction by target audience;
d. training delivery methodology based on learning requirements by target audience; and
e. performance measures (e.g., criterion-referenced achievement tests, questionnaires, interviews, simulation scenarios, observation checklists, performance checklists) as it relates to training requirements by target audience.

8.0 Training Management

8.1 The Training Management and Tracking Plan

The Contractor must provide a Training Management and Tracking Plan to the Project Authority at the kick-off meeting for review and approval. This Plan must include the establishment of a Training Working Group that will include appropriate staff from both the Contractor and Canada. This working group will provide a forum to discuss training and development issues. In addition:

a. The Contractor will be responsible for secretariat support for the Training Working Group, including all documentation; and,

b. The Contractor must plan and coordinate training development and delivery, including reviewing and advising on training budget and schedule.

8.2 Certification Authority

The Contractor must function as a certification authority throughout the duration of the Contract unless an earlier transfer of that authority is negotiated between the Parties. This includes issuing certificates of completion to all successful candidates and maintaining a database of certified personnel including:

i. first and last name;
ii. course title and location
iii. instructor name;
iv. date of successful completion of the course; and
v. date of successful completion of all certification requirements.

8.3 Training Updates

The Contractor must track the requirements for training on an on-going basis throughout the project to meet any training frequency requirements and to address project changes so that the appropriate knowledge and skills are transferred to the target audiences. The Contractor must maintain and update training plans and curriculum throughout the life of the Contract. Training will include individual or group training, demonstrations, written instructions and documents.

9.0 Training Materials

9.1 All training materials must be developed and delivered in a format that can be easily customized by EC to meet their unique needs.

9.2 The Contractor must prepare training materials (including trainer's guide) and any other items needed to ensure training requirements are met. Training materials must be approved by the Project Authority.

9.3 The Contractor is responsible to furnish any tools or equipment required to successfully complete training for the duration of the training session.

9.4 Training materials must be provided at a minimum in Portable Document Format (.pdf).

9.5 Training materials must meet the requirements stated in Appendix E Documentation

9.6 The Contractor must provide training and information sessions in English.

10.0 Type and location of Training

10.1 The type and location of training will be discussed and agreed to by the training working group with recommendations being provided to the Project Authority for approval. The Contractor must cover all costs associated with the training except for the salary and travel expenses of the trainees unless otherwise agreed to by the Project Authority. The type and location of training will be dependent on the target audience and learning requirements and may include:

a. Instructor-led training in the classroom, virtual classroom, computer-based, hands-on, train-the-trainer;
b. Instructor-led, hands-on equipment training in a classroom, lab, workshop or on a radar site;
c. Web-based or computer based independent training;
d. Informal training (e.g., meetings, email);
e. Demonstrations;
f. Written instructions (e.g., manuals, guides, FAQs);
g. Step-by-step training aid; and
h. On-the-job training.

APPENDIX E TO ANNEX A

DOCUMENTATION DELIVERABLES

Various types of documentation are mentioned throughout the SOW. The Contractor must provide all documentation in the Contract, including those documents listed below.

1	General
1.1	The Contractor must develop and deliver all required documentation in English (Canadian or UK) in electronic versions. The number and format of hard-copy versions (if requested) will vary depending on the document, but will not exceed ten (10) copies, except for training documentation where a copy for each trainee will be required. The format of the electronic versions will be agreed upon after discussions between the Contractor and the Project Authority.
1.2	Where the SOW specifies documentation or signage in French, Canadian French must be used and the Project Authority must review and approve the translation prior to finalization.
2	Document Delivery Plan Within 60 days of contract award, the Contractor must provide for Project Authority approval a schedule of the documents to be delivered during all phases of the contract (i.e. Transition-In phase, Operational phase, and Transition-Out phase). In the schedule, the Contractor must outline the following at a minimum: a) Document name; b) Creation and delivery frequency of the document; c) Draft delivery date; d) The Government of Canada review period; and e) Final delivery date.
3	Technical Documentation Deliverables The Contractor must develop and deliver the documentation in support of the Canadian Weather Radar Replacement Solution (CWRRS). All documentation is subject to review and approval by the Project Authority. Documentation must include, but is not limited to: a. Technical manuals, diagrams and schematics to support operations and maintenance by mechanical engineering, electrical engineering and technicians; b. Technical manuals, diagrams and schematics (as required), safety documentation, parts lists to support operations and maintenance, first-line troubleshooting and repair; c. Tower drawings which summarize the tower components and specifications; d. Configuration parameters and software errors; e. Algorithms used to generate products; f. Hardware media and file formats; g. Software manuals, firmware, code, data formats to support software integration; h. High-level descriptions of the main functional components including software and hardware and examples of how end users will complete their tasks; i. Brochures or Manuals containing product and services as well as training tools, FAQs, installation instructions, and technical Support Services; j. Any update or replacement documentation and support to enable integration between the Contractor's processing software and EC processing and visualization software;

	k. Up-to-date Life-Cycle Management and Procurement Documentation, including, but not limited to : i. Comprehensive parts and component lists for the Radar System, including for each component: the OEM, contact information for the OEM, typical lead-times for procurement; ii. Priority list of critical components requiring specialized sparing plans (for example, components with long lead times); iii. List of acceptable substitutions for non-critical and consumable parts; and, iv. Constantly up-to-date asset inventory to track location of the major components of the Radar System and Infrastructure by serial number, asset number or some other unique identifier. The specific format for this will be established after discussions between the Contractor and the Project Authority to ensure effective integration with the GOC asset tracking system (new system currently being implemented).
4	Training Documentation Deliverables The Contractor must develop and provide: a. Training plan; including, but not limited to: i. Prerequisites required; ii. Course objectives, outline, duration, success factors; iii. Materials, equipment, tools, infrastructure required; and, iv. Number of students recommended per session; b. Certification Program description; including, but not limited to: i. Objectives, outline, duration, success factors; ii. Description of phases and milestones; iii. Conditions for successful certification; and, iv. Maintenance of certification; c. Training materials in support of technician training; including, but not limited to: i. Training manuals, workbooks, study sheets; ii. Presentation materials; iii. Test preparation; and, iv. Resource materials such as: maintenance manuals, user manuals, schematics, diagrams; d. Training, summary and reference materials in support of engineer training and information sessions; e. Training, summary and reference materials in support of IT professional training and information sessions; and, f. Training, summary and reference materials in support of scientist training and information sessions.
5	Project Management Documentation Deliverables The Contractor must document all phases of project management with the documents available for review and archive throughout the entire Contract period. This documentation must include: a. Governance and organizational structure; b. Terms of Reference, agenda, minutes and supporting documentation for all committees and meetings; c. Project Charter and related documents; d. Implementation Plan, including: i. Work breakdown structure; ii. Project teams, resource roles and responsibilities; and, iii. Cost and schedule estimates in accordance with radar installation milestones;

	e. Risk and issue tracking, reporting, resolution; f. Quality plan, tracking and reporting; g. Change tracking and reporting ; h. All regular reports (weekly, bi-weekly, monthly, quarterly); and, i. Transition-out documentation, including a Lessons Learned report. The Contractor must maintain similar formats for documents of similar types (for example: minutes, reports, tracking sheets) so that archived documents can be easy to follow over time.

APPENDIX F TO ANNEX A

SPECIALIZED PROFESSIONAL SERVICES DELIVERABLES

1.0 Scope

1.1 In addition to services specifically required by the SOW, Canada may have a need for additional Specialized Professional Services identified in this appendix. The purpose of this appendix is to provide examples of the type of work typically expected to be completed by these specialized services, where these specialized services are not defined elsewhere in the SOW, and to identify required labour categories necessary to carry out this work.

1.2 Specialized Professional Services will be requested of the Contractor using the Task Authorization process on an as and when requested basis and may also be requested following a suggestion made by the Contractor to the project Authority using a Change Process.

2.0 Requirements

The Contractor must possess or obtain the Technical Data and the capabilities necessary to undertake and successfully complete all aspects of the services described. For all identified work, the Contractor must only use and supply parts as defined in the configuration documents for the Radar system. Any proposed substitutions must be approved by the Project Authority and will necessitate an update of the configuration and life-cycle management documentation, and all related files, by the Contractor at no cost to Canada.

2.1 Optional specialized services that may be required include, but are not limited to:

2.1.1 Technical Investigation and Engineering Support (TIES) work may be requested by the Project Authority if the equipment, infrastructure or procedures are not performing satisfactorily beyond characteristics covered directly by the Contract or warranties. The Contractor must prepare and deliver reports in accordance with the task description detailing the results of the work, including the relevant data and configuration details. The type of work may include, but is not limited to:

a. Technical investigation of equipment faults;
b. On-site inspection and related follow-up support (defect correction, modification or supervision of repairs);
c. Provide engineering recommendations and reports on equipment or system improvements and upgrades;
d. Assist in the review of technical documentation and provide recommendations for changes or improvements, including training and maintenance procedures;
e. Make amendments to technical documentation;
f. Assist in identification of spare parts and the maintenance of configuration control;
g. Inspect components held as spares by EC; and,
h. Other tasks as submitted by the Project Authority directly relating to the fitted equipment.

2.1.2 Engineering Change Proposals (ECPs) will be as a result of Project Authority generated Engineering Change Request (ECR) tasks. ECR taskings require updates that are typically issued in order to, but not limited to:

a. Correct a deficiency that is not otherwise covered by the Contract;
b. Add or modify interface or interoperability requirements;

c. Make a significant and measurable change in the operational capabilities or logistics supportability of the system or item;
d. Generate life cycle cost-savings; and,
e. Maintain the equipment availability for the life of the Radar system.

2.1.3 Software support not covered by the Contract

a. Adaptation of the Contractor's software, data format or other IT issues to improve integration with Canada's systems and software;
b. Assisting with upgrades to Contractor's software and firmware as required;
c. Integration of additional COTS software;
d. Bug fixes; and,
e. Participating in meetings with GoC representatives as required regarding software security, configuration, and operating systems to ensure appropriate interface with Canada's systems.

2.1.4 Training Services not covered by the Contract.

a. Additional training and information sessions of the type articulated in the SOW;
b. Preparation of documentation or participation in training sessions for operational forecasters; and,
c. Training sessions for third parties (non-government employees) such as; an organization contracted to provide ongoing maintenance for the Radar systems or clients of the basic radar data from the Radar systems.

2.1.5 Transition Support Services including:

a. Participating in related planning activities including the provision of plans;
b. Preparing additional related documentation such as detailed procedures;
c. Performing service walk-throughs for new service providers;
d. Performing training for new service providers;
e. Providing ad-hoc advice to new service providers;
f. Providing documentation or updates to documentation created or maintained by the Contractor to support its work activities;
g. Phasing out contractor provided services to coincide with the availability of personnel from new service providers; and,
h. Providing Transition-Support Services to support and facilitate the transition of any work provided by the Contractor.

2.1.6 Maintenance Co-ordination Services

When authorized in accordance with the Contract, the Contractor must provide on an "as and when requested" basis Maintenance Co-ordination Services, over-and-above the requirements associated with software maintenance. These services may include but are not limited to:

(a) identifying the cause of reported problems regardless of the origin of the cause of the problems;
(b) co-ordinating activities and reporting status to Project Authority;
(c) identifying and propose resolution to problems associated with any trouble report;
(d) coordinating all resources associated with all warranty, software maintenance services and ad hoc technical and engineering support services; and,

(e) ensuring that any problems are remedied in accordance with the Contract.

3.0 The Contractor must ensure clear problem ownership is maintained throughout the resolution process, with regular and timely progress updates communicated back to Canada in an effective manner. The Contractor must implement measures to avoid reoccurrence of problems.

4.0 The Contractor must provide a web address or other facility that can be accessed electronically by Canada to track the current status of change and issue management activities.

5.0 The Contractor must provide all required tools and facilities to record, track and escalate problems.

6.0 Labour Categories

Labour Category	Typical Tasks/Role
Jr. Technician	Experience Levels 3+ years of experience Responsibilities may include but are not limited to: • Assisting with installation and testing of Radar systems and infrastructure; • Participating in trouble-shooting, problem diagnosis and repair; • Performing electrician and/or electrical technician services ; and, • Performing installation and operation of test sensors and programmable data recorders used in conjunction with equipment testing.
Sr. Technician	Experience Levels 10+ years of experience Responsibilities may include but are not limited to: • Leading installation and performance testing of Radar systems and infrastructure; • Leading or participation in advanced trouble-shooting, problem diagnosis and repair; • Providing input to engineering analysis, engineering change proposals; • Drafting technical documentation, including configuration management, maintenance procedures, life-cycle management guidance; • Performing electrician and/or electrical technician services; and, • Performing installation and operation of test sensors and programmable data recorders used in conjunction with equipment testing.

Labour Category	Typical Tasks/Role
Jr. Engineer	Experience Levels 3+ years of experience Responsibilities may include but are not limited to: • conducting technical studies to produce technical options, validate and assess options, assess technical risks and evaluate designs; • assisting with the design and prototype engineering solutions to technical problems; • maintaining and updating Unsatisfactory Condition Report (UCR) and Technical Failure Report (TFR) data bases. Researching, evaluating and responding to UCR/TFRs in conjunction with field support representatives; • producing draft technical evaluation plans and evaluation standards; • generating and evaluating test plans, procedures and reports; • conducting specialized electromagnetic compatibility (EMC) studies, producing acceptable EMC standards and test procedures and evaluating EMC and electromagnetic interference (EMI) test results; • designing programmable data acquisition, test sensors and recorders used in conjunction with equipment testing; • proposing and analyzing engineering change proposals, estimating costs and risks and making recommendations; • preparing budgetary estimates for the completion of technical programs; • preparing drawings, data packages and systems manuals; • reviewing and making recommendations on work proposals; • participating in planning meetings and technical reviews relating to the design, application management and support of software sub-systems; • developing quality assurance and configuration management plans and practices; • tracking, correcting and recording system and equipment configuration status and conformance; • developing and assessing maintenance strategies, plans and support requirements; • providing equipment project management services; developing environmental protection standards, practices or policies; • conduct reviews of structural designs to ensure compliance with appropriate specifications, standards and guidelines; • perform structural engineering analyses in the area of traditional stress analysis, preliminary design, finite element analysis, damage tolerance assessments, loads derivation, structural dynamic response and fracture mechanics analysis; and, • preparing design documentation in support of structural engineering services, including draft stress reports, manufacturing drawings and design drawings.

Labour Category	Typical Tasks/Role
Sr. Engineer	Experience Levels 10+ years of experience Responsibilities may include but are not limited to: • preparing specifications for and carrying out the integration of systems and equipment; • leading technical studies to produce technical options, validate and assess options, assess technical risks and evaluate designs; • developing design and prototype engineering solutions to technical problems; • Researching, evaluating and responding to UCR/TFRs in conjunction with field support representatives; • producing draft technical evaluation plans and evaluation standards; • generating and evaluating test plans, procedures and reports; • conducting specialized EMC studies, producing acceptable EMC standards and test procedures and evaluating EMC and EMI test results; • designing programmable data acquisition, test sensors and recorders used in conjunction with equipment testing; • proposing and analyzing engineering change proposals, estimating costs and risks and making recommendations; • preparing budgetary estimates for the completion of technical programs; • preparing drawings, data packages and systems manuals; • reviewing and making recommendations on work proposals; • participating in planning meetings and technical reviews relating to the design, application management and support of software sub-systems; • developing quality assurance and configuration management plans and practices; • developing and assessing maintenance strategies, plans and support requirements; • providing equipment project management services; developing environmental protection standards, practices or policies; • conduct reviews of structural designs to ensure compliance with appropriate specifications, standards and guidelines; • perform structural engineering analyses in the area of traditional stress analysis, preliminary design, finite element analysis, damage tolerance assessments, loads derivation, structural dynamic response and/or fracture mechanics analysis; and, • preparing design documentation in support of structural engineering services, including draft stress reports, manufacturing drawings and/or design drawings.

Labour Category	Typical Tasks/Role
IT/Software Engineer	Experience Levels 5+ years of experience Responsibilities may include but are not limited to: • Prepare implementation plans for particular technologies; • Installs and monitors particular facets of technology; • Configures and optimizes technical installations; • Troubleshoots, and responds to user problems; • Maintain up to date knowledge of particular technologies and products supporting that technology; • Develop and prepare diagrammatic plans for solution of business, scientific and technical problems by means of computer systems of significant size and complexity; • Analyze the problems outlined by the systems analysts and designers in terms of such factors as style and extent of information to be transferred to and from storage units, variety of items to be processed, extent of sorting, and format of final printed results; • Select and incorporate available software programs; • Design detailed programs, flow charts, and diagrams indicating mathematical computation and sequence of machine operations necessary to copy and process data and print the results; • Translate detailed flow charts into coded machine instructions and confer with technical personnel in planning programs; • Verify accuracy and completeness of programs by preparing sample data, and testing them by means of system acceptance test runs made by operating personnel; • Correct program errors by revising instructions or altering the sequence of operations; • Test instructions, and assemble specifications, flow charts, diagrams, layouts, programming and operating instructions to document applications for later modification or reference; • Status reporting; • Establishing and maintaining source and object code libraries for a multi-platform, multi-operating system environment; • Establishing software testing procedures for unit test, integration testing and regression testing with emphasis on automating the testing procedures; • Establishing and operating "interoperability" testing procedures to ensure that the interaction and co-existence of various software elements, which are proposed to be distributed on the common infrastructure, conform to appropriate departmental standards (e.g. for performance, compatibility, etc.) and have no unforeseen detrimental effects on the shared infrastructure; and, • Establishing a validation and verification capability which assumes functional and performance compliance.

Labour Category	Typical Tasks/Role
Trainer	Experience Levels 3+ years of experience Responsibilities may include but are not limited to: • Assessing the relevant characteristics of a target audience; • Developing or adapting training materials for audience requirements; • Preparing end-users for implementation of courseware materials; • Delivering face-to-face, instructor-led courses, potentially using visual aids including computers, transparencies, videos, satellite transmissions, flip charts, wall charts, complete projection equipment and slides; • Delivering face-to-face, instructor-led courses, potentially using the tools and equipment on which the students are being trained. This could be in a class-room, lab, workshop, or field environment; • Delivering virtual classroom courses, potentially using WebEx or similar internet meeting software; • Evaluating instruction, program and process; • Communicating effectively by visual, oral and written form with individuals, small groups, and in the classroom; • Managing class time; • Prioritizing material and changing course directions to meet needs; • Identifying standards, needs, and concerns; • Trainer maybe required to be bilingual and to deliver courses in English or French.

APPENDIX G TO ANNEX A

REFERENCE DOCUMENTATION

Documents:

G1 – Sites

G2 – Current Basic Radar Training

G3 – General Environmental Conditions

G4– Example Geotechnical Survey and Engineering Climatology

Document G1 - Radar Site Data

Radar Site	Call Sign	Province	Latitude North (degrees)	Longitude West (degrees)	Site Elevation Above Mean Sea Level (metres)	Antenna Feedhorn Height Above Ground Level (metres)
Aldergrove	WUJ	BC	49.017	122.487	93	20.4
Athabaska		AB	56.557	111.389	New site. Position approximate	
Carvel	WHK	AB	53.561	114.145	784	14.1
Chipman	XNC	NB	46.222	65.699	103	23.1
Dryden	XDR	ON	49.858	92.797	412	29
Foxwarren	XFW	MB	50.549	101.086	550	14.1
Holyrood	WTP	NF&L	47.326	53.126	300	13.9
Jimmy Lake	WHN	SK	54.913	109.960	637	17.1
Lac Castor	WMB	QC	48.575	70.667	801	20
Landrienne	XLA	QC	48.551	77.808	394	26.5
Lasseter Lake	XNI	ON	48.853	89.122	488	23.1
Montreal River Harbour	WGJ	ON	47.248	84.597	520	23.1
Marion Bridge	XMB	NS	45.950	60.205	104	20.4
Prince George	XPG	BC	53.615	122.955	1117	14.1
Radisson	XRA	SK	52.521	107.444	530	14.1
Schuler	XBU	AB	50.313	110.196	864	14
Silver Star Mountain	XSS	BC	50.369	119.064	1887	26.1
Spirit River	WWW	AB	55.695	119.231	1015	29
Timmins	XTI	ON	49.281	81.794	245	22.1
Villeroy	WVY	QC	46.450	71.914	100	20.3

Document G2 – Current EC Radar Training Course outline – Example only

Basic Maintenance Course
Training Plan

Training Program Overview

Training approach

- Training is to enable the maintenance technicians to develop competence with the Radar system. At this time three levels of training are envisaged:
    - ◊ The "Intro" level will ensure that the technicians develop and understanding of basic radar theory and operation and skill required for basic measurements;
    - ◊ The "Basic" level will ensure that the technicians to develop a skill set to perform routine preventative maintenance without endangering themselves or the equipment. This does not certify the technicians as competent; and,
    - ◊ The "Advanced" level may comprise of modules covering complex troubleshooting procedures, diagnostics, and major component replacement and alignment. Modules may be grouped together into a course framework or presented as in individual basis.
- Training is based on the maintenance procedures outlined in the technical manual TM-15-02-04.
- Training must be modular in format. The starting knowledge and experience of trainees will dictate which modules are used. This basic maintenance course is designed to take a trainee from the intro course and equip them with skill set and knowledge to perform the first working level requirements for CWSR98 system preventative maintenance.
- During the course, testing will be used to determine that the trainees have acquired the necessary knowledge and skills, however, will not certify the trainee.
- Upon completion of basic or advanced course modules the trainee is expected to go back and work on the equipment under qualified supervision to gain procedural confidence and experience. After a sufficient period of experience and upon the recommendation of a supervisor, the trainee will go through competency assessment to then certify the trainee as a qualified person.

Basic Maintenance Course Objectives

- ***Safety:*** The ability to accomplish the specified maintenance tasks, in a manner safe for both the maintainer and the equipment**;**
- **Routine Preventative Maintenance Tasks:** The ability to conduct the routine preventative maintenance tasks identified in the technical manual;
- ***Quality data:*** The ability to correctly interpret their results in order to detect deviations from performance standards, as described in TM 15-02-04; and,.
- ***Troubleshooting:*** The ability to investigate performance deficiencies and seek additional support as may be required.

References

- Portions of the Technical Manual for the CWSR98 are in the process of being built. It is referred to as TM-15-02-04.

Performance Objectives

PO 200 Course Introduction

1. **Objective.** Discuss the goals and the objectives of the course. To identify the modules being applied based on the candidates knowledge and experience. To identify candidates course expectations.

Item	periods	module
Basic Course Introduction and Objectives		200.1

PO 201 Safety

1. **Objective.** Discuss safety aspects related to the CWS98 System. Identify the basic risks and hazards, when working in and around the radar site and Radar system.

Item	periods	module
General Site Safety Discussion	1L	201.1
Task hazard analysis and Safe working practice Review		201.2

PO 202 Radar System CWSR98

1. **Objective.** Discuss the main components that comprise the CWSR98 system and the Radar system variances.

Item	periods	module
System Components and Variances	1L	202.1

PO 203 System Computers

1. **Objective.** Discuss computers used with the CWS98 System and operating systems employed.

Item	periods	module
Identify the role and functions performed by the site computers.	1L	203.1
Linux operating system fundamentals	2L	203.2
Linux workshop 1	1L	203.3
Remote Access	1L	203.4

PO 204 Radar Interface Systems

1. **Objective.** Develop a working knowledge of the software and user interfaces which provide interaction and control of the Radar system..

Item	periods	module
Introduction to IRIS	1L	204.1
IRIS Client	2L	204.2
IRIS Setup	1L	204.3
IRIS Utilities	3L	204.4
Radmon3 Utility	1L,0.5P	204.5
Antplot Utility	0.5L,0.5P	204.6
IRIS Utilities Workshop	1P	204.7
System Control Switches	1L	204.8

PO 205 Unit 1 Radar Control Processor

1. **Objective.** To develop a working knowledge on the RCP02 radar control processor and to interact with the configuration.

Item	periods	module
RCP02 component introduction	1L	205.1
RCP02 internal software menu commands and configuration basics.	1L	205.2
RCP02 interaction and navigation practical exercise	1P	205.3
CWSR98 System servo functionality using the RCP02	1L	205.4

PO 206 Unit 1 Radar Video Processor

1. **Objective.** To develop a working knowledge on the RVP7 radar video processor and to interact with the configuration.

Item	periods	module
RVP7 component introduction	1L	206.1
RVP7 Internal software menu commands and configuration basics.	1L	206.2
RVP7 Interaction and navigation practical exercise	1P	206.3
RVP7 processing and Functionality	1L	206.4

PO 207 Unit 2 Radar Transceiver

1. **Objective.** To develop a working knowledge on the overall layout and components of the transceiver.

Item	periods	module
Radar Transceiver Introduction Presentation	2L	207.1
Radar Transceiver components locator session	0.5P	207.2

PO 208 Unit 3 98A Andrew Antenna

1. **Objective** Discuss the components that comprise the 98A system and interaction and control is performed in the CWSR98 System.

Item	periods	module
Introduction to the 98A antenna system and operation		208.1
Site familiarization of 98A components		208.2
Bi-monthly maintenance Activity Workshop		208.3
Hand held controller operation		208.4
Annual Maintenance Workshop		208.5

PO 209 Unit 3 98E Enterprise Antenna

1. **Objective.** Discuss the components that comprise the 98E system and interaction and control is performed in the CWSR98 System.

Item	periods	module
Introduction to the 98E antenna system and operation		209.1
Site familiarization of 98E components		209.2
Bi-monthly maintenance Activity Workshop		209.3
Motor replacement procedure workshop		209.4
Annual Maintenance Workshop		209.5

PO 210 Unit 3 98R Datron-Ratheon Antenna

1. **Objective.** Discuss the components that comprise the 98R system and interaction and control is performed in the CWSR98 System.

Item	periods	module
Introduction to the 98R antenna system and operation		210.1
Site familiarization of 98R components		210.2
Bi-monthly maintenance Activity Workshop		210.3
Annual Maintenance Workshop		210.4

PO 211 Unit 6 UPS

1. **Objective.** Provide a working knowledge of working with and around UPS systems and the maintenance activities performed.

Item	periods	module
Un-Interrupted Power Supply Introduction		211.1
Lorain UPS Site Familiarization and Maintenance		211.2
Emerson UPS Site Familiarization and Maintenance		211.3
Exide UPS Site Familiarization and Maintenance		211.4
XSI 48V UPS Site Familiarization and Maintenance		211.5

PO 212 Unit 7 APU

1. **Objective.** Provide a working knowledge of working with and around APU systems and the maintenance activities performed.

Item	periods	module
Auxiliary Power Unit System Introduction		212.1
Detroit Diesel APU Site Familiarization and Maintenance		212.2
Sommers Propane APU Site Familiarization and Maintenance		212.3
SimPower Propane APU Site Familiarization and Maintenance		212.4
XSI APU Site Familiarization and Maintenance		212.5

PO 213 Site conditions

1. **Objective.** To provide factors for consideration in assessing site conditions and site maintenance

Item	periods	module
Site conditions considerations and evaluations		213.1

PO 214 Troubleshooting

1. **Objective.** Develop an understanding of tools available to utilize when troubleshooting system problems

Item	periods	module
Introduction to Connectivity technology		214.1
Introduction to System schematics.		214.2
Schematic tracing of transmitter power control		214.3
Schematic tracing of Servo power control		214.4
Schematic tracing of system Trigger		214.5
Schematic tracing of Interlock circuits		214.6

PO 215 Technical Procedures

1. **Objective.** To become aware and capable of performing preventative maintenance scheduled tasks identified in the system technical manual.

Item	periods	module
Introduction to the technical manual		215.1
Technical procedures for Computers and pulse measurements workshop		215.2
Technical procedures for Tx functions and PID box workshop		215.3
Technical procedures for Compressor and IFD workshop		215.4
Technical procedures for Sunshot and Phase workshop		215.5
Technical procedures for IRIS Setup and Calibration workshop		215.6
Technical procedures for Pedestal Maintenance workshop		215.7
Technical procedures for UPS (combine with UPS system introduction)		215.8

workshop		
Technical procedures for APU (combine with APU system introduction) workshop		215.9
Technical procedures for Site Conditions workshop		215.10
Annual Technical procedure for Insertion loss verification workshop		215.11
Annual Technical procedure for waveguide loss workshop		215.12
Annual Technical procedure for interlock check and status verification workshop		215.13

PO 216 Network support

1. **Objective.** Develop an understanding of System support mechanism and tools used to support the entire Radar system and Radar network

Item	periods	module
National Radar Program planning, policies and procedures Introduction	1L	216.1
National Radar Information System Introduction (NRIS)	1L	216.2

PO 217 Miscellaneous items

1. **Objective.** Develop an understanding of Systems and support mechanisms that haven't been cover by other sections

Item	periods	module
Unit 5 the compressor and dehydrator	1L	217.1
HVAC systems	1L	217.2

Document G3 – General Environmental Conditions

The information in this document is for guidance only. Where more demanding standards are required by Canadian law, regulations or standards; or by recognized industry standards, the more demanding standards must be followed.

1.0 Equipment Requirements

1.1 Equipment installed outdoors must meet the Outdoor Environment conditions (table 2.1) during both operating and non-operating conditions. The non-operating condition represents the equipment's survivability limit, within which –when conditions return to the operating range- the equipment can return to operation without having sustained damage or degraded performance.

1.2 Equipment installed within the radome must meet the Inside Radome Environment conditions (table 2.2) during operating, non-operating, and maintenance activities. The "during maintenance" environmental condition must be achievable with 2 hours of activation 95% of the time. Contractor must design and install a system which will maintain the radome conditions appropriate for operation of the equipment.

1.3 Equipment installed within a shelter must meet the Indoor Environment conditions (table 2.3) during both operating and non-operating conditions. Contractor must design and install a system which will maintain the shelter conditions appropriate for operation of the equipment.

For further information, consult the appropriate documentation listed in Appendix A, section 2.2.4

2.0 Environmental Conditions

Table 2.1 - Outdoor Environment

Condition	Temperature	Humidity	Wind Speed	Snow Load	Ice Accretion
Operating	-40°C – +40°C	15 – 100% Condensing	Sustained: 170 km/h Gusts: 200km/h	Varies by location. Use local climate records.	Varies by location. Use local climate records.
Non-Operating	-60°C – +55°C	10 – 100% Condensing	Sustained: 200km/h Gusts: 250km/h	Varies by location. Use local climate records. *For reference: 2m accumulation at 350kg/m2 is not uncommon*	Varies by location. Use local climate records. *For reference: 0-10cm*

Table 2.2 - Inside Radome Environment

Condition	Temperature	Humidity
Operating	-40°C – +40°C	15 – 95% Non-condensing
Non-Operating	-60°C – +55°C	15 – 95% Non-condensing
During Maintenance Activities	+5°C – +30°C Achievable in 2 hours 95% of the time	20 – 80% Non-condensing

Table 2.3 - Indoor Environment

Condition	Temperature	Humidity
Operating	+15°C – +28°C	20 – 80% Non-condensing
Non-Operating	-35°C – +55°	15 – 95% Non-condensing

Note: Insects, dust, pollen, mice, birds and other particulate matter and wildlife are considerations at most sites. Design and materials must mitigate against disruption to operations and site safety.

Document G4 – Example Geotechnical Survey and Engineering Climatology

Terraprobe

Consulting Geotechnical & Environmental Engineering
Construction Materials Engineering, Inspection & Testing

September 1, 1998

Our ref: 983105
Stoney Creek Office

Public Works and Government Services Canada
Western Region
1100 - 9700 Jasper Ave.
EDMONTON, Alberta
T5J 4E2

Attention: Mr. R. S. Dagg,
Senior Property Agent
Real Estate Advisory Services

RE: GEOTECHNICAL INVESTIGATION
ENVIRONMENT CANADA STATION
EXETER, ONTARIO

Dear Sir:

This report presents the results of a geotechnical investigation carried out at the above site. The location of the site is shown on the Key Plan, Figure 1.

A request for proposal and the terms of reference for the assignment were outlined in a memorandum from Public Works and Government Services Canada (PWGSC) dated August 18, 1998. A proposal and cost estimate for carrying out the specified program of investigation were detailed in our letter of August 19, 1998. Formal authorization to proceed with the investigation was provided by way of Consultant Agreement No. 6300353 dated September 10, 1998.

The purpose of the work was to investigate and report on the subsurface soil and groundwater conditions in two, ten metre deep boreholes. Based on the results of the boreholes, a discussion was to be provided addressing the geotechnical engineering aspects to be considered in the design of foundations for the proposed Doppler Weather Radar Tower.

Terraprobe

Consulting Geotechnical & Environmental Engineering
Construction Materials Engineering, Inspection & Testing

GEOTECHNICAL INVESTIGATION
ENVIRONMENT CANADA STATION
EXETER, ONTARIO

PREPARED FOR: **Public Works and Government Services Canada**
Western Region
1100 - 9700 Jasper Ave.,
EDMONTON, Alberta
T5J 4E2

DISTRIBUTION:

3 copies	Public Works and Government Services Canada	Our Ref. 983105
1 copy	**Terraprobe Limited**	October 20, 1998

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903 Barton Street, Unit 22
Stoney Creek, Ontario L8E 5P5
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1-800-465-2066

www.terraprobe.on.ca

It should be noted that this report addresses only the geotechnical aspects of the subsurface conditions at the site. The presence of subsurface contamination resulting from previous activities or uses of the site, or from off-site sources are outside the scope of this report and have not been investigated. No analyses with respect to soil or groundwater quality have been carried out as part of this investigation.

1. PROCEDURE

The field work for this investigation was carried out on September 18, 1998, at which time two boreholes, numbered 1 and 2 were drilled at the locations shown on Location Plan, Figure 2. The boreholes were drilled using a truck mounted drill rig supplied and operated by a specialist drilling contractor. The boreholes were advanced using hollow stem continuous flight augers. Standard penetration testing and sampling was carried out at regular intervals of depth using conventional 50mm outside diameter spoon sampling equipment. After the drilling, sampling, and logging was completed, the boreholes were backfilled with drill cuttings.

The field work was continuously supervised by an experienced technician from our office who also; located the boreholes, logged the boreholes, determined ground surface elevations at the borehole locations and cared for the samples recovered. The soil samples recovered in the course of the field work were taken to our Stoney Creek office for further examination, water content determinations, and selective classification testing. In addition two soil samples were submitted to Philip Services laboratories for analysis of soil pH and water soluble sulphate, to assess the potential for sulphate attack on the subsurface concrete.

The ground surface elevations at the borehole locations have been determined relative to a site bench mark provided by PWGSC. The bench mark is described as being on the top of a square iron bar located at the northeast corner of the corner of the subject property. The elevation of this point is understood to be 200.00m, referred to local datum.

2. SUBSURFACE CONDITIONS

2.1 General

The subsurface soil and groundwater conditions encountered in the boreholes are presented on the attached Log of Borehole sheets. The stratigraphic boundaries indicated on the logs of boreholes typically represent a transition from one soil type to another and should not be interpreted to represent exact planes of geological change. The subsurface conditions are confirmed at the borehole locations only, and will vary between and beyond the borehole locations. The following discussion has been simplified in terms of the major soil strata for the purposes of geotechnical design.

The boreholes encountered surface fill underlain by as stratum of stiff to hard silty clay till. Both boreholes were terminated in strata of inter-layered silty clay and silt.

Fill

A surface layer of sand and gravel fill was penetrated in both boreholes. The sand and gravel fill was in a loose to compact state of packing with N values, as determined in the standard penetration testing, of 9 and 13 blows per 0.3m. The sand and gravel fill was fully penetrated at depths of about 0.5 to 1m below the existing ground surface. The sand and gravel fill in borehole 2 was underlain by a layer of clayey silt fill. A single N value of 6 blows per 0.3m was determined in the clayey silt fill. The sample of clayey silt fill recovered from the standard penetration testing had an in-situ water content of about 28 percent.

Silty Clay Till

Both boreholes encountered an extensive deposit of silty clay till. N values of 12 to 36 blows per 0.3m were measured in the silty clay till, inferring a stiff to hard consistency. The natural water content of the silty clay till ranged from about 11 to 19 percent. The silty clay till had liquid and plastic limits of 31 and 16 percent respectively, based on a single Atterberg Limit determination. A grain size distribution curve for a sample of silty clay till is shown on Figure 3. Based on observations of auger resistance, cobbles and possibly boulders were encountered within the till deposit.

The results of analyses of two samples of the silty clay till for pH and water soluble sulphate are detailed in the enclosed Appendix A. A soil pH in the range of about 8.2 to 8.3 and a water soluble sulphate content of about 0.002 percent have been indicated for the two samples of silty clay till tested.

Silt and Silty Clay

The boreholes were terminated in strata of inter-layered silt and silty clay. The N values of 18 and 60 blows per 0.3m were measured in the inter-layered silt and silty clay. The natural water content of the inter-layered silt and silty clay was about 21 percent.

Groundwater Conditions

Borehole 1 was dry upon completion to elevation 191.4m or to a depth of about 9.6m. The water level in the completed borehole 2 was at depth of about 9.5m or at about elevation 191.8m. These conditions should not be interpreted as stabilized groundwater conditions. The groundwater levels will also vary due to seasonal effects and precipitation conditions.

3. DISCUSSION

3.1 General

This section of the report provides our interpretation of the factual data obtained during this investigation and is intended for design purposes only. Comments made with respect to the construction aspects are only provided in as much as they may impact on design considerations. Contractors bidding on or undertaking these works should review the factual information, satisfy themselves as to the adequacy of the information, and make their own interpretation of the data as it affects their construction techniques, equipment selection, scheduling, and the like.

3.2 Foundations

It is understood that the usual design for the Doppler Weather Radar Tower foundations consists of a series of drilled caissons. It is understood that the caissons are intended to support the foundation loads and to provide resistance to uplift forces. Based on the results of the boreholes, this type of

foundation system is considered feasible for the site.

The axial load bearing capacity of a caisson socketed at least one diameter into the very stiff to hard silty clay till may be computed using the end bearing area and an allowable bearing pressure of 300 kPa. Uplift forces on the caissons will be resisted by the skin friction between the shaft surface and the surrounding silty clay till. For design purposes, the uplift capacity of an individual caisson may be calculated assuming a skin friction of 80kPa for the portion of the shaft within the silty clay till and below the depth of frost penetration which can be taken as 1.2m.

The caissons should have a minimum diameter of 750mm and should be provided with temporary steel liners suitable to carry out "down the hole " inspection of the bearing stratum and removal of softened or disturbed soil and any accumulated water from the bearing surface prior to pouring concrete. Plastic concrete should be placed within the liner, and the liner withdrawn in such a manner that a sufficient head of concrete is maintained to minimize groundwater seepage and soil ingress into the drilled hole. The concrete should be placed immediately after inspection and removal of any softened or disturbed material and any accumulated water.

The results of analyses carried out on two samples of the silty clay till have indicated that the subsurface environment is not particularly aggressive to Portland cement concrete with respect to sulphate attack. On this basis, Type 10 cement would be considered acceptable for underground concrete at the site. Criteria for the design of concrete mixes for various classes of exposure are provided in CSA standard A23.1-94, Table 10 and section 15.5.

4. CLOSURE

It is recommended that the geotechnical engineering aspects of the foundation design be reviewed by the geotechnical engineer at the final design stage. The adequacy of the bearing strata should be confirmed by this office during construction.

We trust that this report is satisfactory for your present requirements. If there is any point which requires further clarification please contact the undersigned. Thank you for retaining **Terraprobe** for this assignment.

Yours Truly,

Terraprobe Limited

REGISTERED PROFESSIONAL ENGINEER
J. G. MUCKLE
PROVINCE OF ONTARIO

J. G. Muckle, P.Eng., Associate

Sampling Method	Penetration Resistance
SS - split spoon ST - shelby tube AS - auger sample RC - rock core	Standard Penetration Resistance ('N' values) is defined as the number of blows by a hammer of 63.5kg. mass (140 lbs.) falling freely for a distance of 0.76m (30 inches) required to advance a standard 50mm (2 inch) diameter split spoon sampler for a distance of 0.3m (12 inches). Dynamic Cone Penetration Resistance is defined as the number of blows By a hammer of 63.5 kg. mass (140 lbs.) falling freely for a distance of 0.76m (30 inches) required to advance a conical steel point of 50mm diameter and with 60 degree sides on 'A' size drill rods for a distance of 0.3m (12 inches).

Soil Description

Cohesionless Soils

Relative Density	'N' Value
very loose	<4
loose	4 - 10
compact	10 - 30
dense	30 - 50
very dense	>50

Cohesive Soils

Consistency	Undrained Shear Strength (kPa)	'N'
very soft	<12	<2
soft	12 - 15	2 - 4
firm	25 - 50	4 - 8
stiff	50 - 100	8 - 15
very stiff	100 - 200	15 - 30
hard	>200	>30

Soil Composition	% By Weight
'trace' (eg. trace silt)	<10
'some' (eg. some gravel)	10-20
'adjective' (eg. sandy)	20-35
'and' (e.g. sand and gravel)	35-50

General Information

The recommendations provided in this report are based on the factual information obtained from the boreholes and on the general information provided for the proposed project.
Site investigations by means of boreholes and/or test pit identifies subsurface conditions at the location and time of sampling only. Ground conditions at locations away from the boreholes and test pits may vary.
Recommendations are made by interpretation of this factual data for specific conditions such as size, configuration and location of the proposed project. Changes in project conditions should be reviewed by the Geotechnical consultant as they may affect the recommendations provided.
In order to identify possible changes in ground conditions between the sample locations and their effect on the project, it is recommended that site inspections be carried out during construction by qualified Geotechnical personnel.

Terraprobe

LOG OF BOREHOLE 1

PROJECT No: 983105
CLIENT: Public Works & Government Services Canda
LOCATION: See Figure 2

BORING DATE: September 18, 1998
ELEVATION DATUM: Assumed 200.00m
SAMPLER HAMMER, 63.5kg; DROP, 760mm

BORING METHOD: 60mm Inside Diameter - Hollow Stem Auger

DEPTH SCALE IN METRES

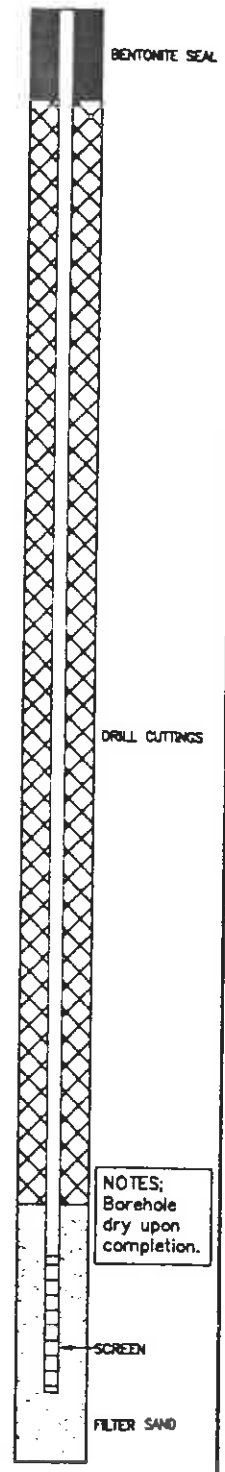
SOIL PROFILE: DESCRIPTION	ELEV. / DEPTH (m)	SAMPLES: NUMBER	TYPE	"N" VALUE
GROUND SURFACE	201.04 / 0.00			
Compact, brown, SAND & GRAVEL (FILL)		1	SS	13
Stiff, dark brown, SILTY CLAY; trace topsoil.	200.04 / 1.00	2	SS	14
	199.54 / 1.50	3	SS	23
		4	SS	21
		5	SS	29
Stiff to hard, brown, SILTY CLAY; trace sand, trace to some gravel. (TILL)		6	SS	20
80mm thick gravel layer at about elevation 194.90m.		7	SS	12
		8	SS	34
Very stiff, brown, interlayered SILTY CLAY and SILT.	192.44 / 8.60	9	SS	18
END OF BOREHOLE	191.44 / 9.60			

STRATA PLOT

PENETRATION RESISTANCE PLOT — SHEAR STRENGTH kPa: 20 40 60 80

WATER CONTENT (%): 10 20 30

INSTALLATION INFORMATION



983105-1.dwg

SHEET 1 OF 1

Terraprobe

LOG OF BOREHOLE 2

PROJECT No: 983105
CLIENT: Public Works & Government Services Canda
LOCATION: See Figure 2

BORING DATE: September 18, 1998
ELEVATION DATUM: Assumed 200.00m
SAMPLER HAMMER, 63.5kg; DROP, 760mm

BORING METHOD: 60mm Inside Diameter – Hollow Stem Auger

DEPTH SCALE IN METRES	DESCRIPTION	ELEV. / DEPTH (m)	NUMBER	TYPE	"N" VALUE
0	GROUND SURFACE	201.00 / 0.00			
	Loose, brown, SAND & GRAVEL. (FILL)	200.45 / 0.55	1	SS	9
1	Firm, brown, CLAYEY SILT; trace topsoil, trace gravel. (FILL)	199.85 / 1.15	2	SS	6
2	Very stiff to hard, brown, SILTY CLAY; trace sand, occasional gravel, cobbles. (TILL)		3	SS	21
			4	SS	36
3			5	SS	26
4			6	SS	20
5			7	SS	18
6			8	SS	21
7					
8			9	SS	22
		192.40 / 8.60			
9	Hard, brown, Interlayered SILTY CLAY and SILT.		10	SS	60
	END OF BOREHOLE	191.40 / 9.60			

SOIL PROFILE: STRATA PLOT

SAMPLES

PENETRATION RESISTANCE PLOT: 20 40 60 80

SHEAR STRENGTH kPa: 20 40 60 80

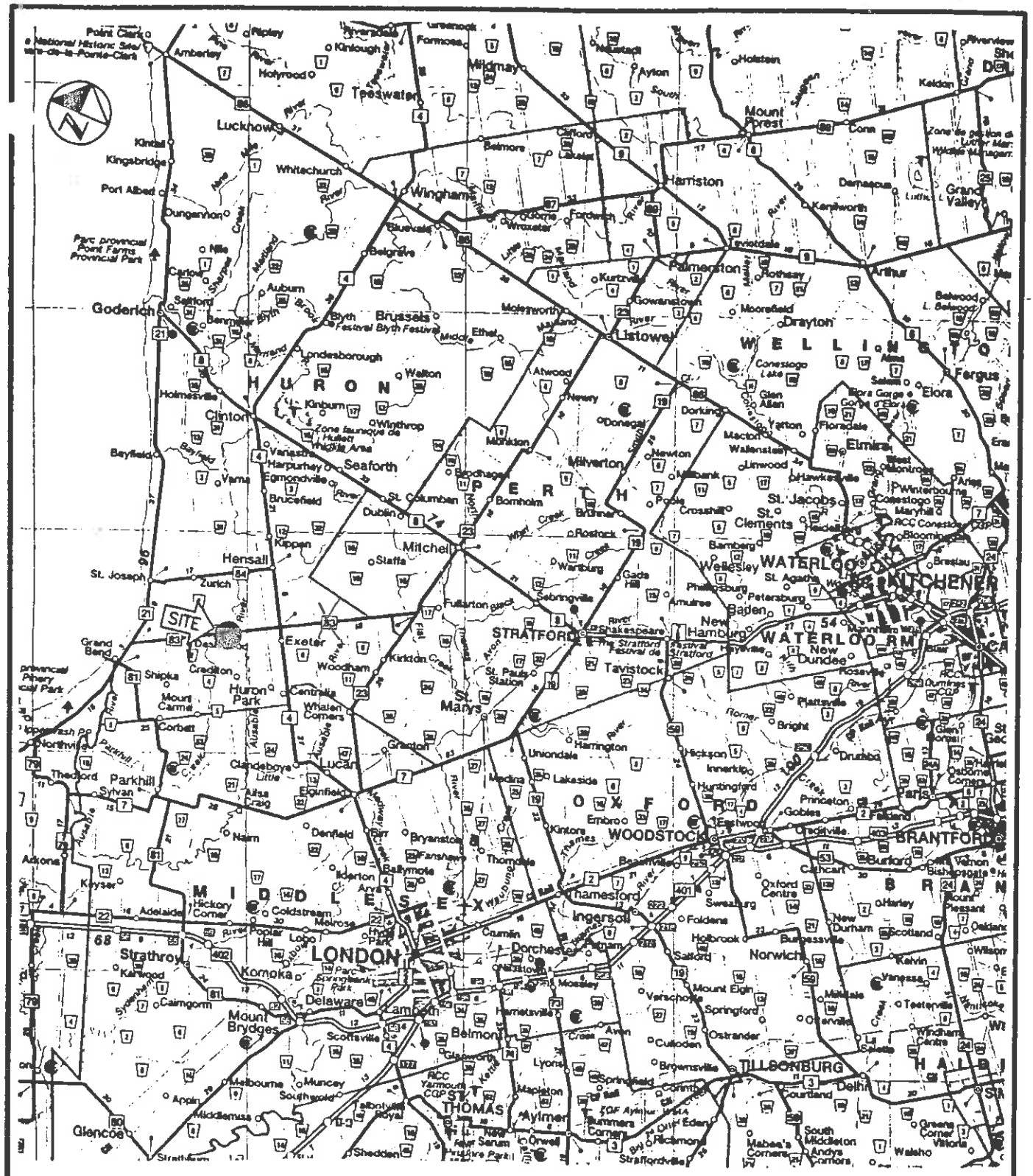
WATER CONTENT (%): 10 20 30

INSTALLATION INFORMATION

NOTES:
Water level in open borehole at elevation 191.76m after drilling.

SHEET 1 OF 1

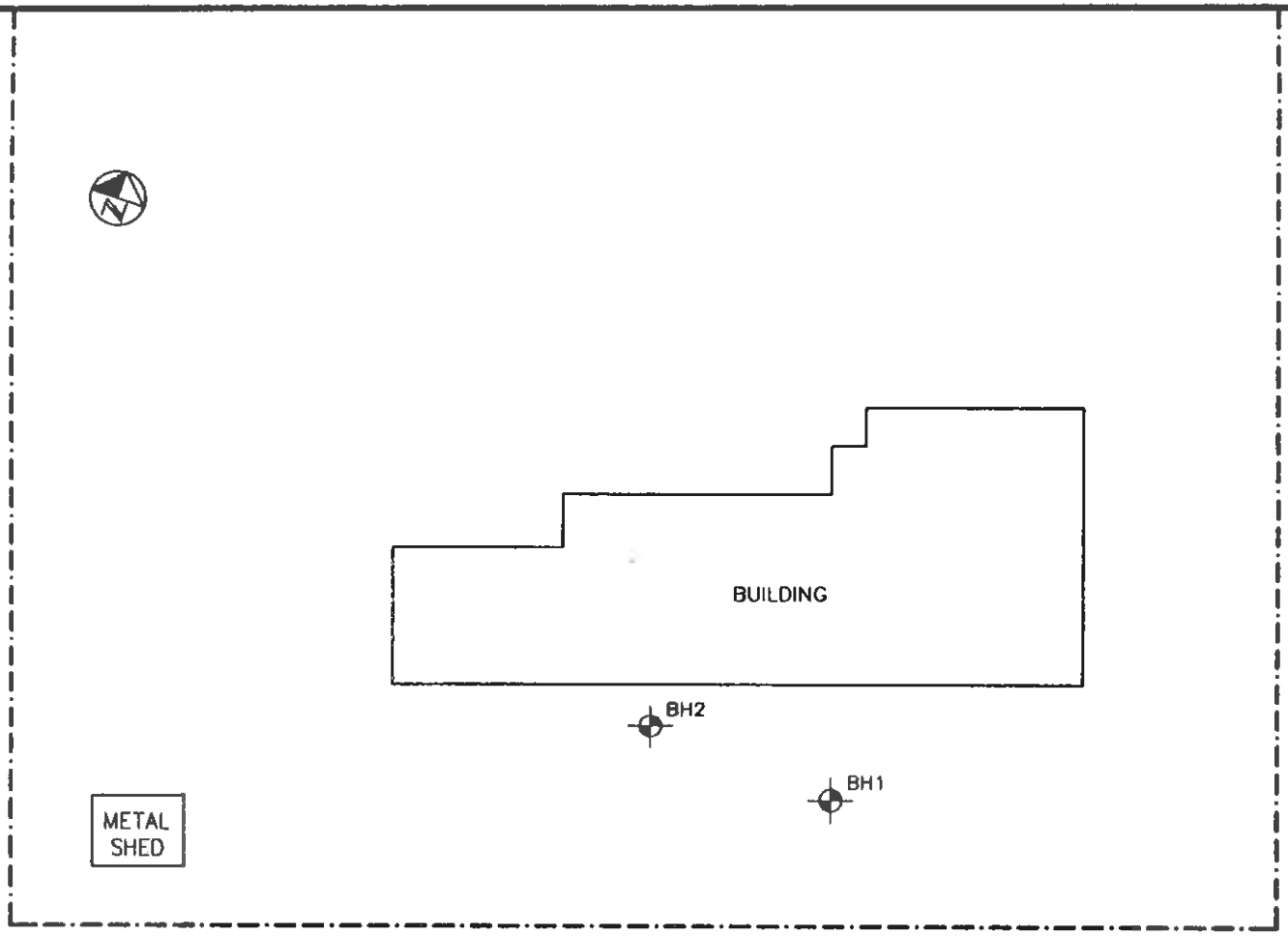
983105-2.dwg



KEY PLAN
EXETER, ONTARIO

Terraprobe

Job no.: 983105	FIGURE 1
Scale: N.T.S.	
Date: Ocober, 1998	



LEGEND:
BH1 location of borehole
property line

NOTES:
all locations and scales are approximate.

LOCATION PLAN
EXETER, ONTARIO

Terraprobe

Job no.: 983105	FIGURE 2
Scale: N.T.S.	
Date: October; 1998	

Marble Mountain, NL 35m Tower

Site Specific 10-yr. Hourly Wind Pressure Documentation Sheet

Site Information:

Name: Marble Mountain, NL
Latitude: 48° 55' 49" N
Longitude: 57° 50' 3" W
Tower Height (m): 35
Elevation MSL (m): 540

UTM Coordinates:

Zone: 21
Easting (m): 438902
Northing (m): 5420040

Results:

Q_e (Pa): 460
Uncertainty of Q_e: [20%, -25%]
Q_{nbc} (Pa): 430
Icing: As per CAN/CSA S37-13
Return Period: **10**

Wind Pressure Formula (for z in metres and result in Pa):

$$Q_h = 0.12919 \{[1 + 0.2389\, e^{(-0.0126\, z)}]\, 50.01\}^2 \;\; (z/10)^{0.2}$$

Profile Formula General Form:

$$Q_h = 0.12919 \{[a_1\, e^{(-a2\, z)} + a_3 \ln(z/z_h) / \ln(z/z_{01})]\, v_{01}\}^2 \;\; (z/10)^{0.2}$$

Site Values of Coefficients:

$$a_1 = 0.2389,\;\; a_2 = 0.0126,\;\; a_3 = 1.0000,\; z_h = 0.3500,\;\; z_{01} = 0.3500,\;\; v_{01} = 50.01 \text{ mph}$$

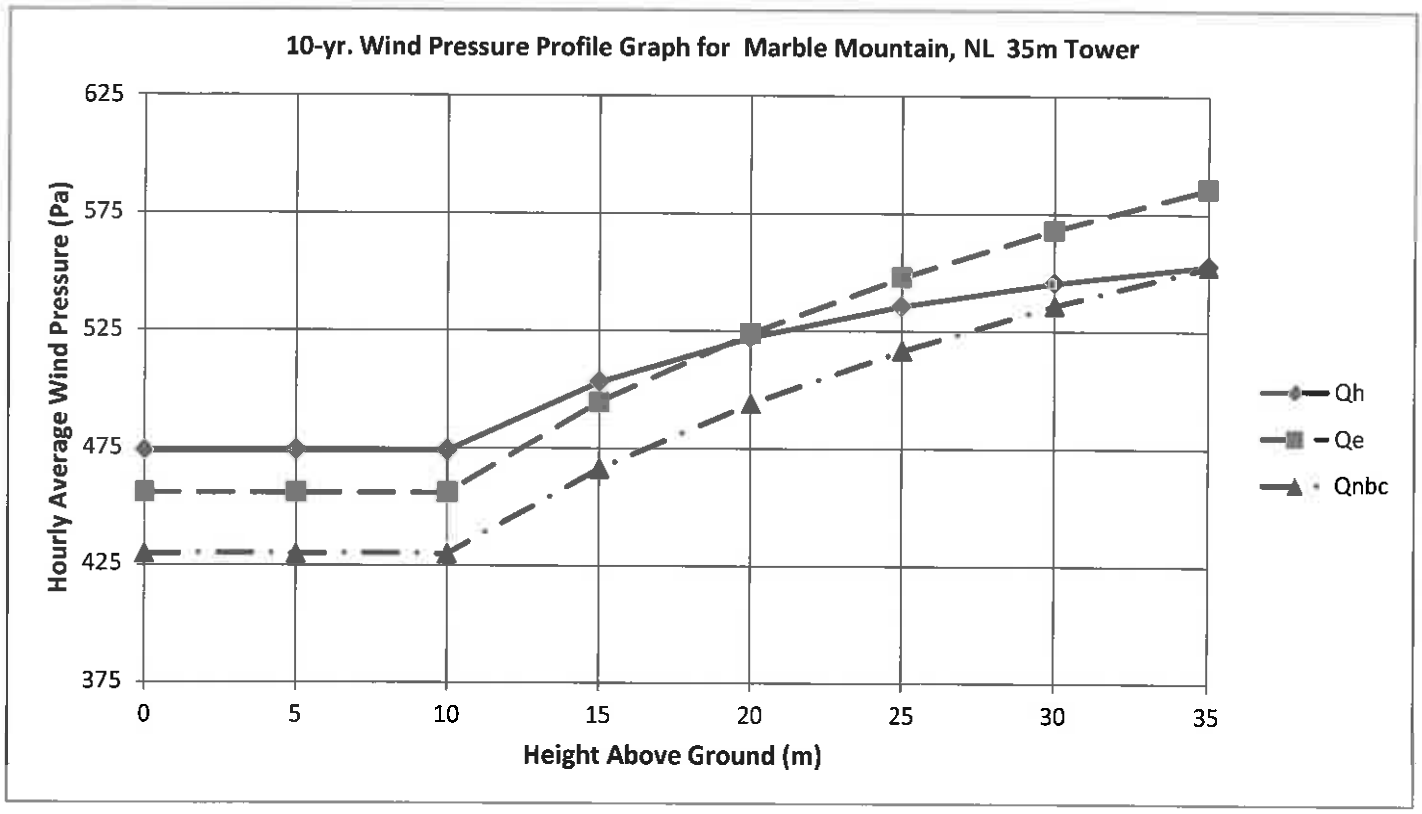
Definitions

Tower Height: Height of the tower from ground level at the base of the tower to the top of the structure.
Q_e: "Site Specific Equivalent Wind Pressure at 10 m" => the wind pressure which, when using the 2/10 power law yields the same average wind pressure over the height of the tower as the Wind Pressure Profile Formula.
Q_{nbc}: Regionally representative reference wind pressure at 10 m in the format of the National Building Code of Canada. As per the November 17, 1988 meeting of the CSA Antenna Tower Technical Committee, the Q_{nbc} value profiled with the 2/10 power law should comprise the minimum hourly average wind pressure at all heights above ground.
Wind Pressure Profile Formula: Formula for the design wind pressure as a function of height.
Height: the vertical distance (m) above ground level at the base of the tower.

Notes:

n.b. No wind pressure value less than 90% of the value at 10 m should be used for heights less than 10 m a.g.l.

These wind pressures were evaluated using a version of the methods described by Taylor and Lee (1984) "Simple Guidelines for Estimating Wind Speed Variations Due to Small Scale Topographic Features", Climatological Bulletin 18 2, using the Boyd (1969) analysis of thirty year return period wind speeds (which is also used for the National Building Code of Canada), modified by a technique described by Wieringa (1980) "Representativeness of Wind Observations at Airports" Bulletin of the American Meteorological Society, 61 9, as input data. The uncertainty in NBCC regionally representative reference wind pressures is about [+15%,-15%].



Qe profile = Qe (the site-specific equivalent reference wind pressure) with the 2/10 power law profile.

Qh = site specific wind pressure directly from Taylor and Lee (1984) simple guidelines.

Qnbc profile = regionally representative wind pressure in the National Building Code format with the 2/10 power law profile

Marble Mountain, NL 35m Tower

Site Specific 30-yr. Hourly Wind Pressure Documentation Sheet

Site Information:

Name: Marble Mountain, NL
Latitude: 48° 55' 49" N
Longitude: 57° 50' 3" W
Tower Height (m): 35
Elevation MSL (m): 540

UTM Coordinates:

Zone: 21
Easting (m): 438902
Northing (m): 5420040

Results:

Q_e (Pa): 550
Uncertainty of Q_e: [20%, -25%]
Q_{nbc} (Pa): 510
Icing: As per CAN/CSA S37-13
Return Period: **30**

Wind Pressure Formula (for z in metres and result in Pa):

$$Q_h = 0.12919 \{[1 + 0.2389\, e^{(-0.0126\, z)}]\, 54.74\}^2 \;\; (z/10)^{0.2}$$

Profile Formula General Form:

$$Q_h = 0.12919 \{[a_1\, e^{(-a2\, z)} + a_3\, \ln(z/z_h) / \ln(z/z_{01})]\, v_{01}\}^2 \;\; (z/10)^{0.2}$$

Site Values of Coefficients:

$$a_1 = 0.2389,\;\; a_2 = 0.0126,\;\; a_3 = 1.0000,\; z_h = 0.3500,\;\; z_{01} = 0.3500,\;\; v_{01} = 54.74\ mph$$

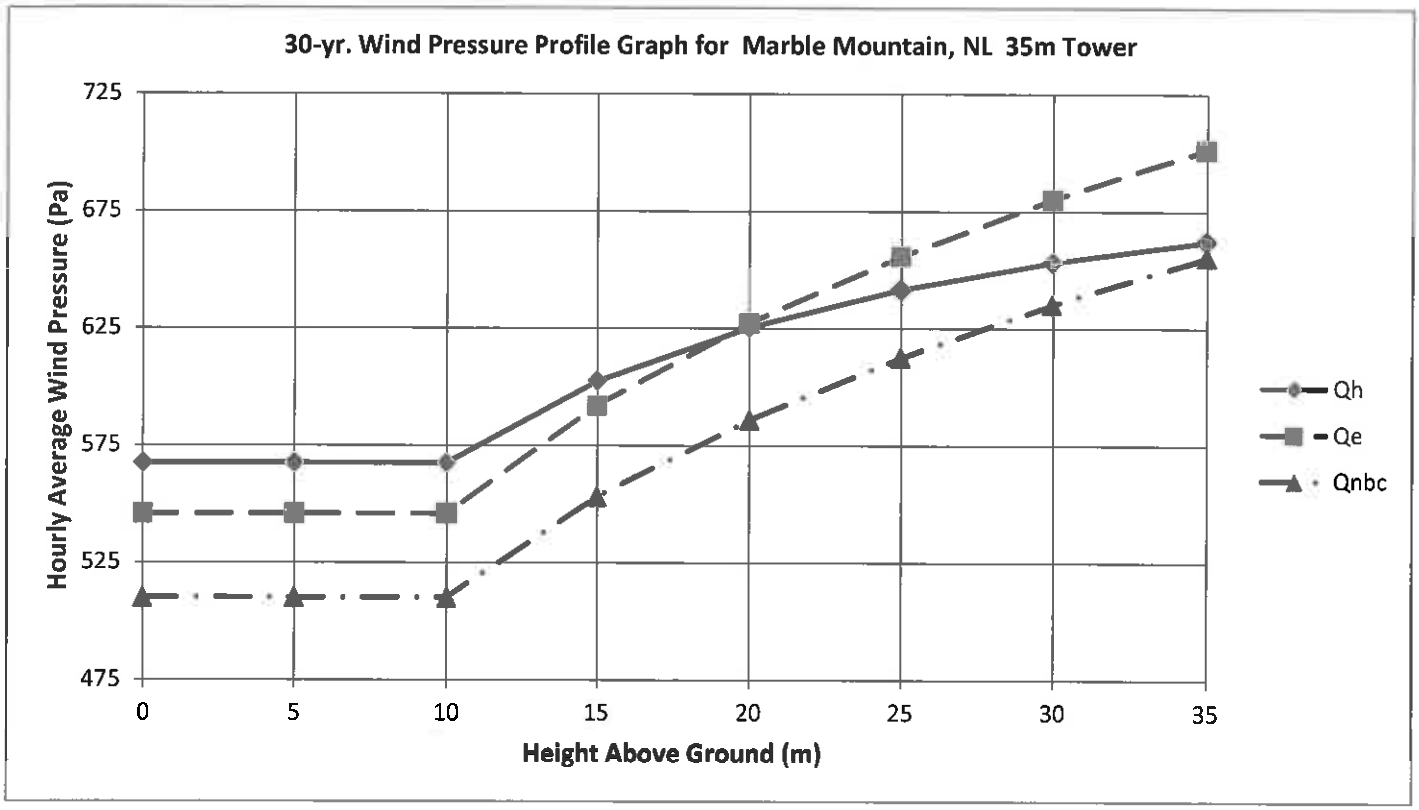
Definitions

Tower Height: Height of the tower from ground level at the base of the tower to the top of the structure.
Q_e: "Site Specific Equivalent Wind Pressure at 10 m" => the wind pressure which, when using the 2/10 power law yields the same average wind pressure over the height of the tower as the Wind Pressure Profile Formula.
Q_{nbc}: Regionally representative reference wind pressure at 10 m in the format of the National Building Code of Canada. As per the November 17, 1988 meeting of the CSA Antenna Tower Technical Committee, the Q_{nbc} value profiled with the 2/10 power law should comprise the minimum hourly average wind pressure at all heights above ground.
Wind Pressure Profile Formula: Formula for the design wind pressure as a function of height.
Height: the vertical distance (m) above ground level at the base of the tower.

Notes:

n.b. No wind pressure value less than 90% of the value at 10 m should be used for heights less than 10 m a.g.l.

These wind pressures were evaluated using a version of the methods described by Taylor and Lee (1984) "Simple Guidelines for Estimating Wind Speed Variations Due to Small Scale Topographic Features", Climatological Bulletin 18 2, using the Boyd (1969) analysis of thirty year return period wind speeds (which is also used for the National Building Code of Canada), modified by a technique described by Wieringa (1980) "Representativeness of Wind Observations at Airports" Bulletin of the American Meteorological Society, 61 9, as input data. The uncertainty in NBCC regionally representative reference wind pressures is about [+15%,-15%].



Qe profile = Qe (the site-specific equivalent reference wind pressure) with the 2/10 power law profile.

Qh = site specific wind pressure directly from Taylor and Lee (1984) simple guidelines.

Qnbc profile = regionally representative wind pressure in the National Building Code format with the 2/10 power law profile

Marble Mountain, NL 35m Tower

Site Specific 50-yr. Hourly Wind Pressure Documentation Sheet

Site Information:

Name: Marble Mountain, NL
Latitude: 48° 55' 49" N
Longitude: 57° 50' 3" W
Tower Height (m): 35
Elevation MSL (m): 540

UTM Coordinates:

Zone: 21
Easting (m): 438902
Northing (m): 5420040

Results:

Q_e (Pa): 590
Uncertainty of Q_e: [20%, -25%]
Q_{nbc} (Pa): 550
Icing: As per CAN/CSA S37-13
Return Period: **50**

Wind Pressure Formula (for z in metres and result in Pa):

$$Q_h = 0.12919 \{[1 + 0.2389\, e^{(-0.0126\, z)}]\, 56.90\}^2 \quad (z/10)^{0.2}$$

Profile Formula General Form:

$$Q_h = 0.12919 \{[a_1\, e^{(-a2\, z)} + a_3 \ln(z/z_h) / \ln(z/z_{01})]\, v_{01}\}^2 \quad (z/10)^{0.2}$$

Site Values of Coefficients:

$$a_1 = 0.2389,\ a_2 = 0.0126,\ a_3 = 1.0000,\ z_h = 0.3500,\ z_{01} = 0.3500,\ v_{01} = 56.90 \text{ mph}$$

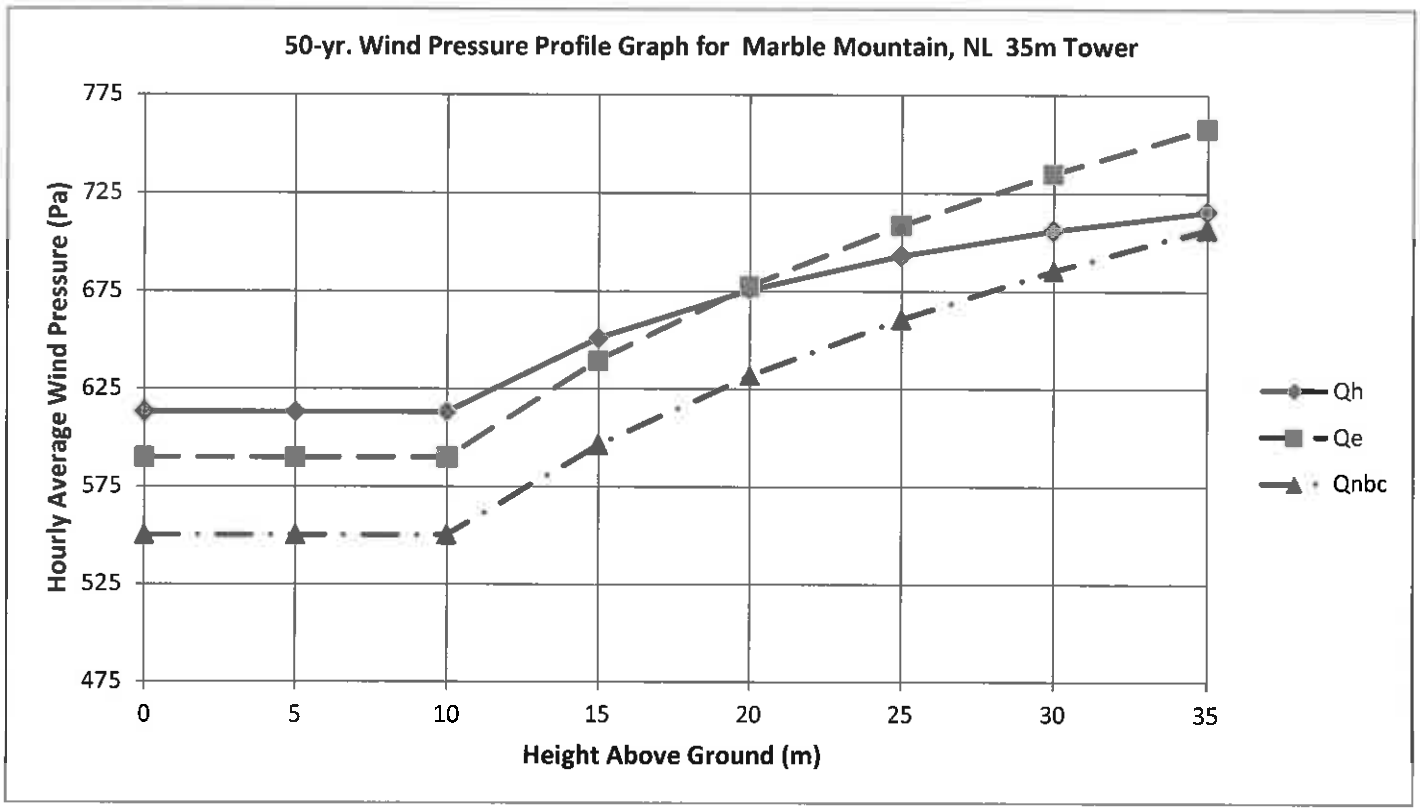
Definitions

Tower Height: Height of the tower from ground level at the base of the tower to the top of the structure.
Q_e: "Site Specific Equivalent Wind Pressure at 10 m" => the wind pressure which, when using the 2/10 power law yields the same average wind pressure over the height of the tower as the Wind Pressure Profile Formula.
Q_{nbc}: Regionally representative reference wind pressure at 10 m in the format of the National Building Code of Canada. As per the November 17, 1988 meeting of the CSA Antenna Tower Technical Committee, the Q_{nbc} value profiled with the 2/10 power law should comprise the minimum hourly average wind pressure at all heights above ground.
Wind Pressure Profile Formula: Formula for the design wind pressure as a function of height.
Height: the vertical distance (m) above ground level at the base of the tower.

Notes:

n.b. No wind pressure value less than 90% of the value at 10 m should be used for heights less than 10 m a.g.l.

These wind pressures were evaluated using a version of the methods described by Taylor and Lee (1984) "Simple Guidelines for Estimating Wind Speed Variations Due to Small Scale Topographic Features", Climatological Bulletin 18 2, using the Boyd (1969) analysis of thirty year return period wind speeds (which is also used for the National Building Code of Canada), modified by a technique described by Wieringa (1980) "Representativeness of Wind Observations at Airports" Bulletin of the American Meteorological Society, 61 9, as input data. The uncertainty in NBCC regionally representative reference wind pressures is about [+15%,-15%].



Qe profile = Qe (the site-specific equivalent reference wind pressure) with the 2/10 power law profile.

Qh = site specific wind pressure directly from Taylor and Lee (1984) simple guidelines.

Qnbc profile = regionally representative wind pressure in the National Building Code format with the 2/10 power law profile

ANNEX B:
PRICING SCHEDULE

FOR

CANADIAN WEATHER RADAR REPLACMENT SOLUTION (CWRRS)

FOR

ENVIRONMENT CANADA

Note to Bidders: The cost in Pricing Schedule will be finalized based on inputs of Attachment 4 - Bidder's Pricing Table from the winning bid. Pricing Schedule will then form part of any resulting Contract.

Part 1: Firm Deliverables

1.1 The firm deliverables include the supply, delivery and installation of CWRRS as per the specifications outlined in Annex A - Statement of Work and the Contractor's bid.

1.2 The Contractor will be paid the firm price in accordance with the Part 2: Milestone Payment Schedule.

Table 1 – Radar System

Item	Description	Quantity	Firm Unit Price	Extended Firm Price (Quantity x Firm Unit Price)
1	For the supply, delivery and installation of Radar System as described in Appendix A of Annex A – Statement of Work.	20	$	$

Table 2 – Radar Infrastructure and Construction – Task Authorization

Item	Description	Quantity	Unit Ceiling Price	Extended Ceiling Price (Quantity x Unit Ceiling Price)
1	For the completion and acceptance of Infrastructure and Construction deliverables for the radar site as described in Appendix B and Appendix G of Annex A – Statement of Work.	20	$	$

Table 3 – Project Management Services

Item	Description	Quantity	Firm Lot Price
1	For the completion and acceptance of Project Management deliverables as described in Appendix C of Annex A – Statement of Work	1	$

Table 4 – Training

Item	Description	Quantity	Firm Lot Price
1	For the delivery of training services as described in Appendix D of Annex A – Statement of Work.	1	$

Table 5 – Document Deliverables

Item	Description	Quantity	Firm Lot Price

Item	Description	Quantity	Firm Lot Price
1	For the completion and acceptance of Document Deliverables as described in Appendix E of Annex A – Statement of Work	1	$

Part 2: Milestone Payment Schedule for Firm Deliverables

Table 1 – Milestone Payment Schedule

Item	Description			% of Contract Value	Maximum Contractor Fee
1	**Milestone 1 – Transition-In Phase: Acceptance of Implementation Plan**			**2%**	$_____ CAD
	Description	***Reference to Contract***	***Allocated Contract Value***		
	• Acceptance of preliminary Implementation Plan required in the initial kick-off meeting	Appendix C of Annex A - SOW	1%		
	• Acceptance of final Implementation Plan and final system and infrastructure design and approvals	Appendix C of Annex A - SOW	1%		
2	**Milestone 2 – Operational Implementation Phase: Acceptance of the First Weather Radar System and infrastructure delivery including all associated deliverables described in Annex A – SOW**			**15%**	$_____ CAD
	Description	***Reference to Contract***	***Allocated Contract Value***		
	• Acceptance of Infrastructure and construction deliverables and supply, delivery and installation of first Weather Radar System	Appendix A and B of Annex A - SOW	10%		
	• Successfully pass the Technical Performance Test at TRL of 8 and approved by Project Authority	Appendix A of Annex A - SOW	3%		
	• Acceptance of training and project management deliverables and successful transfer the ownership of radar system to Canada upon approval by Project Authority	Appendix A, C, D and E of Annex A - SOW	2%		
3	**Milestone 3 – Operational Implementation Phase : Acceptance of the Second Weather Radar System and infrastructure delivery including all associated deliverables described in Annex A – Statement of Work (SOW)**			**13%**	$_____ CAD
	Description	***Reference to Contract***	***Allocated Contract Value***		

	• Acceptance of infrastructure and construction deliverables and supply, delivery and installation of Second Weather Radar System	Appendix A and B of Annex A - SOW	8%		
	• Successfully pass the Technical Performance Test at TRL of 8 and approved by Project Authority	Appendix A of Annex A - SOW	3%		
	• Acceptance of training and project management deliverables and successful transfer of the responsibility for the radar system to GoC upon approval by Project Authority	Appendix A, C, D and E of Annex A - SOW	2%		
4	**Milestone 4 – Operational Implementation Phase : Acceptance of the 18 radar systems and infrastructure deliveries including all associated deliverables described in Annex A – Statement of Work (SOW)**			**60%**	$_____ CAD
	• Acceptance of Infrastructure and construction deliverables and supply, delivery and installation of 3rd to 10th Radar System; Successfully pass the Technical Performance Test at TRL of 9 (TRL 8 if less than 30 months into contract period) and Acceptance of training and project management deliverables and successful transfer the responsibility for the radar system to GoC upon approval by Project Authority. • Note: The delivery of above goods and services will be paid 3% of the Contract Value for each Radar system.	Appendix A, B, C, D and E of Annex A - SOW	24%		
	• Acceptance of mid-project review deliverables.	Appendix C of Annex A - SOW	6%		
	• Acceptance of Infrastructure and construction deliverables and supply, delivery and installation of 11th to 20th Radar System; Successfully pass the Technical Performance Test at TRL of 9 and Acceptance of training and project management deliverables and successful transfer the responsibility for the radar system to GoC upon approval by Project Authority. • **Note: The delivery of above goods/services will be paid 3% of the Contract Value for each Radar system.**	Appendix A, B, C, D and E of Annex A - SOW	30%		

5	**Milestone 5 – Transition-Out Phase: Acceptance of transition-out deliverables as described in Annex A - Statement of Work (SOW)**			**10%**	$_____ CAD
	Acceptance of transition-out deliverables	Appendix C of Annex A - SOW	10%		

Part 3: Optional Deliverables

The optional deliverables may be exercised by the Contracting Authority in accordance with section 7.1.1 of the Contract.

Table 1 – Optional Radar Systems

Item	Description	Quantity	Firm Unit Price
1	For the supply, delivery and installation of Optional Radar System with the same deliverables as described in Appendix A of Annex A – Statement of Work.	Up to 13	$_____ CAD

Table 2 – Optional Radar Infrastructure and Construction – Task Authorization

Item	Description	Quantity	Unit Ceiling Price
1	For the completion and acceptance of Infrastructure and Construction deliverables for the radar site with the same deliverables as described in Appendix B and Appendix G of Annex A – Statement of Work.	Up to 13	$_____ CAD

Table 3 – Optional Project Management Services

Item	Description	Quantity	Firm Price
1	For the completion and acceptance of Project Management services with the same deliverables as described in Appendix C of Annex A – Statement of Work	Up to 13	$_____ CAD

Table 4 – Optional Training Services

Item	Description	Quantity	Firm Unit Price
1	For the delivery of training services as described in Appendix D of Annex A – Statement of Work.	Up to 13	$_____ CAD

Table 5 – Optional Document Deliverables

Item	Description	Quantity	Firm Unit Price
1	For the completion and acceptance of Document Deliverables as described in Appendix E of Annex A – Statement of Work	Up to 13	$_____ CAD

Table 6 – Optional Specialized Professional Services – Task Authorization

Item	Category	Description	Firm Hourly Rate
1	Jr. Technician	As described in Appendix F of Annex A – Statement of Work	$____CAD
2	Sr. Technician	As described in Appendix F of Annex A – Statement of Work	$____CAD
3	Jr. Engineer	As described in Appendix F of Annex A – Statement of Work	$____CAD
4	Sr. Engineer	As described in Appendix F of Annex A – Statement of Work	$____CAD
5	IT/Software Engineer	As described in Appendix F of Annex A – Statement of Work	$____CAD
6	Trainer	As described in Appendix F of Annex A – Statement of Work	$____CAD

ANNEX C:
SECURITY REQUIREMENTS CHECK LIST

FOR

CANADIAN WEATHER RADAR REPLACMENT SOLUTION (CWRRS)

FOR

ENVIRONMENT CANADA

Annex C - Security Requirements Check List (SRCL)

Government of Canada / Gouvernement du Canada

Contract Number / Numéro du contrat
K3D33-131144
Security Classification / Classification de sécurité Unclassified

SECURITY REQUIREMENTS CHECK LIST (SRCL)
LISTE DE VÉRIFICATION DES EXIGENCES RELATIVES À LA SÉCURITÉ (LVERS)

PART A - CONTRACT INFORMATION / PARTIE A - INFORMATION CONTRACTUELLE

1. Originating Government Department or Organization / Ministère ou organisme gouvernemental d'origine Environment Canada	2. Branch or Directorate / Direction générale ou Direction Meteorological Services
3. a) Subcontract Number / Numéro du contrat de sous-traitance	3. b) Name and Address of Subcontractor / Nom et adresse du sous-traitant

4. Brief Description of Work / Brève description du travail

Replace obselete radars with new systems

5. a) Will the supplier require access to Controlled Goods? Le fournisseur aura-t-il accès à des marchandises contrôlées?	✓ No Non	☐ Yes Oui
5. b) Will the supplier require access to unclassified military technical data subject to the provisions of the Technical Data Control Regulations? Le fournisseur aura-t-il accès à des données techniques militaires non classifiées qui sont assujetties aux dispositions du Règlement sur le contrôle des données techniques?	✓ No Non	☐ Yes Oui
6. Indicate the type of access required / Indiquer le type d'accès requis		
6. a) Will the supplier and its employees require access to PROTECTED and/or CLASSIFIED information or assets? Le fournisseur ainsi que les employés auront-ils accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS? (Specify the level of access using the chart in Question 7. c) (Préciser le niveau d'accès en utilisant le tableau qui se trouve à la question 7. c)	✓ No Non	☐ Yes Oui
6. b) Will the supplier and its employees (e.g. cleaners, maintenance personnel) require access to restricted access areas? No access to PROTECTED and/or CLASSIFIED information or assets is permitted. Le fournisseur et ses employés (p. ex. nettoyeurs, personnel d'entretien) auront-ils accès à des zones d'accès restreintes? L'accès à des renseignements ou à des biens PROTÉGÉS et/ou CLASSIFIÉS n'est pas autorisé.	☐ No Non	✓ Yes Oui
6. c) Is this a commercial courier or delivery requirement with **no** overnight storage? S'agit-il d'un contrat de messagerie ou de livraison commerciale **sans** entreposage de nuit?	✓ No Non	☐ Yes Oui

7. a) Indicate the type of information that the supplier will be required to access / Indiquer le type d'information auquel le fournisseur devra avoir accès

Canada ☐	NATO / OTAN ☐	Foreign / Étranger ☐
7. b) Release restrictions / Restrictions relatives à la diffusion		
No release restrictions Aucune restriction relative à la diffusion ☐	All NATO countries Tous les pays de l'OTAN ☐	No release restrictions Aucune restriction relative à la diffusion ☐
Not releasable À ne pas diffuser ☐		
Restricted to: / Limité à : ☐	Restricted to: / Limité à : ☐	Restricted to: / Limité à : ☐
Specify country(ies): / Préciser le(s) pays :	Specify country(ies): / Préciser le(s) pays :	Specify country(ies): / Préciser le(s) pays :
7. c) Level of information / Niveau d'information		
PROTECTED A PROTÉGÉ A ☐	NATO UNCLASSIFIED NATO NON CLASSIFIÉ ☐	PROTECTED A PROTÉGÉ A ☐
PROTECTED B PROTÉGÉ B ☐	NATO RESTRICTED NATO DIFFUSION RESTREINTE ☐	PROTECTED B PROTÉGÉ B ☐
PROTECTED C PROTÉGÉ C ☐	NATO CONFIDENTIAL NATO CONFIDENTIEL ☐	PROTECTED C PROTÉGÉ C ☐
CONFIDENTIAL CONFIDENTIEL ☐	NATO SECRET NATO SECRET ☐	CONFIDENTIAL CONFIDENTIEL ☐
SECRET SECRET ☐	COSMIC TOP SECRET COSMIC TRÈS SECRET ☐	SECRET SECRET ☐
TOP SECRET TRÈS SECRET ☐		TOP SECRET TRÈS SECRET ☐
TOP SECRET (SIGINT) TRÈS SECRET (SIGINT) ☐		TOP SECRET (SIGINT) TRÈS SECRET (SIGINT) ☐

Government of Canada / Gouvernement du Canada

Contract Number / Numéro du contrat
K3D33-131144
Security Classification / Classification de sécurité Unclassified

PART A *(continued)* / PARTIE A *(suite)*

8. Will the supplier require access to PROTECTED and/or CLASSIFIED COMSEC information or assets? ☑ No / Non ☐ Yes / Oui
Le fournisseur aura-t-il accès à des renseignements ou à des biens COMSEC désignés PROTÉGÉS et/ou CLASSIFIÉS?
If Yes, indicate the level of sensitivity:
Dans l'affirmative, indiquer le niveau de sensibilité :

9. Will the supplier require access to extremely sensitive INFOSEC information or assets? ☑ No / Non ☐ Yes / Oui
Le fournisseur aura-t-il accès à des renseignements ou à des biens INFOSEC de nature extrêmement délicate?

Short Title(s) of material / Titre(s) abrégé(s) du matériel :
Document Number / Numéro du document :

PART B - PERSONNEL (SUPPLIER) / PARTIE B - PERSONNEL (FOURNISSEUR)

10. a) Personnel security screening level required / Niveau de contrôle de la sécurité du personnel requis

☐ RELIABILITY STATUS COTE DE FIABILITÉ	☐ CONFIDENTIAL CONFIDENTIEL	☐ SECRET SECRET	☐ TOP SECRET TRÈS SECRET
☐ TOP SECRET– SIGINT TRÈS SECRET – SIGINT	☐ NATO CONFIDENTIAL NATO CONFIDENTIEL	☐ NATO SECRET NATO SECRET	☐ COSMIC TOP SECRET COSMIC TRÈS SECRET
☐ SITE ACCESS ACCÈS AUX EMPLACEMENTS			

Special comments:
Commentaires spéciaux : _____

NOTE: If multiple levels of screening are identified, a Security Classification Guide must be provided.
REMARQUE : Si plusieurs niveaux de contrôle de sécurité sont requis, un guide de classification de la sécurité doit être fourni.

10. b) May unscreened personnel be used for portions of the work? ☐ No / Non ☑ Yes / Oui
Du personnel sans autorisation sécuritaire peut-il se voir confier des parties du travail?
If Yes, will unscreened personnel be escorted? ☐ No / Non ☑ Yes / Oui
Dans l'affirmative, le personnel en question sera-t-il escorté?

PART C - SAFEGUARDS (SUPPLIER) / PARTIE C - MESURES DE PROTECTION (FOURNISSEUR)

INFORMATION / ASSETS / RENSEIGNEMENTS / BIENS

11. a) Will the supplier be required to receive and store PROTECTED and/or CLASSIFIED information or assets on its site or premises? ☑ No / Non ☐ Yes / Oui
Le fournisseur sera-t-il tenu de recevoir et d'entreposer sur place des renseignements ou des biens PROTÉGÉS et/ou CLASSIFIÉS?

11. b) Will the supplier be required to safeguard COMSEC information or assets? ☑ No / Non ☐ Yes / Oui
Le fournisseur sera-t-il tenu de protéger des renseignements ou des biens COMSEC?

PRODUCTION

11. c) Will the production (manufacture, and/or repair and/or modification) of PROTECTED and/or CLASSIFIED material or equipment occur at the supplier's site or premises? ☑ No / Non ☐ Yes / Oui
Les installations du fournisseur serviront-elles à la production (fabrication et/ou réparation et/ou modification) de matériel PROTÉGÉ et/ou CLASSIFIÉ?

INFORMATION TECHNOLOGY (IT) MEDIA / SUPPORT RELATIF À LA TECHNOLOGIE DE L'INFORMATION (TI)

11. d) Will the supplier be required to use its IT systems to electronically process, produce or store PROTECTED and/or CLASSIFIED information or data? ☑ No / Non ☐ Yes / Oui
Le fournisseur sera-t-il tenu d'utiliser ses propres systèmes informatiques pour traiter, produire ou stocker électroniquement des renseignements ou des données PROTÉGÉS et/ou CLASSIFIÉS?

11. e) Will there be an electronic link between the supplier's IT systems and the government department or agency? ☑ No / Non ☐ Yes / Oui
Disposera-t-on d'un lien électronique entre le système informatique du fournisseur et celui du ministère ou de l'agence gouvernementale?

Government of Canada / Gouvernement du Canada

Contract Number / Numéro du contrat
K3D33-131144
Security Classification / Classification de sécurité
Unclassified

PART C - *(continued)* / PARTIE C - *(suite)*

For users completing the form **manually** use the summary chart below to indicate the category(ies) and level(s) of safeguarding required at the supplier's site(s) or premises.
Les utilisateurs qui remplissent le formulaire **manuellement** doivent utiliser le tableau récapitulatif ci-dessous pour indiquer, pour chaque catégorie, les niveaux de sauvegarde requis aux installations du fournisseur.

For users completing the form **online** (via the Internet), the summary chart is automatically populated by your responses to previous questions.
Dans le cas des utilisateurs qui remplissent le formulaire **en ligne** (par Internet), les réponses aux questions précédentes sont automatiquement saisies dans le tableau récapitulatif.

SUMMARY CHART / TABLEAU RÉCAPITULATIF

Category Catégorie	PROTECTED PROTÉGÉ			CLASSIFIED CLASSIFIÉ			NATO				COMSEC					
	A	B	C	CONFIDENTIAL CONFIDENTIEL	SECRET	TOP SECRET TRÈS SECRET	NATO RESTRICTED NATO DIFFUSION RESTREINTE	NATO CONFIDENTIAL NATO CONFIDENTIEL	NATO SECRET	COSMIC TOP SECRET COSMIC TRÈS SECRET	PROTECTED PROTÉGÉ A	PROTECTED PROTÉGÉ B	PROTECTED PROTÉGÉ C	CONFIDENTIAL CONFIDENTIEL	SECRET	TOP SECRET TRES SECRET
Information / Assets Renseignements / Biens																
Production																
IT Media / Support TI																
IT Link / Lien électronique																

12. a) Is the description of the work contained within this SRCL PROTECTED and/or CLASSIFIED?
La description du travail visé par la présente LVERS est-elle de nature PROTÉGÉE et/ou CLASSIFIÉE?

☑ No / Non ☐ Yes / Oui

If Yes, classify this form by annotating the top and bottom in the area entitled "Security Classification".
Dans l'affirmative, classifier le présent formulaire en indiquant le niveau de sécurité dans la case intitulée « Classification de sécurité » au haut et au bas du formulaire.

12. b) Will the documentation attached to this SRCL be PROTECTED and/or CLASSIFIED?
La documentation associée à la présente LVERS sera-t-elle PROTÉGÉE et/ou CLASSIFIÉE?

☑ No / Non ☐ Yes / Oui

If Yes, classify this form by annotating the top and bottom in the area entitled "Security Classification" and indicate with attachments (e.g. SECRET with Attachments).
Dans l'affirmative, classifier le présent formulaire en indiquant le niveau de sécurité dans la case intitulée « Classification de sécurité » au haut et au bas du formulaire et indiquer qu'il y a des pièces jointes (p. ex. SECRET avec des pièces jointes).

Attachment pursuant to Question 15 for ***SRCL K3D33-131144***

Requirement for "Supply Chain Integrity"

The contract should include clauses that will ensure supply chain integrity to protect the integrity, availability and confidentiality of Canada's data and communications.

Requirement for Security Inspections

The contract should include clauses for security inspections of the physical and information technology components during construction and at delivery. The clause should specify that detailed security requirements for the inspections will be provided at contract award.

Note: the contractors will not be dealing with any confidential or classified data/information – nor will they be dealing with any "controlled goods". They will be physically supervised on any government property by qualified staff and will not have unsupervised access to computers/processors that are hooked up to the system. Once the radars are hooked up to the network, it will only be EC employees with access.

ANNEX D:
INSURANCE REQUIREMENTS

FOR

CANADIAN WEATHER RADAR REPLACMENT SOLUTION (CWRRS)

FOR

ENVIRONMENT CANADA

1. Commercial General Liability Insurance

a. The Contractor must obtain Commercial General Liability Insurance, and maintain it in force throughout the duration of the Contract, in an amount usual for a contract of this nature, but for not less than $2,000,000 CAD per accident or occurrence and in the annual aggregate.

b. The Commercial General Liability policy must include the following:

i. Additional Insured: Canada is added as an additional insured, but only with respect to liability arising out of the Contractor's performance of the Contract. The interest of Canada should read as follows: Canada, as represented by Public Works and Government Services Canada.

ii. Bodily Injury and Property Damage to third parties arising out of the operations of the Contractor.

iii. Products and Completed Operations: Coverage for bodily injury or property damage arising out of goods or products manufactured, sold, handled, or distributed by the Contractor and/or arising out of operations that have been completed by the Contractor.

iv. Personal Injury: While not limited to, the coverage must include Violation of Privacy, Libel and Slander, False Arrest, Detention or Imprisonment and Defamation of Character.

v. Cross Liability/Separation of Insureds: Without increasing the limit of liability, the policy must protect all insured parties to the full extent of coverage provided. Further, the policy must apply to each Insured in the same manner and to the same extent as if a separate policy had been issued to each.

vi. Blanket Contractual Liability: The policy must, on a blanket basis or by specific reference to the Contract, extend to assumed liabilities with respect to contractual provisions.

vii. Employees and, if applicable, Volunteers must be included as Additional Insured.

viii. Employers' Liability (or confirmation that all employees are covered by Worker's compensation (WSIB) or similar program)

ix. Broad Form Property Damage including Completed Operations: Expands the Property Damage coverage to include certain losses that would otherwise be excluded by the standard care, custody or control exclusion found in a standard policy.

x. Notice of Cancellation: The Insurer will endeavor to provide the Contracting Authority thirty (30) days written notice of policy cancellation.

xi. If the policy is written on a claims-made basis, coverage must be in place for a period of at least 12 months after the completion or termination of the Contract.

xii. Owners' or Contractors' Protective Liability: Covers the damages that the Contractor becomes legally obligated to pay arising out of the operations of a subcontractor.

xiii. Non-Owned Automobile Liability - Coverage for suits against the Contractor resulting from the use of hired or non-owned vehicles.

xiv. Advertising Injury: While not limited to, the endorsement must include coverage piracy or misappropriation of ideas, or infringement of copyright, trademark, title or slogan.

xv. All Risks Tenants Legal Liability - to protect the Contractor for liabilities arising out of its occupancy of leased premises.

xvi. Sudden and Accidental Pollution Liability (minimum 120 hours): To protect the Contractor for liabilities arising from damages caused by accidental pollution incidents.

xvii. Litigation Rights: Pursuant to subsection 5(d) of the Department of Justice Act, S.C. 1993, c. J-2, s.1, if a suit is instituted for or against Canada which the Insurer would, but for this clause, have the right to pursue or defend on behalf of Canada as an Additional Named Insured under the insurance policy, the Insurer must promptly contact the Attorney General of Canada to agree on the legal strategies by sending a letter, by registered mail or by courier, with an acknowledgement of receipt.

For the province of Quebec, send to:

Director Business Law Directorate,
Quebec Regional Office (Ottawa),

Department of Justice,
284 Wellington Street, Room SAT-6042,
Ottawa, Ontario, K1A 0H8

For other provinces and territories, send to:

Senior General Counsel,
Civil Litigation Section,
Department of Justice
234 Wellington Street, East Tower
Ottawa, Ontario K1A 0H8

A copy of the letter must be sent to the Contracting Authority. Canada reserves the right to co-defend any action brought against Canada. All expenses incurred by Canada to co-defend such actions will be at Canada's expense. If Canada decides to co-defend any action brought against it, and Canada does not agree to a proposed settlement agreed to by the Contractor's insurer and the plaintiff(s) that would result in the settlement or dismissal of the action against Canada, then Canada will be responsible to the Contractor's insurer for any difference between the proposed settlement amount and the amount finally awarded or paid to the plaintiffs (inclusive of costs and interest) on behalf of Canada.

2. Errors and Omissions Liability Insurance

a. The Contractor must obtain Errors and Omissions Liability (a.k.a. Professional Liability) insurance, and maintain it in force throughout the duration of the Contract, in an amount usual for a contract of this nature but for not less than $1,000,000 CAD per loss and in the annual aggregate, inclusive of defense costs.

b. If the policy is written on a claims-made basis, coverage must be in place for a period of at least 12 months after the completion or termination of the Contract.

c. The following endorsement must be included:

Notice of Cancellation: The Insurer will endeavour to provide the Contracting Authority thirty (30) days written notice of cancellation.

3. All Risk Property Insurance

The Contractor must obtain All Risks Property insurance while the Government Property is under its care, custody or control, and maintain it in force throughout the duration of the Contract, in an amount of not less than $1,000,000 CAD. The Government's Property must be insured on Agreed Value (appraisal) basis.

a. Administration of Claims: The Contractor must notify Canada promptly about any losses or damages to Government Property and monitor investigate and document losses of or damage to ensure that claims are properly made and paid.
b. The All Risks Property insurance policy must include the following:

   i. Notice of Cancellation: The Insurer will endeavour to provide the Contracting Authority at least thirty (30) days written notice of policy cancellation.
   ii. Loss Payee: Canada as its interest may appear or as it may direct.
   iii. Waiver of Subrogation Rights: Contractor's Insurer to waive all rights of subrogation against Canada as represented by Environment Canada and Public Works and Government Services Canada for any and all loss of or damage to the property however caused.

4. Automobile Liability Insurance

a. The Contractor must obtain Automobile Liability Insurance, and maintain it in force throughout the duration of the Contract, in an amount usual for a contract of this nature, but for not less than $2,000,000 per accident or occurrence.
b. The policy must include the following:

    i. Third Party Liability - $2,000,000 Minimum Limit per Accident or Occurrence
    ii. Accident Benefits - all jurisdictional statutes
    iii. Uninsured Motorist Protection
    iv. Notice of Cancellation: The Insurer will endeavour to provide the Contracting Authority thirty (30) days written notice of cancellation.
    v. OPCF/SEF/QEF #3 - Drive Government Automobiles Endorsement
    vi. Liability for Physical Damage to Non-owned Automobiles: Ontario OPCF 27 or 27B / Quebec: QEF #27 / Other Provinces: SEF#27

5. Rigger's Liability Insurance

a. The Contractor must obtain Rigger's Liability Insurance, in an amount usual for a contract of this nature, but for not less than $1,000,000 CAD per accident or occurrence and in the annual aggregate. The Contractor's Riggers Liability Insurance must provide coverage for loss or damage to all Government Property under its care, custody or control, and must be maintained in force throughout the duration of the Contract. The Government Property must be insured on Agreed Value (appraisal) basis.

    i. The Contractor must notify Canada promptly about any losses or damages to Government Property and monitor, investigate and document losses of or damage to ensure that claims are properly made and paid.

b. The Rigger's Liability Insurance policy must include the following:

    i. Notice of Cancellation: The Insurer will endeavor to provide the Contracting Authority thirty (30) days written notice of policy cancellation.
    ii. Loss Payee: Canada as its interest may appear or as it may direct, for loss or damage to Government property in the Contractor's care, custody or control.
    iii. Waiver of Subrogation Rights: Contractor's Insurer to waive all rights of subrogation against Canada as represented by Environment Canada and Public Works and Government Services Canada for any and all loss of or damage to the property however caused.

ANNEX E:
TASK AUTHORIZATION FORM

FOR

CANADIAN WEATHER RADAR REPLACMENT SOLUTION (CWRRS)

FOR

ENVIRONMENT CANADA

ANNEX E – TASK AUTHORIZATION FORM PWGSC-TPSGC 572

Clear Data - Effacer les données | Instructions - Page 1 | Instructions - Page 2

Public Works and Government Services Canada | Travaux publics et Services gouvernementaux Canada

Annex
Annexe ____

Task Authorization
Autorisation de tâche

Contract Number - Numéro du contrat	
Contractor's Name and Address - Nom et l'adresse de l'entrepreneur	Task Authorization (TA) No. - N° de l'autorisation de tâche (AT)
	Title of the task, if applicable - Titre de la tâche, s'il y a lieu
	Total Estimated Cost of Task (Applicable taxes extra) Coût total estimatif de la tâche (Taxes applicables en sus) $

Security Requirements: This task includes security requirements
Exigences relatives à la sécurité : Cette tâche comprend des exigences relatives à la sécurité

☐ No - Non ☐ Yes - Oui

If YES, refer to the Security Requirements Checklist (SRCL) included in the Contract
Si OUI, voir la Liste de vérification des exigences relative à la sécurité (LVERS) dans le contrat

For Revision only - Aux fins de révision seulement

TA Revision Number, if applicable Numéro de révision de l'AT, s'il y a lieu	Total Estimated Cost of Task (Applicable taxes extra) before the revision Coût total estimatif de la tâche (Taxes applicables en sus) avant la révision $	Increase or Decrease (Applicable taxes extra), as applicable Augmentation ou réduction (Taxes applicables en sus), s'il y a lieu $

Start of the Work for a TA : Work cannot commence until a TA has been authorized in accordance with the conditions of the contract.

Début des travaux pour l'AT : Les travaux ne peuvent pas commencer avant que l'AT soit autorisée conformément au contrat.

1. Required Work: - Travaux requis :

A. Task Description of the Work required - Description de tâche des travaux requis — See Attached - Ci-joint ☐

B. Basis of Payment - Base de paiement — See Attached - Ci-joint ☐

C. Cost of Task - Coût de la tâche — See Attached - Ci-joint ☐

D. Method of Payment - Méthode de paiement — See Attached - Ci-joint ☐

Annex
Annexe ____

Contract Number - Numéro du contrat

2. Authorization(s) - Autorisation(s)

By signing this TA, the authorized client and (or) the PWGSC Contracting Authority certify(ies) that the content of this TA is in accordance with the conditions of the contract.

The client's authorization limit is identified in the contract. When the value of a TA and its revisions is in excess of this limit, the TA must be forwarded to the PWGSC Contracting Authority for authorization.

En apposant sa signature sur l'AT, le client autorisé et (ou) l'autorité contractante de TPSGC atteste(nt) que le contenu de cette AT respecte les conditions du contrat.

La limite d'autorisation du client est précisée dans le contrat. Lorsque la valeur de l'AT et ses révisions dépasse cette limite, l'AT doit être transmise à l'autorité contractante de TPSGC pour autorisation.

Name and title of authorized client - Nom et titre du client autorisé à signer

Signature | Date

PWGSC Contracting Authority - Autorité contractante de TPSGC

Signature | Date

3. Contractor's Signature - Signature de l'entrepreneur

Name and title of individual authorized - to sign for the Contractor
Nom et titre de la personne autorisée à signer au nom de l'entrepreneur

Signature | Date

ANNEX F:
FEDERAL CONTRACTORS PROGRAM FOR EMPLOYMENT EQUITY – CERTIFICATION

FOR

CANADIAN WEATHER RADAR REPLACMENT SOLUTION (CWRRS)

FOR

ENVIRONMENT CANADA

ANNEX F - FEDERAL CONTRACTORS PROGRAM FOR EMPLOYMENT EQUITY – CERTIFICATION

I, the Bidder, by submitting the present information to the Contracting Authority, certify that the information provided is true as of the date indicated below. The certifications provided to Canada are subject to verification at all times. I understand that Canada will declare a bid non-responsive, or will declare a contractor in default, if a certification is found to be untrue, whether during the bid evaluation period or during the contract period. Canada will have the right to ask for additional information to verify the Bidder's certifications. Failure to comply with any request or requirement imposed by Canada may render the bid non-responsive or constitute a default under the Contract.

For further information on the Federal Contractors Program for Employment Equity visit Employment and Social Development Canada (ESDC) – Labour's website.

Date:_____(YYYY/MM/DD) (If left blank, the date will be deemed to be the bid solicitation closing date.)

Complete both A and B.

A. Check only one of the following:

( ) A1. The Bidder certifies having no work force in Canada.

( ) A2. The Bidder certifies being a public sector employer.

( ) A3. The Bidder certifies being a federally regulated employer being subject to the *Employment Equity Act*.

( ) A4. The Bidder certifies having a combined work force in Canada of less than 100 employees (combined work force includes: permanent full-time, permanent part-time and temporary employees [temporary employees only includes those who have worked 12 weeks or more during a calendar year and who are not full-time students]).

A5. The Bidder has a combined workforce in Canada of 100 or more employees; and

( ) A5.1. The Bidder certifies already having a valid and current Agreement to Implement Employment Equity (AIEE) in place with ESDC-Labour.

OR

( ) A5.2. The Bidder certifies having submitted the Agreement to Implement Employment Equity (LAB1168) to ESDC-Labour. As this is a condition to contract award, proceed to completing the form Agreement to Implement Employment Equity (LAB1168), duly signing it, and transmit it to ESDC-Labour.

B. Check only one of the following:

( ) B1. The Bidder is not a Joint Venture.

OR

( ) B2. The Bidder is a Joint venture and each member of the Joint Venture must provide the Contracting Authority with a completed annex Federal Contractors Program for Employment Equity - Certification. (Refer to the Joint Venture section of the Standard Instructions)

ATTACHMENT 1 –
EVALUATION METHODOLOGY AND BASIS OF SELECTION

1.0 Overview

This attachment outlines the evaluation methodology to be used in the evaluation of proposals received in response to this RFP. This evaluation methodology is structured to ensure a fair and consistent assessment of the solutions proposed by bidders while bringing definition, consistency and objectivity to the requirements.

2.0 Evaluation Process

Canada is conducting the following two-step bid evaluation process for this requirement:

Step 1: Technical and Financial Evaluation Process.

(a) Technical Evaluation: Evaluation of Mandatory Requirements and Point-Rated Requirements;
(b) Financial Evaluation; and

Step 2: Verification Process.

3.0 Step 1: Technical and Financial Evaluation Process

1. To be declared responsive in Step 1, a bid must

   a. comply with all the requirements of the bid solicitation;

   b. meet all Mandatory Requirements; and

   c. obtain the required minimum passing points specified in Attachment 3 – Point-Rated Requirements for the technical evaluation.

2. Bids not meeting (a) or (b) or (c) will be declared non-responsive and will be given no further consideration.

3. The Top Ranked Bid selection will be based on the highest responsive combined rating of Total Technical Score and Total Financial Score. The ratio will be 70% for the Total Technical Score and 30% for the Total Financial Score.

4. To establish the Total Technical Score, each responsive bid will be determined as follows: (Total Weighed Technical Score/100) x 70. The Total Weighted Technical Score is described in Table 1 of this document and determined as follows: Sum of (group points obtained/ maximum points available for each group x weight % x 100)

5. To establish the Total Financial Score, each responsive bid will be determined as follows: (Lowest Bid Evaluated Price / Bidder's Bid Evaluated Price) x 30

6. For each responsive bid, the Total Technical Score and the Total Financial Score will be added to determine its combined rating (highest total score).

7. Neither the responsive bid obtaining the highest technical score nor the one with the highest financial score will necessarily be accepted. The responsive bid with the highest combined rating of technical merit and price will be the Top Ranked Bid.

8. Only the Top Ranked Bidder determined from the example Table 2 in this document will be invited to participate in Step 2 – Verification Process.

9. If more than one Bidder is tied for the Top Ranked Bidder, the responsive bid with the highest Total Technical Score will be invited to participate in Step 2 – Verification Process, subject to the provisions of this bid solicitation.

10. If more than one bidder is tied for the Top Ranked Bidder with identical Total Technical Scores and Total Financial Score, these bidders will be notified in writing by the Contracting Authority and advised that the Total Score, Total Technical Score and Total Financial Score of their bid is identical to that of another Bidder or Bidders. The tied Bidders will have 7 days following receipt of the notification to submit a revised financial bid to the Contracting Authority. The revised financial bid will be evaluated according to the financial evaluation methodology and procedures as described in this bid solicitation and a Top Ranked Bid will then be determined and invited to participate in Step 2 – Verification Process.

Table 1: Total Weighted Technical Score

NOTE: The following table is an EXAMPLE for information purpose only. The points and score will be rounded to two (2) decimal places.

Point-Rated Criteria Group	Maximum Points Available (700 Points)	Minimum Passing Score	Weight (%)	Bidder 1 Points Obtained	Bidder 2 Points Obtained	Bidder 3 Points Obtained	Bidder 4 Points Obtained
Group 1	*100*	***60***	*35%*	90	70	80	60
Group 2	*320*	***150***	*40%*	290	280	300	140
Group 3	*280*	***200***	*25%*	240	200	260	270
Minimum Passing Score:				**Met**	**Met**	**Met**	**Not Met (Group 2)**
Calculation:				(90/100 x 35) + (290/320 x 40) + (240/280 x 25) = (31.50 + 36.25 + 21.43) = 89.18	(70/100 x 35) + (280/320 x 40) + (200/280 x 25) = (24.50 + 35.00 + 17.86) = 77.36	(80/100 x 35)+ (300/320 x 40) + (260/280 x 25)= (28.00 + 37.50 + 23.21) = 88.71	**N/A**
Total Technical Weighted Score:				**89.18**	**77.36**	**88.71**	N/A

Table 2: Basis of Selection for Top Ranked Bid

The table below illustrates an example where three bids are responsive and the selection of the Top Ranked Bid is determined by a 70/30 ratio of technical merit and price, respectively.

NOTE: The following table is an EXAMPLE for information purpose only. The points and score will be rounded to two (2) decimal places.

		Bidder 1	**Bidder 2**	**Bidder 3**
Total Weighted Technical Score		89.18	77.36	88.71
Bid Evaluated Price		$55,000.00	$50,000.00	$45,000.00
Calculations	**Total Technical Score**	89.18/100 x 70 = 62.43	77.36/100 x 70 = 54.15	88.71/100 x 70 = 62.10
	Total Financial Score	$45,000/$55,000 x 30 = 24.55	$45,000/$50,000 x 30 = 27.00	$45,000/$45,000 x 30 = 30.00
Combined Rating		86.98	81.15	92.10
Overall Rating		2nd	3rd	Top Ranked Bid

4.0 Step 2: Verification Process

4.1 Purpose/Objective

The Verification Process is designed to verify the top ranked Bidder's proposed solution to the CWRRS mandatory requirements listed in Annex A – SOW and Attachment 2 to Part 4 of the RFP – Mandatory Requirements.

4.2 Scope

(a) Verification Process is Step 2 of the evaluation process and consists of the validation of a Bidder's proposed CWRRS, as outlined at Attachment 1 – Evaluation Methodology and Basis of Selection to Part 4 of the RFP.

(b) The verification criteria will focus on the Radar System deliverables, major assemblies, subassemblies and overall performance requirements.

4.3 Methods of Verification

(a) Canada will conduct the verification process with one or more of the following methods, which includes but is not limited to:

- Demonstrations (in field or on a range);
- Factory presentations and tours (Bidder, OEM);
- Review of simulations; and
- Meetings with references.

(b) The Canada's representatives may, if required, travel to one location of the Bidder's choice (factory, range, past client, or other) to undertake the verification.

4. 4 Verification Procedures

(a) A Verification team comprised of representatives of Canada will conduct the Verification Process with oversight from the Fairness Monitor.

(b) The top ranked Bidder in Step 1 will be notified of the detailed Verification Process including the exact criteria, proposed times and dates. After being notified by the Contracting Authority, the Bidder will be given 7 working days to reply and propose the location.

(c) The Verification Process may take place at a location inside or outside Canada proposed by the top-ranked Bidder, if that location is agreed to by both Project Authority and Contracting Authority and if the Bidder assumes all responsibility for recreating the technical environment described in the bid solicitation. Canada will pay its own evaluation team's travel and salary costs associated with this Verification Process.

(d) Once the Verification Process has begun, it must be completed within 5 working days. During the verification process, the proposed CWRRS must run 24/7 unattended except during specific verification steps that require a planned shut-down, as agreed to in advance by the Project Authority. If there is any reason why 24/7 unattended operation is not possible during the Verification Process, this must be communicated to the Contracting Authority as soon as possible. The Contracting Authority may agree to allow alternatives to this requirement.

(e) Bidders remain solely responsible for ensuring that they have sufficient spares and appropriately trained personnel available to meet Verification Process criteria.

(f) Through the Verification Process, Canada will verify the solution proposed in the top-ranked bid (identified after the Step 1: Technical and Financial Evaluation) to confirm both that it will function as described in the Bid and that it meets the technical functionality requirements described in Annex A – SOW and Attachment 2 to Part 4 of the RFP – Mandatory Requirements.

(g) The proposed CWRRS must be at minimum of Technical Readiness Level 7 as described in Section 3.1 of Annex A –SOW or better at the time of the Verification Process.

(h) Design changes to any CWRRS component will not be permitted.

4.5 Results and Report

(a) If Canada determines during the Verification Process that the Bidder's proposed solution does not meet any mandatory requirement of this bid solicitation, the bid will be declared non-responsive. Canada will then invite the second ranked bidder from Step 1: Technical and Financial Evaluation Process to participate in the Step 2: Verification Process.

5.0 Basis of Selection – Contract Award

5.1 To be declared responsive:

(a) a bid must:

(i) comply with all the requirements of the bid solicitation; and

(ii) meet all mandatory requirements including Technical, Financial and Certification requirements and the minimum pass score of point-rated technical requirements; and

(b) the Bidder's proposed solution must pass the Verification Process as outlined in Attachment 1 – Evaluation Methodology and Basis of Selection.

5.1.1 Bids not meeting 4.2.1 (a) (i) and (ii) during Step 1 will be declared non-responsive, and receive no further consideration.

5.1.2 Only the top-ranked Bidder will be invited to Step 2: Verification Process. Bids not meeting 4.2.1 (b) the requirements identified in Attachment 1 – Evaluation Methodology and Basis of Selection during Step 2 will be declared non-responsive, and then the second ranked bid from Step 1 will be invited to Step 2: Verification Process.

5.1.3 A bid must comply with the requirements of the bid solicitation and meet all mandatory evaluation criteria to be declared responsive. The responsive bid pass the evaluation process described in Attachment 1 – Evaluation Methodology and Basis of Selection will be recommended for award of a contract.

5.1.4 Bidders should note that all contract awards are subject to Canada’s internal approvals process, which includes a requirement to approve funding in the amount of any proposed contract. Despite the fact that the Bidder may have been recommended for contract award, a contract will only be awarded if internal approval is granted according to Canada’s internal policies. If approval is not granted, no contract will be awarded.

ATTACHMENT 2 – MANDATORY EVALUATION CRITERIA

1.0 Overview

Bidders must meet all of the mandatory requirements in this attachment. Where Bidders must submit client project references in their responses to the mandatory requirements, Canada may contact the client references to validate Bidders responses. The information obtained through client reference validation will be used to assist in determining the compliancy of the referenced project to the mandatory requirement. The client reference checks will result in either confirmation that project reference information is accurate or in the Government of Canada determining that the project reference does not meet the mandatory requirements. The proposed individual project experience can be used to substantiate different requirements.

Bidders must respond to the corresponding mandatory requirements by providing a description explaining, demonstrating, substantiating and justifying their qualifications or approach to meet the requirement. Bidders are requested to utilize the unique number and associated title of each mandatory requirement in their responses. Bidders are requested to indicate where their mandatory requirement is met by entering the location (e.g. volume/binder number, page number, etc.) in the "Cross Reference to Proposal" column. Bidders' responses to the mandatory requirements will be evaluated as either "Met" or "Not Met". A "Not Met" will result in the bid submission being deemed non-compliant.

NOTE: At the bid evaluation stage, the proposed Radar System must meet the Technical Readiness Level of 7 as described in Section 1.4 of Appendix A – Radar System Deliverables of Annex A – (Statement of Work)

1.1 Mandatory Corporate and High-Level Requirements

1.1.1 Definitions

"Challenging" – ultimate authority lies outside the project; factors unrelated to the project can impact cost, scope, schedule; management of communications can impact project significantly.

"Complex" – involving dynamic interactions between project factors, high level of uncertainty regarding implementation, standard practices cannot be relied upon to achieve success.

"Large" scanning surveillance radar – 3 metre antenna or larger

"Operational" – see glossary in Annex A – Statement of Work.

"Network" – systems that are designed and constructed to work together in a coordinated or standardized fashion to produce an overall service or good.

"Similar"(for any project requirements) – is defined as being substantively the same or easily scalable in scope, size, duration, or cost of the work described in this solicitation. Types of similar project activities may include, but not be limited to:

- Design, construction, installation, adaptation of large scanning radars, preferably weather radars;
- Design, installation or adjustment of highly technical systems such that they operate as a coherent and calibrated network;
- Project requiring configuration management over a number of systems and over a period of years (a minimum of 3 years);
- Large scale operational projects for, or with, government;
- Delivery of a complex project with tight timelines and heavy reporting requirements; and
- Delivery of a project with minimal flexibility for timing of milestones, both final and intermediate.

"Similar" (for any radar, system or radar system requirements) – operational or periodically operational scanning weather radar with hardware, software and functionality the same as the proposed system except for a minority of features or of an earlier generation.

NOTE: the date of RFP closing is used as the reference point for all experience requirements. That is, “of the last X years” or “the most recent X years” means the X years immediately preceding the RFP closing date. Word with * is defined under 1.1.1 Definitions.

Num	Mandatory Requirements	Cross Reference to Proposal
M1	***Corporate Experience*** The Bidder must demonstrate the following corporate experience: a) Minimum of 15 years of the last 25 years in the radar industry, including: weather radar or large* scanning surveillance radars such as ATC or defense. b) Minimum of 10 years of the last 15 years, including at least the most recent 5 years in the field of large scanning weather radar.	
M2	***Core Provider(s) Management*** The Bidder must include an overview of its core goods and services provider(s) (e.g. Contractor, partners, sub-Contractors, joint venture members). For each core goods and services provider involved in delivering the required deliverables, the following information must be provided: (a) The corporate name and address; (b) The principal areas of business and expertise; (c) The number of years in business; (d) A description of the corporate ownership and organization; and (e) The proof of agreement between the Bidder and its core goods and services provider(s), indicating the intent of commitment to deliver the required goods and services under the contract during the entire Contract Period. The Bidder must provide the name of the designated single point of contact with executive authority for all aspects of the Bidder’s involvement in a potential future contract. The Bidder must fully describe the governance structure of its team and the roles and responsibilities of each core service provider. The roles, responsibilities, authorities and accountabilities of key staff must be defined. The Bidder must provide an organization chart for their implementation team. This chart must reflect the key resources involved in implementing each particular service and it must identify the core service provider that each named individual on the chart represents. The roles, responsibilities, authorities and accountabilities of key staff must be defined.	
M3	***Experience – Radar systems*** The Bidder must provide descriptions of a minimum of two (2),but no more than three (3) radar system projects, within the last ten (10) years, which collectively demonstrate experience similar* to this project, including: a) A minimum of one project must include significant infrastructure goods and services (project total over $10M) at a minimum of three (3) related sites, including the construction and installation of the goods; and, b) A minimum of one project requiring configuration management and control of a number of systems over time (2+ years) in order for them to effectively perform and be supported as a “network”; and c) A minimum of one project that spanned at least three (3) years in duration. The Bidder must include the following information (maximum 10 pages per project using the	

Num	Mandatory Requirements	Cross Reference to Proposal
	content of the list below as headings): i. A clear indication of how the project is comparable and relevant to this project; ii. A brief description of the project's intent, objectives, scope, schedule, budget and cost and time overruns, and explanation of variances; iii. A brief description of design and construction approaches (including site services) used to meet project objectives, scope, budget and schedule requirements; iv. An explanation of any changes in the project scope (engineering and construction , and site services) during the project implementation; v. A brief description of challenges and problems that were encountered during the project and how they were resolved using risk and contingency management, critical path tracking, issue identification and resolution, and communication management; vi. An identification of key disciplines involved in the project, the names of the firms (e.g., sub-contractors) who provided the expertise and the names of key personnel who provided the services; and, vii. At least 1 Client Reference for each proposed project including: name, phone and e-mail address of client contact at working level. References must be current and complete. Canada reserves the right to contact the reference to verify the information provided.	
M4	***<u>Experience – Project management</u>*** The Bidder must provide descriptions of a minimum of two (2), but no more than three (3) projects, within the last ten (10) years, which collectively demonstrate experience relevant to this project, including: a) A minimum of one project must be over $20M with a duration of at least three (3) years that involved both goods and services and resulted in the client obtaining an operational system. (ie. A 'turnkey solution'); and, b) A minimum of one project must be $10M with complex* and challenging* timelines and constraints. The project must have required mature project management skills (e.g., risk and contingency management, critical path tracking, issue identification and resolution, communication management). The Bidder must include the following information (maximum 10 pages per project using the content of the list below as headings.): i. A clear indication of how the project is comparable and relevant to this project; ii. A brief description of the project's intent, objectives, scope, approach, schedule, budget and cost and time overruns, and explanation of variances; iii. Where services were provided on multi-disciplinary projects, indicate the portion of the project scope, budget and schedule that was under the responsibility of the Sub-contractor; iv. An explanation of any changes in the project scope during the project implementation; v. A brief description of challenges and problems that were encountered during the project and how they were resolved using risk and contingency management, critical path tracking, issue identification and resolution, and communication management; vi. An identification of key personnel who provided the project management expertise; and, vii. At least 1 Client Reference for each proposed project including: name, phone, and e-mail address of client contact at working level. References must be current and complete. Canada reserves the right to contact the reference to verify the information provided.	
M5	***<u>Experience – Project Management Team</u>*** The Bidder must provide information on their proposed project management team expertise and years of experience (breadth of experience and years of experience). Each of the key	

Num	Mandatory Requirements	Cross Reference to Proposal
	members of the project team must have a minimum of 10 years of project experience within the last 15 years, with a minimum of 5 years recent (within last 8 years) experience in the role they will fulfill for this project. The key roles for personnel must include, but are not limited to: a. Project Manager; b. Project Administrator; c. Project Engineer; d. Project Analyst; and e. Client Liaison. The Contractor must determine how these roles are fulfilled (for example, the Project Administrator may also fill the Analyst role); however, the Contractor must explain clearly how the project team will be set up, the roles and responsibilities, and the qualifications of each of the members filling key roles. The Bidder must include the following information: i. Individual's name, title and brief description of current functions; and name of firm; ii. A description of expertise and experience (with number of years) and demonstration of how they are relevant to the specific needs of this RFP; iii. A demonstration of roles, responsibilities and degree of involvement on past projects, along with minimum of 2 applicable references that will corroborate the person's expertise and experience; iv. Details regarding relevant education and professional accreditation (designation body, year, status, etc.) v. Involvement in any technical committees and associations; and vi. Special accomplishments, achievements, or awards.	
M6	***Project Management Methodology*** The Bidder must provide information on the project management methodology to be used and describe the processes that will be in place to ensure that all goods and services are delivered on time, on budget and meeting requirements. The Bidder must propose an internationally recognized, up-to-date Project Management methodology for delivering the service (e.g. PMBoK, ISO 21500:2012). The methodology must include established processes for, at a minimum: a. Tracking and managing scope, cost, and schedule; b. Change and configuration management; c. Quality management; d. Risk and issues management; and e. Communications.	
M7	***Implementation Plan*** The Bidder must provide a preliminary Implementation Plan. The plan must list, at a high level, all activities, deliverables, dependencies, risks and mitigation strategies, milestone dates, resource assignments and level of effort, assumptions, and the identification of critical dependencies. The implementation plan must cover and identify all activities required to meet contract deliverables including but not limited to the following: a. Transition-In Strategy; b. Project management: i. Work breakdown structure; ii. Project teams, resource roles and responsibilities; and iii. Estimated schedule in accordance with radar installation milestones; c. Risk management; d. Quality management; e. Security and accreditation; f. Dependencies on the Government of Canada;	

Num	Mandatory Requirements	Cross Reference to Proposal
	g. Service level implementation; h. Customizations; i. Change management support (for example: communications, issue management, and training); and j. Transition-out Strategy.	
M8	***<u>Project Technical Team</u>*** The Bidder must describe the expertise and experience of the proposed key technical personnel to be assigned to this project. Each of the key technical personnel must have a minimum of 10 years of recent experience (within the last 15 years) in a field directly related to scanning weather radars (for example: large scanning antennae, scanning radar systems, radar data processing, transmitter engineering) and 7 years (within the last 10 years) in large* scanning weather radars specifically. The Bidder must provide the following for each key member of the technical project team: a. Individual's name, title and brief description of current functions; and name of firm; b. A description of expertise and experience (with number of years) and demonstration of how they are relevant to the specific needs of this RFP; c. A demonstration of roles, responsibilities and degree of involvement on past projects, along with appropriate references that will corroborate the person's expertise and experience; d. Details regarding relevant education and professional accreditation (designation body, year, status, etc.); e. Involvement in any technical committees and associations; and f. Special accomplishments, achievements, or awards.	
M9	***<u>Training Plan</u>*** The Bidder must submit a preliminary training plan with a proposed methodology to address the training needs articulated in Annex A, including Appendix D. This preliminary plan must include, but not be limited to: a. The proposed training team, their name(s), title(s), expertise and experience; b. The training objectives; c. The proposed process for establishing the training requirements (knowledge or skill gaps); d. Proposed training methodologies; and e. Performance measures, for the course and for trainees.	
M10	***<u>Design of Proposed Solution</u>*** The Bidder must submit the design of the Radar system and associated infrastructure. Documentation must include a block diagram of the proposed system, any relevant engineering information, OEM published documentation, available performance specifications and any other materials relevant to demonstrating compliance to the requirements. Also, a tower design must be included. This Radar system design must be documented sufficiently to indicate features including, but not limited to: a. The Radar system (excluding tower) is at a Technical Readiness Level of 7 (see section 1.4 of Appendix A – Radar System Deliverables of Annex A – Statement of Work); and b. The Radar System (including the tower) is capable of meeting the mandatory requirements in Annex A – Statement of Work.	

1.2 Mandatory Technical and Performance Requirements

1.2.1 All measured data provided as substantiation in the bid must have been produced by equipment calibrated in conformance with section 7.6 (Control of measuring and monitoring devices) of the ISO 9001 standard. During the verification phase, should the calibration of a measuring device become suspect, the MSC may – at its own discretion: examine the calibration records of the device, request the device to be recalibrated at a facility approved by the MSC, replace the suspect device with a calibrated device provided by the MSC.

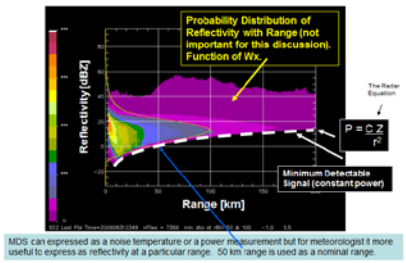
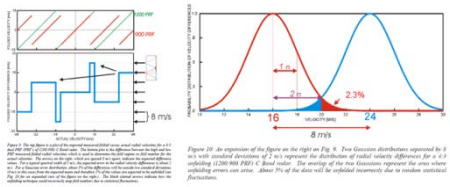
"Equivalent Radar" or "radar with equivalent characteristics": This is radar with equipment similar enough to the proposed radar system such that adjustment of the documented evidence can be done using the standard radar equation – that is: equation 4.35, Doviak and Zrnic, 1984. Sufficient evidence (including original data and conversion details) must be provided so that results can be verified and evaluated.

1.2.2 When moment estimate performance is specified, the radar must be configured as per item M12 below; and unbiased estimate means that:

a. There must be a procedure to estimate the bias;
b. There is a procedure to remove or offset this bias; and,
c. This bias is reported as metadata.

1.2.3 The Bidder is requested to provide the suggested substantiation documents listed in the following table of Mandatory Technical and Performance Requirements. If Canada seeks further clarification or verification from the Bidder about these mandatory Technical and Performance Requirements, the Bidder will have 5 business days to provide the necessary information to Canada. Failure to meet the deadline will result in the bid being declared non-responsive.

Num	Mandatory Requirements	Requirement clarification and suggested substantiation documents	Cross Reference to Proposal
M11	The Proposed radar system and associated infrastructure must be a turnkey installation consisting of the equipment specified in the SOW, installed and tested in accordance with the requirements detailed in the SOW, and ready for operational use.	Description of the proposed Radar system and associated Infrastructure. Signed engineering documents, OEM published specifications, block diagrams, and other informational materials that clearly indicate how the proposed system meets requirements.	
M12	The sensitivity of the radar must have a minimum detectable signal of -5 dBZ at 50 km range, 250 m range bins, 1° azimuthal resolution, spinning at 2rpm and equivalent at all ranges (inverse square law relationship).	Technical description of radar system, sampling strategies, scan strategy, data acquisition capabilities, and formula for computing reflectivity; and, Documented evidence by a probability distribution of reflectivity analysis of radar data as a function of range and reflectivity from a calibrated radar in light echo/precipitation (<20 dBZ) from a calibrated radar with "equivalent characteristics"). The radar should be configured with 250m range bins and 64 samples. Ten sweeps at 1° elevation angle should be used to compute the PDF.	

Num	Mandatory Requirements	Requirement clarification and suggested substantiation documents	Cross Reference to Proposal
		 Evaluation will be done by normalizing the data to single shot (pulse) performance and will be reduced by 10 log (M_I) from sampled data. Where M is the number of independent samples. Time to independence is determined by 1 / Band Width. Sufficient evidence (including data) must be provided to be able to verify the results. Ref: Doviak, R.J. and D.S. Zrnic, 1993: Doppler Radar and Weather Observations, 2nd Ed., Academic Press Inc.,	
M13	The radar system must have an extended Nyquist velocity range of 48 m/s (using a dual-PRF technique) out to a range 240 km. Dual-PRF error rates must be less than 4.6% (see Joe et al, 1998 or Joe and May, 2004 for an explanation of this calculation).	Technical description of radar system, sampling strategies, scan strategy and data acquisition capabilities. The nominal error rate of the dual PRF or staggered PRT technique is determined by calculating the area underneath the overlapping Gaussian distribution of velocity differences assuming 1 m/s standard deviation of the weather spectra with the dual-PRF technique. (see Joe and May 2003, Joe et al, 1998). Stating the relevant radar parameters (wavelength, dual-PRF ratio and Nyquist velocities) is sufficient to evaluate this.  Figure is from Joe et al, 1998.	
M14	The radar systems must have a phase noise level of equal to or less than 0.2° measured using a delay line.	Evidence must be provided from an identical or equivalent radar and should be an average of 10 measurements or more.	

Num	Mandatory Requirements	Requirement clarification and suggested substantiation documents	Cross Reference to Proposal
M15	The radar systems must have a cross-polar correlation (ρ_{HV}) of 0.995 or higher.	This is measured from an identical or equivalent radar. It is specified as the mode of the PDF of ρ_{HV} from a light rain target using the configuration indicated in item 13 above.	
M16	The radar systems must be able to achieve an unbiased differential reflectivity (Z_{DR}) of 0 dB with a precision of +/- 0.3 dB or less	This is a measure from vertically-pointing identical or equivalent radar made in light precipitation. The variance must be estimated from the PDF of the Z_{DR}.	
M17	The radar system must have a power variance of 2 dB or less	PDF of repeated solar calibrations should vary by 2 dB or less.	
M18	The radar system must have user-configurable multi-trip suppression capability for the first-trip echo of at least 50 dB.	Technical description of radar system, sampling strategies, scan strategy, data acquisition capabilities. Must have user-configurable phase diversity suppression in the design. This will be evaluated by image(s) or data of second-trip echo suppression from an identical or equivalent radar. This must be demonstrated using data from an identical or equivalent radar	
M19	The radar filtering must be capable of clutter suppression of at least 50 dB.	Demonstrated in widespread precipitation.	
M20	The radar signal processor must produce user-selectable corrected data for at least, but not limited to, the following parameters: Z, Vr, W, SNR, SQI, K_{DP}, Z_{DR}, ρ_{HV}, φ_{dp}. The user must be able to configure the processor to apply corrections and adjustments including, but not limited to: Ground clutter rejection, multi-trip suppression, multi-trip recovery, point filter, and attenuation correction. The user must be able to request uncorrected or corrected data, the difference, or all. These moments must be user configurable and available for both polarizations.	System User manual for an identical or equivalent system. Technical design specifications, OEM published materials	
M21	The power calibration amongst radars must have a variance of 1 dB or less.	PDF of a minimum of 10 solar calibration measurements from 2 radars identical or equivalent to the proposed system. Documented Quality Management System with quality control records. Customer references, published materials.	
M22	The Bidder must provide a certificate of authorization and software support if third party software is provided.		

Num	Mandatory Requirements	Requirement clarification and suggested substantiation documents	Cross Reference to Proposal
M23	The tower is considered part of the Radar system and must not compromise the ability of the system to meet the operational requirements throughout the specified range of environmental conditions. The tower must have a design life of a minimum of 20 years and must be safe from structural failure while bearing the static and dynamic loads imposed by the radar system and environmental conditions. See Appendix G, Document G3 of Annex A - SOW, General Environmental Conditions.	Engineering analysis of the tower design	
M24	The two-way radome signal loss must be 0.5 dB or less.	MDS analysis with and without radome. Published manufacturers' specifications.	
M25	The radome must have a rigid construction and a pseudo random panel design and the antenna, tower must be designed to minimize the impact on dual-polarization parameters. The azimuthal Z_{DR} variation at 1.0°, 5.0° and 10.0° elevations must have a variation less than 0.15 dB.	Sample of Z_{DR} as a function of azimuth made at 1°, 5°, and 10° elevation angles made in wide-spread uniform light rain at 50 km. Published manufacturers' specifications.	
M26	The radar antenna assembly must produce a beam width of 1° or less for a frequency meeting Industry Canada licensing protocols regarding frequency allocation.	Antenna patterns on range.	
M27	The antenna side lobes must be -27 dB or less.	Antenna patterns on range.	
M28	The radar system must have a cross-polarization isolation of 32 dB or greater.	Antenna patterns on range.	
M29	Reliability: The Radar System overall must have a Mean Time Between Critical Failure (MTBCF) of 15,000 hours or greater while meeting sensitivity requirements with appropriate preventative maintenance.	It is suggested that the Bidder provide customer references to obtain information on performance and maintenance records for similar systems for a period of at least 5 consecutive years. Engineering calculations and test results for component life under representative operating conditions. (This could include, but is not limited to bearing life calculations, fatigue limits for stressed components, and wear analysis of durability test units.) Documentation from component manufacturers stating rated service life, indicating any correction factors applied for their actual application and usage (for example: number of cycles at given load).	
M30	Mean time between critical failure of the transmitter must meet or exceed 15,000 hours while meeting sensitivity requirements.		
M31	Mean time between critical failure of slip rings must meet or exceed 40,000 hours		
M32	Mean time between critical failure of the main components of the drive system must meet or exceed 15,000 hours.		

Num	Mandatory Requirements	Requirement clarification and suggested substantiation documents	Cross Reference to Proposal
M33	Availability: The equipment Achieved Availability (Aa) must each be greater than 97%. Aa is a measure of availability under ideal conditions. Aa assumes that an end item is unavailable only when corrective and preventive maintenance are being performed. Ideal conditions exist when the stipulated tools, parts, skilled manpower, manuals, support equipment and other required support items are available. Aa excludes delays such as ready time, supply downtime, administrative downtime, etc. Aa may be expressed as a percentage by the following formula: Aa = (1 – (CM + PM) / Ts) x 100, where Ts = specified operating time (8760 hours annually) CM = Corrective Maintenance (annual hours) PM = Preventive Maintenance (annual hours)	It is suggested that the Bidder provide customer references to obtain information on performance and maintenance records for similar systems for a period of at least 5 consecutive years. Engineering calculations and test results for component life under representative operating conditions. (This could include, but is not limited to bearing life calculations, fatigue limits for stressed components, and wear analysis of durability test units). Documentation from component manufacturers stating rated service life, indicating any correction factors applied for their actual application and usage (for example: number of cycles at given load).	
M34	The Mean Time to Repair (MTTR) for the Radar system must be no greater than 8 hours from arrival at site with equipment.	Description of the proposed Radar system and associated infrastructure. Published repair and maintenance manuals or procedures. Customer references to obtain information on the ease of maintenance and repair for similar or identical systems.	
M35	The Radar system must meet the performance requirements in Annex A while operating within the authorized and approved radar frequencies granted from Industry Canada. The Bidder will be responsible to ensure that the proposed frequencies will be authorized and approved for use by Industry Canada. Canada will be responsible for radio frequency licensing.		
M36	In order for the Radar systems in the network to work effectively as a network, they must have near identical performance in many areas, in particular, the radars:	Documented Quality Management System with quality control records. Customer references, published materials.	
M36a	(a) must have the same sensitivity to within 2 dB of each other;	For M36 (a): Difference of MDS analysis of three calibrated radar shall be 2 dB or less.	
M36b	(b) must have the same phase noise performance to within 0.05 degrees of each other;	For M36 (b): Measurements from 3 calibrated radars must be within 0.05 °of each other.	
M36c	(c) must have the same correlation performance to within 0.003 of each other; and	For M36 (c): Measurements from 3 calibrated radars must be within 0.003 of each other.	

Num	Mandatory Requirements	Requirement clarification and suggested substantiation documents	Cross Reference to Proposal
M36d	(d) must have the same Z_{DR} performance to within 0.1 and 0.1 dB of each other.	For M36 (d): Bias and variance from 3 radars must be within 0.1 and 0.1 dB of each other.	

ATTACHMENT 3 – POINT-RATED EVALUATION CRITERIA

1.0 Overview

If the Bidder's proposal passes the following point-rated evaluation, those point-rated requirements form part of the Contract deliverables in accordance with section 7.1.1 of the Contract.

The total maximum points available for the Point-Rated requirements are 1060 points. To be considered responsive, bidders must achieve a minimum pass mark of each group criteria identified in this document.

The evaluation methodology of Point-Rated requirements is described in Attachment 1 – Evaluation Methodology and Basis of Selection and are associated with the appendices in "Annex A – Statement of Work" (SOW).

The breakdown of points available by Point-Rated Requirement Group is as follows:

Point-Rated Requirements Group	Group Description	Maximum Points Available	Minimum Group Passing Score	Weighting (%)
Group 1: (R1-R3)	Corporate Requirements	45	20	5%
Group 2: R4	Beamwidth	100	0	40%
Group 3: R5	Sensitivity	100	20	20%
Group 4: (R6-R10)	System Performance	320	75	10%
Group 5: (R11-R15)	Design of Dual-Polarization Performance	180	0	10%
Group 6: R16-R20	Robustness	110	0	10%
Group 7: R21-R39	Features	205	100	5%
Total Maximum Points Available:		**1060 points**		

2.0 Point-Rated Requirements

2.1 Definitions

"Challenging" – ultimate authority lies outside the project; factors unrelated to the project can impact cost, scope, schedule; management of communications can impact project significantly.

"Complex" – involving dynamic interactions between project factors, high level of uncertainty regarding implementation, standard practices cannot be relied upon to achieve success.

"Large" scanning surveillance radar – 3 metre antenna or larger.

"Operational" – designed and operated to run constantly and be relied upon to perform to specifications with minimal downtime and manual intervention.

“Network” – systems that are designed and constructed to work together in a coordinated or standardized fashion to produce an overall service or good.

“Similar”(for any project requirements) – is defined as being substantively the same or easily scalable in scope, size, duration, or cost of the work described in this solicitation. Types of similar project activities may include, but not be limited to:

- Design, construction, installation, adaptation of large scanning radars, preferably weather radars;
- Design, installation or adjustment of highly technical systems such that they operate as a coherent and calibrated network;
- Project requiring configuration management over a number of systems and over a period of years (a minimum of 3 years);
- Large scale operational projects for, or with, government;
- Delivery of a complex project with tight timelines and heavy reporting requirements; and
- Delivery of a project with minimal flexibility for timing of milestones, both final and intermediate.

“Similar” (for any radar, system or radar system requirements) – operational or periodically operational scanning weather radar with hardware, software and functionality the same as the proposed system except for a minority of features or of an earlier generation.

2.2 Point-Rated Requirement Bidder Instructions

In order to obtain technical point(s), Bidders in preparing their bid submission, must respond to the corresponding rated requirement by providing a description explaining, demonstrating, substantiating, or justifying their capability or approach to meet the requirement. Bidders’ response should be relevant, thorough, clear, and concise.

Bidders should limit their response for each rated requirement to a maximum of 3000 words. Bidders are required to utilize the unique number identified with each point-rated requirement and the associated title in responding to the rated requirements. Bidders’ responses to the point-rated requirements will be evaluated and scored in accordance with the evaluation grid. Only bids that obtain the minimum pass mark for each respective group will be considered responsive and move to the next step in the evaluation process.

NOTE: the date of RFP closing is used as the reference point for all experience requirements. That is, “of the last X years” or “the most recent X years” means the X years immediately preceding the RFP closing date. Word with * is defined under 1.1.1 Definitions.

Num	Point-Rated Requirement	Reference in Attachment 2 – Mandatory Requirements and Suggested Substantiation Document	Scoring Scheme	Max. Points	Cross Reference to Proposal
Group 1: Corporate Requirements					
R1	**Experience – Radar systems** Further to the Radar system projects requirements described in Mandatory	See M3 in Attachment 2 – Mandatory	5 points for each criterion met	15	

Num	Point-Rated Requirement	Reference in Attachment 2 – Mandatory Requirements and Suggested Substantiation Document	Scoring Scheme	Max. Points	Cross Reference to Proposal
	Requirements M3, 5 points will be awarded where any of the project examples meets the following criteria: • Over $30M; • Spanning over 5 years; or, • Involving more than 5 sites	Requirements			
R2	**Experience – Project management** Further to the Project Management examples described in Mandatory Requirements M4, 5 points will be awarded where any of the project examples meets the following criteria: • Over $50M; • Spanning over 5 years; or • Involving a significant (>20%) change in scope, budget or schedule at the client's request.	See M4 in Attachment 2 – Mandatory Requirements	5 points for each criterion met	15	
R3	**Project Management Team** Further to the requirements provided in Mandatory Requirements M5, 3 points will be awarded for each key team member with more than 5 years' experience with large scanning weather radars in a project team role.	See M5 in Attachment 2 – Mandatory Requirements	3 points per team member meeting the criterion.	15	
Group 2: Beamwidth					
R4	Further to the requirement described in M26, the extra points will be awarded to the beam width of less than 1°.	See M26 See in Attachment 2 – Mandatory Requirements	2.5 points for each 0.01° of improvement. (example: 0.99° = 2.5 pts; 0.98 = 5 pts)	100	
Group 3: Sensitivity					

Num	Point-Rated Requirement	Reference in Attachment 2 – Mandatory Requirements and Suggested Substantiation Document	Scoring Scheme	Max. Points	Cross Reference to Proposal
R5	Further to the requirement described in M12, the extra points will be awarded when sensitivity performance is improved.	See M12 in Attachment 2 – Mandatory Requirements	5 points for each 0.5 dB of sensitivity improvement.	100	
Group 4: System Performance					
R6	Further to the requirement described in M14, the extra points will be awarded when a phase noise level is less than 0.2° measured using a delay line.	See M14 in Attachment 2 – Mandatory Requirements	5 points for each additional 0.01 ° of phase noise stability	100	
R7	Further to the requirement described in M15, the extra points will be awarded when Cross-polar correlation (ρ_{HV}) performance is higher than 0.995.	See M15 in Attachment 2 – Mandatory Requirements	15 points for every additional 0.001 improvement	75	
R8	Further to the requirement described in M18, the extra points will be awarded when the suppression capability is over 50 dB for the first-trip echo as part of the user-configurable multi-trip suppression capability.	See M18 in Attachment 2 – Mandatory Requirements	10 points for every additional 5 dB suppressed	40	
R9	Further to the requirement described in M19, the extra points will be awarded when the radar filtering has clutter suppression capability better than 50 dB.	See M19 in Attachment 2 – Mandatory Requirements	25 points for each additional 5 dB suppressed.	75	
R10	The proposed radar system will be awarded extra points if it has a solid state transmitter while meeting all the sensitivity and performance requirements stated in Annex A – Statement of Work.	Suggested substantiation document: System User manual for an identical or equivalent system. Technical design specifications, OEM published materials	0 or 30 points	30	

Num	Point-Rated Requirement	Reference in Attachment 2 – Mandatory Requirements and Suggested Substantiation Document	Scoring Scheme	Max. Points	Cross Reference to Proposal
Group 5: Design of Dual-Polarization Performance					
R11	Further to the requirement described in M16, the extra points will be awarded when the differential reflectivity (ZDR) variance is better than +/-0.30.	See M16 in Attachment 2 – Mandatory Requirements	5 points for every 0.01 dB improvement	50	
R12	Further to the requirement described in M24, the extra points will be awarded when the two-way radome signal loss is less than 0.5 dB	See M24 in Attachment 2 – Mandatory Requirements	10 points for each additional 0.1 dB of improvement	40	
R13	Further to the requirement described in M25, the extra points will be awarded when the azimuthal Z_{DR} variation at 0.5^{o} elevations has a variation less than 0.15 dB.	See M25 in Attachment 2 – Mandatory Requirements	10 points for every 0.01 dB decrease in ZDR variance	50	
R14	Further to the requirement described in M27, the extra points will be awarded when the antenna side lobe is less than -27 dB.	See M27 in Attachment 2 – Mandatory Requirements	5 points for each additional 1.0 dB improvement	20	
R15	Further to the requirement described in M28, the extra points will be awarded when the cross-polarization isolation is greater than 32 dB.	See M28 in Attachment 2 – Mandatory Requirements	5 points for each additional 1.0 dB improvement	20	
Group 6: Robustness					
R16	Further to the requirement described in M21, the extra points will be awarded when the power calibration among radars has less than a 1 dB variance.	See M21 in Attachment 2 – Mandatory Requirements	10 points for each additional 0.1 dB improvement	50	

Num	Point-Rated Requirement	Reference in Attachment 2 – Mandatory Requirements and Suggested Substantiation Document	Scoring Scheme	Max. Points	Cross Reference to Proposal
R17	Further to the requirement described in M29 to M32, the extra points will be awarded when the MTBCF of the Radar system is greater than 15,000 hours.	See M29 to M32 in Attachment 2 – Mandatory Requirements	5 points per additional 4,000 hours.	15	
R18	Further to the requirement described in M29 to M32, the extra points will be awarded when the MTBCF of the transmitter is greater than 15,000 hours.	See M29 to M32 in Attachment 2 – Mandatory Requirements	5 points per additional 4,000 hours.	15	
R19	Further to the requirement described in M29 to M32, the extra points will be awarded when the MTBCF of the slip rings is greater than 40,000 hours.	See M29 to M32 in Attachment 2 – Mandatory Requirements	5 points per additional 10,000 hours.	15	
R20	Further to the requirement described in M29 to M32, the extra points will be awarded when the MTBCF of the main components of the drive system is greater than 15,000 hours.	See M29 to M32 in Attachment 2 – Mandatory Requirements	5 points per additional 4,000 hours.	15	
Group 7: Features					
R21	The proposed Radar system will be awarded extra points if it has horizontal-only transmit and dual receive capability.	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	0 or 10 points	10	
R22	The proposed Radar system will be awarded extra points if it has but not be limited to single pulse range bin resolutions of 500m, 1 and 2 km.	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	0 or 10 points	10	
R23	The proposed Radar system will be awarded extra points if it has a single pulse range bin resolution of 5 km.	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	0 or 10 points	10	

Num	Point-Rated Requirement	Reference in Attachment 2 – Mandatory Requirements and Suggested Substantiation Document	Scoring Scheme	Max. Points	Cross Reference to Proposal
R24	The proposed Radar system will be awarded extra points if it has dual PRF ratios of 3:2. 5:4 and 7:5.	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	0 or 10 points	10	
R25	The proposed Radar system will be awarded extra points if it has over-sampling capability.	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	0 or 10 points	10	
R26	The proposed Radar system will be awarded extra points if it has multi-trip recovery capability.	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	0 or 10 points	10	
R27	The proposed Radar system will be awarded extra points if it can provide the following functionality for ground clutter suppression: • Pulse Pair; • Gaussian Model Adaptive Processing (GMAP); or • Clutter Mitigation and Detection (CMD).	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	10 points for each available functionality	30	
R28	The proposed Radar system will be awarded extra points if it has the following user selectable and configurable functionality:	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	5 points for each functionality	15	
28a	Electromagnetic Interference Suppression capability;		0 or 5 points		
28b	Wind Turbine Suppression capability; or		0 or 5 points		
28c	Sea Clutter Suppression capability.		0 or 5 points		
R29	The proposed radar will be awarded extra points if it can report absolute phase.	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	0 or 5 points	5	

Num	Point-Rated Requirement	Reference in Attachment 2 – Mandatory Requirements and Suggested Substantiation Document	Scoring Scheme	Max. Points	Cross Reference to Proposal
R30	The proposed radar will be awarded extra points if it can report refractivity.	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	0 or 5 points	5	
R31	The proposed radar will be awarded extra points if the signal processor can produce LDR data for horizontal transmit-dual receiver mode.	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	0 or 10 points	10	
R32	The proposed radar system will be awarded extra points if it can produce moment (processed quantities such as reflectivity, radial velocity) and time series (In-phase and Quadrature) data simultaneously.	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	0 or 10 points	10	
R33	The proposed radar system will be awarded extra points if it can transmit and process at least 256 samples.	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	Additional 5 points for each doubling above that (512, 1024, etc)	10	
R34	The proposed radar system will be awarded extra points if the radar data is configurable to be transmitted as single rays.	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	0 or 10 points	10	
R35	The proposed radar system will be awarded extra points if the radar moments are packed on a bin basis.	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	0 or 10 points	10	
R36	The proposed radar system will be awarded extra points if each ray can be tagged by the command and transmit power.	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	0 or 10 points	10	
R37	The proposed radar system will be	System user manual	0 or 10	10	

Num	Point-Rated Requirement	Reference in Attachment 2 – Mandatory Requirements and Suggested Substantiation Document	Scoring Scheme	Max. Points	Cross Reference to Proposal
	awarded extra points if each ray can be tagged by the noise level.	for an identical or equivalent system. Technical design specifications, OEM published materials	points		
R38	The proposed radar system will be awarded extra points if the data from the on-site meteorological station is included as part of the radar data or metadata.	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	0 or 10 points	10	
R39	The proposed radar system will be awarded extra points if the data is available in OPERA ODIM_H5 format with all mandatory data requirements.	System user manual for an identical or equivalent system. Technical design specifications, OEM published materials	0 or 10 points	10	

ATTACHMENT 4 – BIDDER'S PRICING TABLE

Note: Bidders must provide pricing for all line items, in **Canadian dollars**, the Goods and Services Tax or the Harmonized Sales Tax excluded. FOB destination, Packaging, Transportation costs and the Canadian customs duties are included, and in accordance with Annex A - Statement of Work.

Bidders must not put conditions in the pricing tables. A conditional price is not acceptable and will render the bid non-complaint.

All Firm deliverables must be received on or before March 31, 2023.

1.0 Firm Deliverables

1.1 For the supply, delivery and installation as per the specifications outlined in Annex A - Statement of Work:

Table 1 – Radar Systems

Item	Reference	Description	Quantity	Firm Unit Price	Extended Firm Price (Quantity x Firm Unit Price)
1	Annex A – Statement of Work	For the supply, delivery and installation of Radar System as described in Appendix A of Annex A – Statement of Work.	20	$	$
				Evaluated Price for Table 1:	$

Table 2 – Radar Infrastructure and Construction – Task Authorization

Note to bidder: When the Bidder is providing the pricing for the Radar Infrastructure and Construction deliverables please refer to Appendix B and Appendix G of Annex A – Statement of Work. Bidders should assume a "Greenfield" site with standard power and telecommunications available at a demarcation point on site. Note that the sites are generally level and have radar operating on site currently. The geotechnical survey provided in Appendix G is an old one from one of our existing sites and the engineering climatology data is for another of our sites (neither is in the 20 sites in the SOW). The engineering climatology data is for a 35 metre tower, which is taller than our average. The geotechnical data is likely on the easy side of average and the climatology is typical of Canada.

Item	Reference	Description	Quantity	Unit Ceiling Price	Extended Ceiling Price (Quantity x Unit Ceiling Price)
1	Annex A – Statement of Work	For the completion and acceptance of Infrastructure and Construction deliverables for the radar site as described in Appendix B of Annex A – Statement of Work.	20	$	$
				Evaluated Price for Table 2:	$

Table 3 – Project Management Services

Item	Reference	Description	Quantity	Firm Lot Price
1	Annex A – Statement of Work	For the completion and acceptance of Project Management deliverables as described in Appendix C of Annex A – Statement of Work	1	$
			Evaluated Price for Table 3:	$

Table 4 – Training

Item	Reference	Description	Quantity	Firm Lot Price
1	Annex A – Statement of Work	For the delivery of training services as described in Appendix D of Annex A – Statement of Work.	1	$
			Evaluated Price for Table 4:	$

Table 5 – Document Deliverables

Item	Reference	Description	Quantity	Firm Lot Price
1	Annex A – Statement of Work	For the completion and acceptance of Document Deliverables as described in Appendix E of Annex A – Statement of Work	1	$
			Evaluated Price for Table 5:	$

Table 6 – Total Evaluated Price for Firm Deliverables

Total Evaluated Price for Firm Deliverables = Evaluated Price of (Table 1 + Table 2 + Table 3 + Table 4 + Table 5)	**$**

2.0 Optional Deliverables

Table 7 – Optional Radar Systems

Item	Reference	Description	Quantity	Firm Unit Price	Extended Firm Price (Quantity x Firm Unit Price)
1	Annex A – Statement of Work	For the supply, delivery and installation of Optional Radar System with the same deliverables as described in Appendix A of Annex A – Statement of Work.	Up to 13	$	$
				Evaluated Price for Table 7:	$

Table 8 – Optional Radar Infrastructure and Construction – Task Authorization

Item	Reference	Description	Quantity	Unit Ceiling Price	Extended Ceiling Price (Quantity x Unit Ceiling Price)
1	Annex A – Statement of Work	For the completion and acceptance of Infrastructure and Construction deliverables for the radar site with the same deliverables as described in Appendix B of Annex A – Statement of Work.	Up to 13	$	$
				Evaluated Price for Table 8:	$

Table 9 – Optional Project Management Services

Item	Reference	Description	Quantity	Unit Firm Price	Extended Firm Price (Quantity x Unit Firm Price)
1	Annex A – Statement of Work	For the completion and acceptance of Project Management services with the same deliverables as described in Appendix C of Annex A – Statement of Work	Up to 13	$	$
				Evaluated Price for Table 9:	$

Table 10 – Optional Training Services

Item	Reference	Description	Quantity	Firm Unit Price	Extended Firm Price (Quantity x Firm Unit Price)
1	Annex A – Statement of Work	For the delivery of training services as described in Appendix D of Annex A – Statement of Work.	Up to 13	$	$
				Evaluated Price for Table 10:	$

Table 11 – Optional Document Deliverables

Item	Reference	Description	Quantity	Firm Unit Price	Extended Firm Price (Quantity x Firm Unit Price)
1	Annex A – Statement of Work	For the completion and acceptance of Document Deliverables as described in Appendix E of Annex A – Statement of Work	Up to 13	$	$
				Evaluated Price for Table 11:	$

Table 12 – Optional Specialized Professional Services – Task Authorization

Item	Category	Description	Hourly Rate	Estimated Hours	Extended Price (Hourly Rate x Estimated Hours)
1	Jr. Technician	As described in Appendix F of Annex A – Statement of Work	$	145 hours	$
2	Sr. Technician	As described in Appendix F of Annex A – Statement of Work	$	200 hours	$
3	Jr. Engineer	As described in Appendix F of Annex A – Statement of Work	$	130 hours	$
4	Sr. Engineer	As described in Appendix F of Annex A – Statement of Work	$	105 hours	$
5	IT/Software Engineer	As described in Appendix F of Annex A – Statement of Work	$	205 hours	$
6	Trainer	As described in Appendix F of Annex A – Statement of Work	$	300 hours	$
				Evaluated Price for Table 12:	$

Table 13 – Total Evaluated Price for Optional Deliverables

Total Evaluated Price for Optional Deliverables = Evaluated Price of (Table 7 + Table 8+ Table 9 +Table 10 + Table 11 + Table 12)	**$**

Table 14 – Total Evaluated Price for the Bid

Total Evaluated Price for the bid = Total Evaluated Price of (Table 6 + Table 13)	**$**

Form 1 - Software Publisher Certification Form (to be used where the Bidder itself is the Software Publisher)
The Bidder certifies that it is the software publisher of all the following software products and that it has all the rights necessary to license them (and any non-proprietary sub-components incorporated into the software) on a royalty-free basis to Canada pursuant to the terms set out in the resulting contract: _____ _____ _____ _____ *[bidders should add or remove lines as needed]*

Form 2 - Software Publisher Authorization Form
(to be used where the Bidder is not the Software Publisher)

This confirms that the software publisher identified below has authorized the Bidder named below to license its proprietary software products under the contract resulting from the bid solicitation identified below. The software publisher acknowledges that no shrink-wrap or click-wrap or other terms and conditions will apply, and that the contract resulting from the bid solicitation (as amended from time to time by its parties) will represent the entire agreement, including with respect to the license of the software products of the software publisher listed below. The software publisher further acknowledges that, if the method of delivery (such as download) requires a user to "click through" or otherwise acknowledge the application of terms and conditions not included in the bid solicitation, those terms and conditions do not apply to Canada's use of the software products of the software publisher listed below, despite the user clicking "I accept" or signaling in any other way agreement with the additional terms and conditions.

This authorization applies to the following software products:

_____

_____

[bidders should add or remove lines as needed]

Name of Software Publisher (SP) _____

Signature of authorized signatory of SP _____

Print Name of authorized signatory of SP _____

Print Title of authorized signatory of SP _____

Address for authorized signatory of SP _____

Telephone no. for authorized signatory of SP _____

Fax no. for authorized signatory of SP _____

Date signed _____

Solicitation Number _____

Name of Bidder _____

Form 3 - OEM Certification Form
This confirms that the original equipment manufacturer (OEM) identified below has authorized the Bidder named below to provide and maintain its products under any contract resulting from the bid solicitation identified below.

Name of OEM _____

Signature of authorized signatory of OEM _____

Print Name of authorized signatory of OEM _____

Print Title of authorized signatory of OEM _____

Address for authorized signatory of OEM _____

Telephone no. for authorized signatory of OEM _____

Fax no. for authorized signatory of OEM _____

Date signed _____

Solicitation Number _____

Name of Bidder _____