



RETURN BIDS TO:

RETOURNER LES SOUMISSIONS À:

**Bid Receiving Public Works and Government
Services Canada/Réception des soumissions
Travaux publics et Services gouvernementaux
Canada**

**Government of Canada Building
101 - 22nd Street East
Suite 110
Saskatoon
Saskatchewan
S7K 0E1
Bid Fax: (306) 975-5397**

**REQUEST FOR PROPOSAL
DEMANDE DE PROPOSITION**

**Proposal To: Public Works and Government
Services Canada**

We hereby offer to sell to Her Majesty the Queen in right of Canada, in accordance with the terms and conditions set out herein, referred to herein or attached hereto, the goods, services, and construction listed herein and on any attached sheets at the price(s) set out therefor.

**Proposition aux: Travaux Publics et Services
Gouvernementaux Canada**

Nous offrons par la présente de vendre à Sa Majesté la Reine du chef du Canada, aux conditions énoncées ou incluses par référence dans la présente et aux annexes ci-jointes, les biens, services et construction énumérés ici sur toute feuille ci-annexée, au(x) prix indiqué(s).

Comments - Commentaires

Title - Sujet Avalanche Detection Network	
Solicitation No. - N° de l'invitation 5P435-180223/A	Date 2018-06-18
Client Reference No. - N° de référence du client 5P435-180223	
GETS Reference No. - N° de référence de SEAG PW-\$STN-205-5066	
File No. - N° de dossier STN-7-40059 (205)	CCC No./N° CCC - FMS No./N° VME
Solicitation Closes - L'invitation prend fin at - à 02:00 PM on - le 2018-07-30	Time Zone Fuseau horaire Central Standard Time CST
F.O.B. - F.A.B. Plant-Usine: <input type="checkbox"/> Destination: <input type="checkbox"/> Other-Autre: <input type="checkbox"/>	
Address Enquiries to: - Adresser toutes questions à: Baessler, Nancy	Buyer Id - Id de l'acheteur stn205
Telephone No. - N° de téléphone (306) 241-2826 ()	FAX No. - N° de FAX () -
Destination - of Goods, Services, and Construction: Destination - des biens, services et construction: PARKS CANADA Gilles Lussier CO Highway Engineering Services 301B 3RD ST WEST P.O.BOX 350 REVELSTOKE British Columbia V0E2S0 Canada	

Instructions: See Herein

Instructions: Voir aux présentes

Vendor/Firm Name and Address

**Raison sociale et adresse du
fournisseur/de l'entrepreneur**

Issuing Office - Bureau de distribution

Public Works and Government Services Canada/Réception
des soumissions Travaux publics et Services gouvernementaux
Canada
Government of Canada Building
101 - 22nd Street East
Suite 110
Saskatoon
Saskatchewan
S7K 0E1

Delivery Required - Livraison exigée See Herein	Delivery Offered - Livraison proposée
Vendor/Firm Name and Address Raison sociale et adresse du fournisseur/de l'entrepreneur	
Telephone No. - N° de téléphone Facsimile No. - N° de télécopieur	
Name and title of person authorized to sign on behalf of Vendor/Firm (type or print) Nom et titre de la personne autorisée à signer au nom du fournisseur/ de l'entrepreneur (taper ou écrire en caractères d'imprimerie)	
Signature	Date

TABLE OF CONTENTS

PART 1 - GENERAL INFORMATION	2
1.1 REQUIREMENT.....	2
1.2 DEBRIEFINGS.....	2
1.3 TRADE AGREEMENTS.....	2
PART 2 - BIDDER INSTRUCTIONS	3
2.1 STANDARD INSTRUCTIONS, CLAUSES AND CONDITIONS	3
2.2 SUBMISSION OF BIDS	3
2.3 ENQUIRIES - BID SOLICITATION	3
2.4 APPLICABLE LAWS	3
PART 3 - BID PREPARATION INSTRUCTIONS	4
3.1 BID PREPARATION INSTRUCTIONS.....	4
PART 4 - EVALUATION PROCEDURES AND BASIS OF SELECTION	6
4.1 EVALUATION PROCEDURES	6
4.2 BASIS OF SELECTION	6
PART 5 – CERTIFICATIONS AND ADDITIONAL INFORMATION	7
5.1 CERTIFICATIONS REQUIRED WITH THE BID.....	7
5.2 CERTIFICATIONS PRECEDENT TO CONTRACT AWARD AND ADDITIONAL INFORMATION.....	7
PART 6 - RESULTING CONTRACT CLAUSES	9
6.1 SECURITY REQUIREMENTS	9
6.2 STATEMENT OF WORK	9
6.3 STANDARD CLAUSES AND CONDITIONS	9
6.4 TERM OF CONTRACT.....	9
6.5 AUTHORITIES.....	10
6.6 PAYMENT.....	11
6.7 INVOICING INSTRUCTIONS.....	12
6.8 CERTIFICATIONS AND ADDITIONAL INFORMATION	13
6.9 APPLICABLE LAWS	13
6.10 PRIORITY OF DOCUMENTS	13
6.11 INSURANCE REQUIREMENTS.....	13
ANNEX "A"	14
STATEMENT OF WORK	14
ANNEX "B"	26
BASIS OF PAYMENT	26
ANNEX "C"	28
MANDATORY TECHNICAL CRITERIA	28
ANNEX "D" TO PART 3 OF THE BID SOLICITATION	30
ELECTRONIC PAYMENT INSTRUMENTS.....	30
ANNEX "E" TO PART 5 OF THE BID SOLICITATION	31
FEDERAL CONTRACTORS PROGRAM FOR EMPLOYMENT EQUITY – CERTIFICATION.....	31
ANNEX "F"	32
ENVIRONMENTAL ASSESSMENT CHECKLIST	32
ANNEX "G"	36
INSURANCE REQUIREMENTS.....	36

Solicitation No. - N° de sollicitation
5P435-180223/A
Client Ref. No. - N° de réf. du client
5P435-180223

Amd. No. - N° de la modif.
File No. - N° du dossier
STN-7-40059

Buyer ID - Id de l'acheteur
STN205
CCC No./N° CCC - FMS No./N° VME

PART 1 - GENERAL INFORMATION

1.1 Requirement

Parks Canada Agency (PCA) is seeking a Contractor to carry out the design, supply, install, monitoring, calibrations and maintenance of a comprehensive Avalanche Detection Network (AND) that will provide continuous avalanche activity monitoring in slide paths which effect the Trans-Canada Highway (TCH) through Glacier National Park (GNP) during the winter months.

1.2 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.

1.3 Trade Agreements

The requirement is subject to the provisions of the World Trade Organization Agreement on Government Procurement (WTO-AGP), the North American Free Trade Agreement (NAFTA), the Canada-European Union Comprehensive Economic and Trade Agreement (CETA), and the Canadian Free Trade Agreement (CFTA).

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) (<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](#) (2017-04-27) 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: 120 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 5 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 British Columbia.

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

Due to the nature of the bid solicitation, bids transmitted by epost Connect service and by facsimile will not be accepted.

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

Section I: Technical Bid (two hard copies and one soft copy on USB key)
Section II: Financial Bid (two hard copies and one soft copies on USB key)
Section III: Certifications (one hard copy)

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.

Canada requests that bidders follow the format instructions described below in the preparation of hard copy of their bid:

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

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) (<http://www.tpsgc-pwgsc.gc.ca/ecologisation-greening/achats-procurement/politique-policy-eng.html>). To assist Canada in reaching its objectives, bidders should:

- 1) 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
- 2) 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.

Section I: Technical Bid

In their technical bid, Bidders should explain and demonstrate how they propose to meet the requirements and how they will carry out the Work.

Section II: Financial Bid

Bidders must submit their financial bid in accordance with the Basis of Payment.

3.1.1 Electronic Payment of Invoices – Bid

If you are willing to accept payment of invoices by Electronic Payment Instruments, complete Annex "D" Electronic Payment Instruments, to identify which ones are accepted.

If Annex "D" Electronic Payment Instruments is not completed, it will be considered as if Electronic Payment Instruments are not being accepted for payment of invoices.

Acceptance of Electronic Payment Instruments will not be considered as an evaluation criterion.

Solicitation No. - N° de sollicitation
5P435-180223/A
Client Ref. No. - N° de réf. du client
5P435-180223

Amd. No. - N° de la modif.
File No. - N° du dossier
STN-7-40059

Buyer ID - Id de l'acheteur
STN205
CCC No./N° CCC - FMS No./N° VME

3.1.2 Exchange Rate Fluctuation

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

3.1.3 SACC Manual Clauses

A9076T Improvement of Requirement During Solicitation Period 2007-05-25

Section III: Certifications

Bidders must submit the certifications and additional information required under Part 5.

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.
- (b) An evaluation team composed of representatives of Canada will evaluate the bids.

4.1.1 Technical Evaluation

4.1.1.1 Mandatory Technical Criteria

Mandatory Technical Evaluation Criteria detailed in Annex 'C'.

4.1.2 Financial Evaluation

SACC *Manual* Clause [A0220T](#) (2014-06-26), Evaluation of Price

4.2 Basis of Selection

4.2.1 Mandatory Technical Criteria

SACC *Manual* Clause [A0031T](#) (2010-08-16), Basis of Selection – Mandatory Technical Criteria

PART 5 – CERTIFICATIONS AND ADDITIONAL INFORMATION

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

The certifications provided by Bidders to Canada are subject to verification by Canada at all times. Unless specified otherwise, Canada will declare a bid non-responsive, or will declare a contractor in default 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 will render the bid non-responsive or constitute a default under the Contract.

5.1 Certifications Required with the Bid

Bidders must submit the following duly completed certifications as part of their bid.

5.1.1 Integrity Provisions - Declaration of Convicted Offences

In accordance with the Integrity Provisions of the Standard Instructions, all bidders must provide with their bid, **if applicable**, the declaration form available on the [Forms for the Integrity Regime](http://www.tpsgc-pwgsc.gc.ca/ci-if/declaration-eng.html) website (<http://www.tpsgc-pwgsc.gc.ca/ci-if/declaration-eng.html>), to be given further consideration in the procurement process.

5.2 Certifications Precedent to Contract Award and Additional Information

The certifications and additional information listed below should be submitted with the bid, but may be submitted afterwards. If any of these required certifications or additional information 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 provide the certifications or the additional information listed below within the time frame provided will render the bid non-responsive.

5.2.1 Integrity Provisions – Required Documentation

In accordance with the section titled Information to be provided when bidding, contracting or entering into a real procurement agreement of the [Ineligibility and Suspension Policy](http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html) (<http://www.tpsgc-pwgsc.gc.ca/ci-if/politique-policy-eng.html>), the Bidder must provide the required documentation, as applicable, to be given further consideration in the procurement process.

5.2.2 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 available at the bottom of the page of the [Employment and Social Development Canada \(ESDC\) - Labour's](https://www.canada.ca/en/employment-social-development/programs/employment-equity/federal-contractor-program.html#) website (<https://www.canada.ca/en/employment-social-development/programs/employment-equity/federal-contractor-program.html#>).

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.

Solicitation No. - N° de sollicitation
5P435-180223/A
Client Ref. No. - N° de réf. du client
5P435-180223

Amd. No. - N° de la modif.
File No. - N° du dossier
STN-7-40059

Buyer ID - Id de l'acheteur
STN205
CCC No./N° CCC - FMS No./N° VME

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 titled 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.

PART 6 - RESULTING CONTRACT CLAUSES

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

6.1 Security Requirements

6.1.1 There is no security requirement applicable to the Contract.

6.2 Statement of Work

The Contractor must provide the items detailed under the Statement of Work at Annex "A".

6.3 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) (<https://buyandsell.gc.ca/policy-and-guidelines/standard-acquisition-clauses-and-conditions-manual>) issued by Public Works and Government Services Canada.

6.3.1 General Conditions

[2010A](#) (2016-04-04), General Conditions - Goods (Medium Complexity), apply to and form part of the Contract.

6.4 Term of Contract

The period of the Contract is from date of Contract to **2021-03-31** inclusive.

6.4.1 Period of the Contract

The Contractor grants to Canada the irrevocable option to extend the term of the Contract by up to one additional three 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.

Canada may exercise this option at any time by sending a written notice to the Contractor at least 30 calendar days before the expiry date of the Contract. The option may only be exercised by the Contracting Authority, and will be evidenced for administrative purposes only, through a contract amendment.

6.4.2 Delivery Date

All the deliverables must be received on or before **2021-03-31**.

6.4.3 Delivery Points

Delivery of the requirement will be made to delivery point(s) specified at Annex "A" of the Contract.

6.4.4 Liquidated Damages

1. If the Contractor fails to deliver the goods within the time specified in the Contract, the Contractor agrees to pay to Canada liquidated damages in the amount of **\$500.00** for each calendar day of delay. The total amount of the liquidated damages must not exceed five percent (5%) of the contract price.
2. Canada and the Contractor agree that the amount stated above is their best pre-estimate of the loss to Canada in the event of such a failure, and that it is not intended to be, nor is it to be interpreted as, a penalty.
3. Canada will have the right to hold back, drawback, deduct or set off from and against the amounts of any monies owing at any time by Canada to the Contractor, any liquidated damages owing and unpaid under this section.
4. Nothing in this section must be interpreted as limiting the rights and remedies which Canada may otherwise have under the Contract.

6.5 Authorities

6.5.1 Contracting Authority

The Contracting Authority for the Contract is:

Nancy Baessler, Procurement Specialist
Public Works and Government Services Canada
Acquisitions Branch, Western Region
Suite 110, 101 22nd Street East
Saskatoon, SK
S7K 0E1
Telephone: 306-241-2826
E-mail address: nancy.baessler@pwgsc-tpsgc.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.

6.5.2 Project Authority

The Project Authority for the Contract is:

To be determined and inserted 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.

Solicitation No. - N° de sollicitation
5P435-180223/A
Client Ref. No. - N° de réf. du client
5P435-180223

Amd. No. - N° de la modif.
File No. - N° du dossier
STN-7-40059

Buyer ID - Id de l'acheteur
STN205
CCC No./N° CCC - FMS No./N° VME

6.5.3 Contractor's Representative

(Bidder to Complete)

Name: _____

Title: _____

Organization: _____

Address: _____

Telephone: ____ - ____ - _____

Facsimile: ____ - ____ - _____

E-mail address: _____

6.6 Payment

6.6.1 Basis of Payment

The Contractor will be paid for its costs reasonably and properly incurred in the performance of the Work, in accordance with the Basis of Payment in Annex B, to a limitation of expenditure of \$ _____ (*insert the amount at contract award*). Customs duties are included and Applicable Taxes are extra.

6.6.2 Limitation of Expenditure

1. Canada's total liability to the Contractor under the Contract must not exceed \$ _____. Customs duties are included and Applicable Taxes are extra.

No increase in the total liability of Canada or in the price of the Work 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 approved, in writing, by the Contracting Authority before their incorporation into the Work. The Contractor must not perform any work or provide any service that would result in Canada's total liability being exceeded before obtaining the written approval of the Contracting Authority. The Contractor must notify the Contracting Authority in writing as to the adequacy of this sum:

- a. when it is 75% committed, or
- b. four months before the contract expiry date, or
- c. as soon as the Contractor considers that the contract funds provided are inadequate for the completion of the Work,

whichever comes first.

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.

6.6.3 Multiple Payments

Canada will pay the Contractor upon completion and delivery of units 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.

6.6.4 Contract Financial Security

1. The Contractor must provide one of the following contract financial securities within 10 calendar days after the date of contract award:
 - a. a performance bond form [PWGSC-TPSGC 505](#) in the amount of 10% percent of the Contract Price; or
 - b. a performance bond form [PWGSC-TPSGC 505](#) and a labour and material payment bond form [PWGSC-TPSGC 506](#), each in the amount of 10% percent of the Contract Price; or
 - c. a labour and material payment bond form [PWGSC-TPSGC 506](#) in the amount of 10% percent of the Contract Price; or
 - d. a security deposit as defined in clause [E0008C](#) in the amount of 10% percent of the Contract Price.

Any bond must be accepted as security by one of the bonding companies listed in [Treasury Board Contracting Policy, Appendix L](#), Acceptable Bonding Companies.

2. Security deposits in the form of government guaranteed bonds with coupons attached will be accepted only if all coupons that are unmaturing, at the time the security deposit is provided, are attached to the bonds. The Contractor must provide written instructions concerning the action to be taken with respect to coupons that will mature while the bonds are pledged as security, when such coupons are in excess of the security deposit requirement.
3. If Canada does not receive the required financial security within the specified period, Canada may terminate the Contract for default pursuant to the Contract default provision.

6.6.5 SACC Manual Clauses

A9117C	T1204 – Direct Request by Customer Department	2007-11-30
E0008C	Security Deposit Definition – Contract	2014-09-25

6.6.6 Electronic Payment of Invoices – Contract

The Contractor accepts to be paid using any of the following Electronic Payment Instrument(s):

VISA Acquisition Card;
MasterCard Acquisition Card;
Direct Deposit (Domestic and International);
Electronic Data Interchange (EDI);
Wire Transfer (International Only);
Large Value Transfer System (LVTS) (Over \$25M)

6.7 Invoicing Instructions

1. The Contractor must submit invoices in accordance with the section entitled "Invoice Submission" of the general conditions. Invoices cannot be submitted until all work identified in the invoice is completed.
2. Invoices must be distributed as follows:

- a. The original and one (1) copy must be forwarded to the address shown on page 1 of the Contract for certification and payment.

6.8 Certifications and Additional Information

6.8.1 Compliance

Unless specified otherwise, the continuous compliance with the certifications provided by the Contractor in its bid or precedent to contract award, and the ongoing cooperation in providing additional information are conditions of the Contract and failure to comply will constitute the Contractor in default. Certifications are subject to verification by Canada during the entire period of the Contract.

6.8.2 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.

6.9 Applicable Laws

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

6.10 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 general conditions 2010A (2016-04-04), Goods (Medium Complexity);
- (c) Annex A, Statement of Work;
- (d) Annex B, Basis of Payment;
- (e) the Contractor's bid dated _____

6.11 Insurance Requirements

The Contractor must comply with the insurance requirements specified in Annex G. 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.

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.

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.

ANNEX "A"

STATEMENT OF WORK

SW1 Title

Avalanche Detection Network - Glacier National Park, British Columbia

SW2 Background

Parks Canada Agency (PCA) is seeking a Contractor to carry out the design, supply, install, monitoring, calibration and maintenance of a comprehensive Avalanche Detection Network (ADN) that will provide continuous avalanche activity monitoring in slide paths which affect the Trans-Canada Highway (TCH) through Glacier National Park (GNP) during the winter months.

The TCH is a critical transportation corridor within British Columbia and a vital link in Canada's national highway network. The operational efficiency of this section of highway in the winter months relies heavily on effective avalanche control using both passive and active mitigation strategies.

In 2015, the Government of Canada launched the Trans-Canada Highway - Avalanche Mitigation Project for Glacier National Park. The objectives of this project are to reduce closures and improve winter road safety through numerous strategies including traffic storage expansion, snow shed rehabilitations, improved signage, and upgraded avalanche mitigation structures and systems.

Infrasound technology for the detection of snow avalanches was tested in GNP over the 2016-17 winter season (December 24, 2016 to May 11, 2017). An evaluation of the technology was performed by Montana State University (MSU) and this ADN Statement of Work is based in part on MSU's recommendations.

SW3 Scope

The objective of the ADN is to provide the GNP Avalanche Control Section (ACS) with confirmation of avalanche activity in specific paths, improving avalanche forecasting and timing of winter road closures. The result is expected to be improved winter avalanche control and a reduction in winter road closure hours.

The work consists of the design, supply, installation, monitoring, calibration and maintenance of an ADN that must provide continuous avalanche activity monitoring in slide paths from approximately TCH km 14+200 to km 43+700. The ADN must include a comprehensive operational user-interface, four (4) Radar Detection Systems and thirteen (13) Infrasound Detection Systems. See Annex A-1 for approximate locations of Infrasound Detection Systems and Radar Detection Systems. The work also includes the design and construction of one permanent helicopter landing pad.

The Contractor must provide all the necessary facilities, materials, state-of-the-art equipment and an experienced install team to access the sites and carry out the work described in this SOW. The Contractor must also provide ongoing monitoring, maintenance and calibration services, and technical support, by a team experienced in ADN calibration and associated algorithm refinement. The Contractor must train PCA staff to operate and perform routine maintenance on the system throughout the project and service agreement duration.

SW4 Objectives

The objectives of the ADN acquisition are:

Solicitation No. - N° de sollicitation
5P435-180223/A
Client Ref. No. - N° de réf. du client
5P435-180223

Amd. No. - N° de la modif.
File No. - N° du dossier
STN-7-40059

Buyer ID - Id de l'acheteur
STN205
CCC No./N° CCC - FMS No./N° VME

1. **Manufacture & Supply:** To manufacture all components and transport all required equipment and materials for the ADN, and one permanent helipad, to the described locations within the timeframe laid out in this SOW.
2. **Install, Calibrate, Monitor, Maintain & Train:** To install all required components of the ADN, and one permanent helipad, at the described locations within the timeframe laid out in this SOW. To process the avalanche activity data collected by the ADN and the associated avalanche observations provided by ACS and refine the algorithms to improve Probably of Detection (POD) and Probability of Non-Events (PON) scores according to the requirements laid out in this SOW. To monitor the ADN and provide 24h technical support during the Contract duration. To provide maintenance services for all ADN components during the Contract duration, including routine maintenance, repairs, spare parts, and removal and replacement of infrasound sensors, power sources and other seasonally removable infrastructure in spring and fall. To train PCA staff throughout the Contract duration in the operation of the system, routine maintenance, and basic troubleshooting.

SW5 Objectives for Optional Contract Extension

The objectives of the Optional work are:

1. **Ongoing Calibration, Monitoring, Maintenance & Training:** To process the avalanche activity data collected by the ADN and the associated avalanche observations provided by ACS and refine the algorithms as required. To monitor the ADN and provide 24h technical support. To provide maintenance services for all ADN components, including routine maintenance, repairs, spare parts, and removal and replacement of infrasound sensors, power sources and other seasonally removable infrastructure in spring and fall. To train PCA staff in the operation of the system, routine maintenance, and basic troubleshooting.

PCA reserves the right to determine the duration of the Optional Contract Extension based on final financial evaluation.

SW6 Detailed Technical Specifications

SW6.1 Task 1: Design, Manufacture & Supply

ADN manufacture & supply must meet the following criteria:

- .1 All designs and implementations must conform to the requirements of any licenses, permits, registrations or guidelines issued by any Canadian authority having jurisdiction.
- .2 The ADN must have a design life of 15 years. The permanent helipad must have a design life of 20 years.
- .3 The entire ADN, including, but not limited to, all electronic and electrical components, must be operable and remain able to detect snow avalanches in all weather conditions encountered in GNP, specifically for a location that receives equivalent weather conditions to the proposed sites, as observed in the 30 year (1981-2010) Canadian Climate Normals for Glacier NP Mt Fidelity Station. Data for this station is publicly available at the following Government of Canada website:

http://climate.weather.gc.ca/climate_normals/results_1981_2010_e.html?stnID=1345&lang=&Code=&dispBack=0&StationName=&SearchType=Contains&province=&provBut=Go&month1=0&month2=11&submit=View (or general page: https://weather.gc.ca/canada_e.html).

- .4 The design and construction of the ADN must ensure that all installed components are able to withstand the effects of natural forces that will be encountered at each location where the components are installed. These forces include, but are not limited to, the effects of avalanche, rock fall, seasonal snow cover, seasonal flooding, snow glide, snow creep, wind loads and damage from wildlife.
- .5 All parts of the ADN must be treated to inhibit or prevent rust or made of material that prevents rust.
- .6 Each device and component of the radar detection systems must be protected from the effects of lightning.
- .7 The radar systems must be installed on structurally engineered foundations that must provide adequate height to components and structures that are designed to be accessed or to operate above the snow surface.
- .8 The Contractor must prepare all foundation engineered form work drawings, concrete drawings and drawings of any other structures.
- .9 Tolerances in fabrication and installation to be as per Manufacturer's recommendations.
- .10 All infrasound systems supplied and installed under this SOW must be manufactured by the same supplier.
- .11 All radar systems supplied and installed under this SOW must be manufactured by the same supplier.
- .12 The Contractor must supply two devices (PC / Lap-top / Tablet) for monitoring the data, full versions of all necessary software and hardware licenses and any necessary sim cards and subscriptions (e.g. mobile plan) required for data transfer or communication for the Contract duration. The two devices must be of the same type, make and model. [GL1]
- .13 The Contractor must submit an outline of the procurement process for consumables, including a list of suppliers, transportation requirements, and permits and licensing.
- .14 The Contractor must supply all consumables required for the testing and operation of all systems for the Contract duration. The purchase of any additional consumables required beyond the Contract duration must be negotiated by Parks and must be separate to this Contract. The Contractor must be able to supply all consumables required by the system to PCA should Parks request this service.

SW6.2 Task 2: Install, Calibrate, Monitor, Maintain & Train

- .1 The Contractor must install thirteen (13) Infrasound Detection Systems at the locations shown on Figure 1 in Annex A-1. Minor adjustments to the final locations may be made in the field and will be subject to the approval of Parks Canada Agency. Digital Elevation Models are publicly available at: <http://maps.canada.ca/czs/index-en.html>
- .2 The Contractor must install four (4) Radar Detection Systems at the locations shown on Figure 1 in Annex A-1. The Radar Detection Systems must reliably detect avalanches (according to the criteria laid out in this SOW) within the target areas shown on Figure 2 in Annex A-1. Alternate locations for Radar Detection Systems which meet the criteria laid out in this SOW will be considered by the Parks Canada Agency. Final locations are subject to the approval of the Parks Canada Agency and may be subject to field adjustments to minimize cultural and environmental impacts. Digital Elevation Models are publicly available at: <http://maps.canada.ca/czs/index-en.html>
- .3 The Contractor must design and construct one permanent helicopter landing pad adjacent to the Avalanche Crest & Abbott Radar Detection System location. See Figure 1 in Annex A-1.

- .4 The permanent helicopter landing pad must adhere to the BC Hydro Helipad Location and Installation Technical Procedure (see reference document Standard ESC41C January 2012). The Contractor must construct one permanent helicopter landing pad at the work site which facilitates access to the Radar Detection System for construction, operations and maintenance work for on the Radar Detection System for the duration of its design life. The helicopter landing pad dimensions must be 16 feet by 20 feet and be designed for both a Bell 407 and B2 helicopters. Helipad designs must be signed and sealed by a qualified Professional Engineer registered to practice in BC, and conform to all relevant codes and regulations. Final locations are subject to approval by Parks Canada Agency.
- .5 Exact final locations must be determined during a field visit immediately following Contract Award. A Parks Environmental Surveillance Officer (ESO) and a Parks Cultural Resource Management Advisor (CRMA) must attend the field visit.
- .6 Clearing and brushing of vegetation must be kept to an absolute minimum.
- .7 Any clearing or brushing necessary for the install or operation of the ADN must be completed outside the bird nesting window (April 1 – August 31). Permission is required in advance from a PCA Environmental Surveillance Officer (ESO) in the case that clearing or brushing must take place inside the bird nesting window. If permitted by the ESO, the Contractor must engage the services of a Qualified Environmental Professional (QEP) to perform bird nest surveys prior to the work. Any costs incurred for clearing or brushing inside the bird nesting window, including engaging a QEP, will be incidental to the work and no additional payment will be made.
- .8 The Contractor must adhere to PCA's Accidental Finds protocol, for any culturally relevant finds onsite:
 - .1 There is a chance, however low, that features or artifact concentrations are encountered in the course of construction or ground disturbance. If significant features (e.g. „structural remains and/or high artifact concentrations) are encountered, work must stop in the immediate area, photographs and a GIS reading must be taken, and the Parks Canada project manager informed. The project manager must then contact Parks Canada's Terrestrial Archaeology section for advice and assessment of significance that will in turn determine what will be required to mitigate the chance find.
 - .2 What is a significant find? It is possible that a scattering of historic objects will be found in the project areas. Isolated finds of such things as tin cans or bottles are not reason to stop work. If there is a particularly interesting specimen, it could be set aside for the archaeologist to collect later. Concentrations of them are significant, however, and so are structural features like log cabin foundations, tent platforms, or log cribbing retaining features. Encountering any of these is a stop work situation, as is the accidental find of human remains.
- .9 All installs will take place outside avalanche paths or in extreme runout zones, however, there remains the remote possibility of encountering unexploded ordnance (UXOs) from ongoing avalanche control with howitzer ammunition. The Contractor must take any necessary precautions to ensure the safety of workers, and if encountered, stop work and report UXOs to PCA immediately.
- .10 All components of the ADN must be installed such that visual inspections of all components can take place in the spring and fall. Cables must be installed on the ground surface, not buried. All components must remain in place year-round except the infrasound sensors which must be removed each spring and replaced each fall.
- .11 Each infrasound and radar system must have a self-contained power supply, configured such that re-fueling or routine maintenance is not required during the avalanche season (November 1 through May 31) after the Final Calibration Date. Fuel cells, solar panels and small wind generators may be used. From Contract Award until the Final Calibration Date, the Contractor is responsible for re-filling of fuel cells mid-winter when necessary. After the Final Calibration Date, each fuel cell must be filled once in the fall and fuel cell sizes must be adjusted such that no mid-winter refilling is necessary. The Contractor must include power requirement estimates, and a suggested power source combination, for each system with their bid submission. Power source combinations may be altered after Contract Award however no additional payment will be made for such alterations.

- .12 An Infrasonnd Detection System includes, but is not limited to, all components, electronics, sensors, cables, power sources and specialized equipment required to fulfill the requirements of this SOW at each of the thirteen Infrasonnd Detection System locations. Infrasonnd Detection Systems must conform to the following criteria:
- .1 Infrasonnd Detection Systems must be installed at the locations shown on Figure 1 in Annex A-1. Any changes to these locations are subject to approval by the Parks Canada Agency.
 - .2 Each Infrasonnd Detection System must reliably detect all avalanches > Size 2 (see Table 1 in Annex A-1) within a 3 km radius.
 - .3 Each Infrasonnd Detection System must be composed of a minimum of four sensors.
 - .4 At locations where Infrasonnd Detection Systems are subject to avalanche impacts (or other natural hazards), they must be designed to withstand such impacts. See Table 2 in Annex A-1 for site descriptions of areas subject to avalanche impacts.
 - .5 All components must be located (or protected) such that their performance is not affected by seasonal flooding during snow melt and/or high stream or river levels. See Table 2 in Annex A-1 for site descriptions of areas subject to flooding.
- .13 A Radar Detection System includes, but is not limited to, all foundations, masts, power sources and specialized equipment required to fulfill the requirements of this SOW at each of the Radar Detection System locations. Radar Detection Systems must conform to the following criteria:
- .1 At locations where Radar Detection Systems are subject to avalanche impacts (or other natural hazards), they must be designed to withstand such impacts. See Table 2 in Annex A-1.
 - .2 At a minimum, the Radar Detection Systems must reliably detect avalanches \geq Size 2 (see Table 1 in Annex A-1) within the target areas shown on Figure 2 in Annex A-1. See Table 3 in Annex A-1 for accuracy of detection requirements.
 - .3 The Radar Detection Systems must reliably determine if any avalanche has stopped within or exceeded the target areas shown on Figure 2 in Annex A-1.
 - .4 Detection accuracy of avalanches by each Radar Detection System must be:
 - .1 less than 3 degrees in azimuth, and
 - .2 less than 100 m in range.
- .14 The ADN must provide a secure, password protected, web-based interface, allowing simultaneous, multi-user access (applications such as TeamViewer are not permitted), which unifies data presentation from all infrasonnd arrays and radar units.
- .15 The ADN must allow visualization of data in at least three formats: tabular, map (on oblique and/or orthorectified aerial imagery), chart (i.e. time series).
- .16 The ADN must store data in database format which can be queried by date range, by avalanche path and area, and by event characteristics such as runout position relative to the highway, magnitude of event and signal reliability.
- .17 The ADN interface must be a web-based application accessible via the internet on both desktop and mobile devices, scaled appropriately for both and be functional on any operating system (e.g. Windows, Android, iOS, Blackberry).
- .18 Small wind generators may also be considered to supplement solar and fuel cell power, subject to approval by Parks Canada Agency. The Contractor must include power requirement estimates, and a suggested power source combination, for each system with their submission. Primary communication must be via mobile network.
- .19 Mobile network modems shall use a dynamic IP address.
- .20 A backup communication system independent of the mobile network must be installed that provides redundant communications in the event of mobile network failure.

- .21 The ADN must be configured such that it is not susceptible to cyber-attacks (e.g. SPAM).
- .22 The Contractor must continuously (24/7) monitor the status of the ADN during the winter season (November 1 – May 31) for the Contract duration and provide notice to PCA of malfunctions within one (1) hour.
- .23 The Contractor must have technicians available continuously (24/7) during the winter season (November 1 – May 31) for the Contract duration to provide troubleshooting and technical support. If the Contractor cannot resolve the issue remotely, the Contractor must have technical support onsite within 72h.
- .24 All data must be hosted and processed by the Contractor, according to PCA requirements. All data is the property of PCA and must be available to PCA at any time upon request. Permission to use PCA's data for any purpose, research or otherwise, or to share PCA's data with any other party, is subject to the approval of PCA.
- .25 Avalanche detection by the ADN (both infrasound and radar) must trigger an alert which must be sent via SMS and email. The alert system must be customizable such that events can be screened to meet certain criteria (e.g. minimum magnitude, runout distance relative to the highway, avalanche path or location) and be sent to specific people who meet specified criteria.
- .26 The alert system must be customizable such that each user can activate/deactivate their own alerts and set their own screening thresholds for alerts.
- .27 Alerts must be able to provide, at a minimum, the following information by the Final Calibration Date:
 - .1 a location of the detection using the path name;
 - .2 the runout (stopping) distance of the avalanche relative to the highway;
 - .3 an image of the signal migration (avalanche motion) plotted on a map and/or oblique image.
- .28 Alerts must be sent within 1 minute or less of signal arrival at the sensor (subject to Final Calibration Date).
- .29 Each Infrasound Detection System must be evaluated by the Contractor at the end of each of the two winters using the ACS avalanche observations data for the detection of avalanches > Size 2 (see Table 1 in Annex A-1) by comparing detections against the PCA avalanche occurrence database. Two standard model assessment metrics must be used; (1) Probability of Detection (POD) and (2) Probability of Non-Events (PON). See Table 3 in Annex A-1 for definitions.
 - .1 *During the first season of operation each infrasound system must have a POD score of > 0.5 and a PON score of >0.9.*
 - .2 *During the second season of operation each infrasound system must have a POD score of > 0.8 and a PON score of >0.9.*
- .30 Avalanches detected by the ADN must be attributed to the path in which they occur (subject to Final Calibration Date), with a minimum accuracy as per metrics listed above. Path attribution must be included in SMS and email alerts.
- .31 The ADN must be capable of plotting the path of the signal migration detected by each infrasound system on a map in near-real time (subject to a maximum 1-minute delay) (subject to Final Calibration Date). This map must be part of the web interface and included in the alert message.
- .32 Each Radar Detection System must be evaluated by the Contractor at the end of each of the two winters using the ACS avalanche observations data for the detection of avalanches \geq Size 2 (see Table 1 in Annex A-1) using two standard model assessment metrics; (1) Probability of Detection (POD) and (2) Probability of Non-Events (PON). See Table 3 in Annex A-1 for definitions.
 - .1 *During the first season of operation each Radar Detection System must have a POD score of > 0.7 and a PON score of >0.9.*

- .2 During the second season of operation the system must have a POD score of > 0.9 and a PON score of >0.95.
- .33 Adjustments to the algorithms (for both Infrasonnd and Radar Detection Systems) may be made throughout the winter if necessary, however, each spring, the winter's data must be compiled (infrasonnd and radar avalanche detections, and ACS avalanche observations) and the algorithms must be adjusted based on this data, prior to the fall commissioning of the system to achieve specified POD and PON scores.
- .34 The Contractor is fully responsible for any and all required calibration, troubleshooting, technical support, maintenance, and repair or upgrades to infrastructure, hardware and software until March 31, 2021. All materials and resources required for the above (spare parts etc.) are incidental to the work.
- .35 The Contractor must perform routine inspections and maintenance each spring and fall on all components of the ADN based on recommendations by the component manufacturers for the Contract Duration. An inspection and maintenance checklist must be approved by PCA and used during routine inspections and maintenance.
- .36 The Contractor must commission the ADN in the fall and decommission the ADN in the spring for the duration of the Contract. This includes removal and storage of any components that require removal for the summer months, and reinstallation of the same components in the fall. This also includes cleaning of any components that require cleaning, and repair or replacement of any components which require repair or replacement.
- .37 The Contractor must hold a minimum of two training sessions for PCA staff in the use of the ADN prior to the first winter of operation, and two more training sessions once all components of the ADN are installed and operational. The Contractor must coordinate with PCA to ensure that all necessary staff are available to attend at least one session. The Contractor must provide an overview of the system, how it works, where each component is located, how to access the user interface, how to interpret the data, how to customize alerts, how to contact technical support, how to provide feedback, and what will be required of PCA staff to maintain and operate the system in the long term. The Contractor must train PCA staff to perform routine inspections and maintenance of the ADN components, including removal and replacement of sensors and fuel cells, cleaning, repair, or replacement of any components, and refilling of fuel cells.
- .38 The Contractor must describe to PCA staff exactly what information is required from them in order for the Contractor to calibrate the avalanche detection algorithms (e.g. avalanche activity observations).
- .39 The Contractor must train PCA IT staff to troubleshoot minor malfunctions under the supervision of the Contractor's IT staff.
- .40 The Contractor must provide a user's manual and troubleshooting guide for the ADN in English.
- .41 The Contractor must provide instructions to PCA staff on how to operate the ADN using the backup communications system.

SW7 Permits:

Obtaining all the necessary permits and clearances to do the work from the Federal, Provincial, Municipal and other agencies.

SW8 Safety and Environment:

The Contractor must comply with WorkSafe BC and the Occupational Health and Safety Regulations of British Columbia. The Contractor must comply with the Canada Labour Code, Canada Occupational Safety and Health Regulations. The Contractor is responsible for the safety and security of their worksite and staging areas and any personnel who access these areas.

The Contractor must provide and enforce a safe work environment to all members of the crew, including sub-contractors. The Contractor must ensure that crew members have valid licenses or permits required to perform their specific tasks, have an Emergency Response Plan and use acquisition procedures and equipment minimizing the environmental impact of the work. All health, safety, and environmental incidents must be reported immediately to PCA. Daily logs must include all health, safety and environmental incidents and concerns (including near-miss) related to the work. The Contractor must facilitate field visits of a PCA Environmental Safety Officer and comply with their recommendations in a timely manner.

Prior to commencement of any on-site work:

1. Environmental Protection Plan (EPP) must be prepared by the Contractor and accepted by PCA (see Environmental Assessment Checklist, Annex F)
2. Contractor site personnel must attend an Environmental Briefing facilitated by PCA

SW9 Travel

The Contractor is responsible for the mobilization and subsequent demobilization of all equipment, materials and field crew required for the work. The Contractor is responsible for room and board for its crew during travel and during the work.

SW10 Special Constraints

Restricted Activity Permits and Parks Business Licenses must be obtained prior to on-site Works.

SW11 Deliverables

Detailed deliverables, at the end of the first season (Nov 15, 2018 – May 31, 2019) include:

- A summary of the first year's avalanche detections;
- Overall POD and PON for a) the installed Infrasonnd Detection Systems and b) the installed Radar Detection Systems during the first season.
- A summary of adjustments made to the system and algorithms after the first year;

Detailed deliverables, at the end of the second season (Nov 1, 2019 – May 31, 2020) include:

- A summary of the second year's avalanche detections;
- Overall POD and PON for a) the installed Infrasonnd Detection Systems and b) the installed Radar Detection Systems during the second season.
- A summary of adjustments made to the system and algorithms after the second year;

Detailed deliverables, at the end of the third season (Nov 1, 2020 – March 31, 2021) include:

- A summary of the third year's avalanche detections;
- Overall POD and PON for a) the installed Infrasonnd Detection Systems and b) the installed Radar Detection Systems during the third season.
- A summary of adjustments made to the system and algorithms after the third year;

Deliverables for Optional Contract Extension (April 1, 2021 – March 31, 2024) include:

- A summary of each year's avalanche detections during the Optional Contract Extension. ;
- Overall POD and PON for a) the installed Infrasonnd Detection Systems and b) the installed Radar Detection Systems during each of the Optional Control Extension seasons.
- A calculation of each infrasonnd and each radar system's POD and PON after each year;
- A summary of adjustments made to the system and algorithms after each year.;

Solicitation No. - N° de sollicitation
5P435-180223/A
Client Ref. No. - N° de réf. du client
5P435-180223

Amd. No. - N° de la modif.
File No. - N° du dossier
STN-7-40059

Buyer ID - Id de l'acheteur
STN205
CCC No./N° CCC - FMS No./N° VME

SW12 Schedule

- Complete installation of at least four (4) Infrasonnd Detection Systems and one (1) Radar Detection System by Nov. 15, 2018. Locations selected for install in 2018 are subject to the approval of PCA.
**Note: due to timing/scheduling, the Contractor may elect to implement temporary installations at some locations for First Year data collection.*
- Submit First Year Deliverables by June 30, 2019.
- Complete installation of all components of the ADN by Oct. 15, 2019.
- Submit Second Year Deliverables by June 30, 2020.
- Final Calibration Date: Complete calibration to criteria outlined in this SOW by March 31, 2021.
- Submit Third Year Deliverables by June 30, 2021.
- Optional Contract Extension to begin April 1, 2021 and finish March 31, 2024.
- Optional Contract Extension deliverables to be submitted each year by June 30.

Table 1. Canadian Classification System for Avalanche Size (McClung & Schaerer, 2006¹)

Size	Destructive Potential	Typical Mass (tonnes)	Typical Path Length (m)	Typical Impact Pressure (kPa)
1	Relatively harmless to people.	< 10	10	1
2	Could bury, injure or kill a person.	10 ²	100	10
3	Could bury a car, destroy a building, or break a few trees.	10 ³	1000	100
4	Could destroy a railway car, large truck, several buildings, or a forest with an area up to 4 hectares.	10 ⁴	2000	500
5	Largest snow avalanches known; could destroy a village or a forest of 40 hectares.	10 ⁵	3000	1000

¹ McClung, D. & P. Schaerer. 2006. The Avalanche Handbook. The Mountaineers Books. Seattle. 342 pp.

Table 2: Site Descriptions

Location Name	Site Description	Special Considerations	Avalanche Hazard
Infrasound			
Connaught	Located low on the NE ridge of Mt. MacDonald, between the TCH and the CPR. Undulating terrain with some elevation change of 20-50 m east to west. Lots of dead fall.	Will need brushing to clear trails for cable routing through dead fall.	No
Portal	Good options for sensors in the east-west direction, but difficult to locate a sensor in the north-south direction. Generally flat site. Close to CPR and Connaught tunnel east portal and to creek.	CPR RoW and snow plowing. Recommend allowing for extra cable lengths to allow sensor to be placed on the north side of Connaught Creek using culvert for cable routing.	Yes (Stone Arch, Portal)
Crossover	Located adjacent to the Crossover gun platform. Surface area here is limited due to TCH and Connaught Creek making it difficult to achieve ideal geometry. Some wet ground but can likely be avoided.	Difficult to achieve ideal geometry. Could consider a sensor north of the TCH with cable routing on the Single Bench snow shed.	Yes (Double Bench, Single Bench, Crossover)
Hermit	Located adjacent to the magazine site, east of Hermit Creek.	Evidence of debris flow from Hermit Creek running over magazine access road into lower array area. Consider snow plowing for magazine site.	Potential (Lone Pine, Hermit)
Rogers Pass Compound	Located at the south end of the weather plot. Some wet ground in the area but can be avoided.	Power may accessible here, coordinate with PCA.	No
Rogers Pass Summit	Located immediately west of the summit monument. Slight slope with a total elevation change of 20-30 m.	Avoid any impact to high summer use pedestrian area and 1885 trail running parallel to TCH.	No
Avalanche Crest	Located above CPR Connaught Tunnel west portal inside the 90 degree corner. Flat site with local terrain undulations. Wet areas, likely can be avoided at sensor locations.	May need to consider elevated platforms for sensors depending on selected locations.	No
Loop Brook	Located between the CPR, Illecillewaet River and Loop Brook. Sufficient area for good geometry. Wet areas can likely be avoided.	May need to move 175-200 m to the east to avoid archaeological area.	No
Ross Peak	Located at the western edge of the Cougar Creek West avalanche path, between the CPR and Illecillewaet River. Tight area but sufficient for good geometry.	Recommend raised platforms for sensors due to seasonal flooding.	Yes (Cougar Corner 5 & 6, Cougar Creek West)
Mannix	Located between the TCH and CPR below the Gunners 1 avalanche path. Tight area but sufficient for good geometry. Very dense brush. Wet ground is unavoidable.	Significant brushing required for cable routing. Recommend raised platforms for sensors due to wet ground and seasonal flooding.	Yes (Gunners 1, Gunners Siding)
Smart	Located at the Hemlock Grove boardwalk. Sensors can be placed around existing infrastructure. Some wet areas but possible to avoid.	Extra cable lengths for routing around existing infrastructure (e.g. parking lot, boardwalks).	No

Fidelity	Located on the north side of the TCH near the Fidelity gun platform. Ground is steeper here with an elevation change of 25-35 m possible across the array. Wet ground in some locations, may be difficult to avoid. Dense undergrowth in some locations	Additional brushing may be required for cable routing. Raised platforms for some or all sensors may be required due to wet ground and seasonal flooding.	No
West Boundary	Located between TCH, Illecillewaet River and the western park boundary. Some wet areas but avoidable. Southern most are near the river is prone to flooding with strong current and debris possible, sensors should not be located here.	Sensors should not be located outside the park (i.e. past the west boundary cut line) or in the flood prone area.	No
Radar			
MacDonald West Shoulder	Located on the west side of the TCH near the north lateral boundary of the Cheops 2 avalanche path.	Minimal tree clearing required at this site.	Yes (MacDonald West Shoulder 1 & 2)
Avalanche Crest & Abbott	Located at approx. 1620 m on Napoleon Spur on a small bench, outside the lateral boundary of Cheops South 6 avalanche path.	Tree clearing will be required for line of sight. Helicopter pad required. Consider mounting multiple antennae on a single tower.	No
Ross Peak	Located on Cougar Corner ridge.	Minimal tree clearing required at this site. Existing helicopter pad in place from snow net construction.	No

Table 3: Probability of Detection (POD) and Probability of Non-Events (PON)

		Manual Observations	
		Non-Avalanche Event	Avalanche Event
Detection	Non-Avalanche Event	a: Correct non event	b: Misses
	Avalanche Event	c: False alarm	d: Hits

Probability of detection $POD = \frac{d}{b+d}$

Probability of non-events $PON = \frac{a}{a+c}$

1 Definitions are the same as those documented by Wilks (1995) and Doswell et al. (1990), and as used by Hendriks et al. (2017).

Wilks, D., 1995. Statistical Methods in the Atmospheric Sciences. Academic Press, 467pp.

Doswell, A., Davies-Jones, R., and Keller, D., 1990. On summary measures of skill in rare event forecasting based on contingency tables. Weather and Forecasting, 5, 576-585

Hendriks, J., Dreier, L. and Olivieri, G. 2017. Evaluation of an infrasound detection system for avalanches, Rogers Pass, Canada; Winter 2016 – 17.

ANNEX "B"

BASIS OF PAYMENT

B1 Pricing Details to be Provided in Financial Proposal

The Bidder hereby offers to PCA, as requested by the Minister, to furnish all necessary expertise, supervision, materials, equipment and other items necessary to performing the work as described in the statement of work of this Request for Proposal and in accordance with the terms and conditions of the Request for Proposal, to the satisfaction of the Minister, or his or her authorized representative, for the following price(s).

Bidders must provide financial details as requested in this Annex. Proposals which do not contain pricing details as requested below shall be considered incomplete and non-responsive.

B2.1 Costs from Contract Award to March 31, 2021

Requirement	Unit of Measurement	Quantity	Unit Price	Total Cost
Task 1: Design, Manufacture & Supply				
a) <i>Infrasound Detection System</i>	<i>Each</i>	13		
b) <i>Radar Detection System</i>	<i>Each</i>	4		
c) <i>Permanent Helicopter Landing Pad</i>	<i>Each</i>	1		
Task 2: Install, Calibrate, Monitor, Maintain & Train				
a) <i>Infrasound Detection System</i>	<i>Each</i>	13		
b) <i>Radar Detection System</i>	<i>Each</i>	4		
c) <i>Permanent Helicopter Landing Pad</i>	<i>Each</i>	1		
SUBTOTAL B2.1				

B2.2 Costs for Optional Period of the Contract from March 31, 2021 to March 31, 2024

Requirement	Unit of Measurement	Quantity	Unit Price	Total Cost
Calibrate, Monitor, Maintain & Train	<i>Lump Sum</i>	1		
SUBTOTAL B2.2				

Solicitation No. - N° de l'invitation
5P435-180223/A
Client Ref. No. - N° de réf. du client
5P435-180223

Amd. No. - N° de la modif.
File No. - N° du dossier
STN-7-40059

Buyer ID - Id de l'acheteur
STN205
CCC No./N° CCC - FMS No./N° VME

B2.3 Bidder Total Tendered Price

Bidder total tendered price to fulfill requirements from contract award to March 31, 2021 (B2.1)	\$
Bidder total tendered price to fulfill the Optional requirements from March 31, 2021 to March 31, 2024 (B2.2)	\$
B2.1 + B2.2 = B2.3	\$

Any estimated level of effort specified in the Pricing Details detailed above is provided for **financial proposal evaluation purposes only**. It is only an approximation of the requirements and is not to be considered as a contract guarantee.

ANNEX "C"

MANDATORY TECHNICAL CRITERIA

The Mandatory Criteria listed below will be evaluated on a simple pass/fail basis. Proposals which fail to meet the mandatory criteria will be deemed non-responsive.

Bidders are advised to address each criterion in sufficient depth to permit a complete requisite analysis and assessment by the evaluation team. Proposals failing to adequately respond to the mandatory criteria may be excluded from further considerations. The technical proposal should address each of the criteria in the order in which they appear. Bidders are advised that only listing experience without providing any supporting data to describe responsibilities, duties and relevance to the criteria will not be considered demonstrated for the purpose of this evaluation.

The Bidder should provide complete details as to where, when (month and year) and how (through which activities/ responsibilities) the stated qualifications/experience were obtained. Experience gained during formal education shall not be considered work experience. All criteria for work experience shall be obtained in a legitimate work environment as opposed to an educational or research setting.

Item	Mandatory Requirement	Compliant (Yes/No)	Reference to Bidder's Proposal
M1	The Bidder's proposed ADN design must meet all requirements outlined in the SOW.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
M2	The Bidder's proposed schedule must meet all requirements outlined in the SOW.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
M3	<p>The Bidder, or the Bidder's proposed Subcontractors, must have experience manufacturing and installing Infrasonnd Detection Systems (minimum one infrasonnd array) for Avalanche Operations in two different locations during the period of January 1, 2013 to the date of bid closing. Each array must have reliably detected avalanches >Size 2 (see Table 1 in Annex A-1) for a minimum of three months.</p> <p>The Bidder must submit Supplier Name and Contact, Installer Name and Contact, and a description of the installs completed including Client Name and Contact, Location and Install dates.</p> <p>The Bidder must submit signed letters of intent from any Subcontractors to be involved in the work.</p>	<input type="checkbox"/> Yes <input type="checkbox"/> No	
M4	The Bidder, or the Bidder's proposed Subcontractors, must have experience manufacturing and installing Doppler Radar Detection Systems (minimum one radar system) for Avalanche Operations in two different locations during the period of January 1, 2013 to the	<input type="checkbox"/> Yes <input type="checkbox"/> No	

Solicitation No. - N° de l'invitation
5P435-180223/A
Client Ref. No. - N° de réf. du client
5P435-180223

Amd. No. - N° de la modif.
File No. - N° du dossier
STN-7-40059

Buyer ID - Id de l'acheteur
STN205
CCC No./N° CCC - FMS No./N° VME

	<p>date of bid closing. Each radar system must have reliably detected avalanches \geq Size 2 (see Table 1 in Annex A-1) for a minimum of three months. The Bidder must submit Supplier Name and Contact, Installer Name and Contact, and a description of the installs completed including Client Name and Contact, Location and Install dates. The Bidder must submit signed letters of intent from any Subcontractors to be involved in the work.</p>		
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The Bidder must include in their proposal signed statements of intent by all proposed suppliers and subcontractors.

The Bidder must include in their proposal contact information for Senior Avalanche Operations Staff willing to vouch for the stated experience.

Solicitation No. - N° de l'invitation
5P435-180223/A
Client Ref. No. - N° de réf. du client
5P435-180223

Amd. No. - N° de la modif.
File No. - N° du dossier
STN-7-40059

Buyer ID - Id de l'acheteur
STN205
CCC No./N° CCC - FMS No./N° VME

ANNEX "D" to PART 3 OF THE BID SOLICITATION

ELECTRONIC PAYMENT INSTRUMENTS

The Bidder accepts any of the following Electronic Payment Instrument(s):

- VISA Acquisition Card;
- MasterCard Acquisition Card;
- Direct Deposit (Domestic and International);
- Electronic Data Interchange (EDI);
- Wire Transfer (International Only);
- Large Value Transfer System (LVTS) (Over \$25M)

ANNEX "E" to PART 5 OF THE BID SOLICITATION

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 permanent full-time and/or permanent part-time employees.
- 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)

Solicitation No. - N° de l'invitation
5P435-180223/A
Client Ref. No. - N° de réf. du client
5P435-180223

Amd. No. - N° de la modif.
File No. - N° du dossier
STN-7-40059

Buyer ID - Id de l'acheteur
STN205
CCC No./N° CCC - FMS No./N° VME

ANNEX "F"

ENVIRONMENTAL ASSESSMENT CHECKLIST



Parks Canada EIA Requirement Checklist

Project Title: Glacier National Park (GNP) Avalanche Detection Network

Project Location: Various locations throughout GNP

MRG Project #: MRG2017-31

FII Project Number: 566

Proponent Contact Information: Highway Engineering Services

Date of Request: March 2018

Section A: No EIA Required

1. The project is exempted from EIA requirements under CEAA 2012 S. 70: *(check the appropriate box)*

- the project relates to matters of national security;
- the project is being carried out in response to a national emergency for which special temporary measures are being taken under the *Emergencies Act*; or
- the project is to be carried out in response to an emergency, and in the interest of preventing damage to property or the environment or in the interest of public health or safety.

2. The project is exempted from EIA requirements as the same project was previously assessed: *(both boxes must be checked to apply this option)*

- the previous EIA is adequate
- there is no change in information that would alter the results of the EIA analysis # _____.

3. The project is exempted from EIA requirements because an initial analysis has determined:

- there is **NO potential for adverse effects to natural and cultural resources**, including:
 - natural resources targeted in management objectives and ecological integrity monitoring indicators; listed species at risk, their residence or critical habitat. Additionally, the activity is not prohibited in a protection order under the *Species at Risk Act*.
 - cultural resources targeted in management objectives and identified in a Parks Canada cultural resource management document, or any structure, site or thing of historical, archaeological, paleontological or architectural significance.

OR

- potential adverse effects of the project are exclusive to cultural resources (including potential archaeological resources), and the Cultural Resource Impact Analysis (CRIA) will be used to assess impacts and determine appropriate mitigation measures.

Provide a concise explanation to justify the decision.

If you have exempted the project from an EIA requirement by selecting one of the three options above, Proceed to Section D.



Section B: EIA Pathway Decision

The EIA pathway to be applied to the proposed project is:

- an approved alternate process (must be approved by VP PAEC)
- one or more approved Best Management Practices (BMPs)
- a Basic Impact Analysis (indicate if one or more BMPs are also being used)
- a Detailed Impact Analysis (indicate if one or more BMPs are also being used)

The following BMPs will be applied to the project work to mitigation potential adverse impacts:

- Parks Canada National Best Management Practices: **Roadway, Highway and Parkway Infrastructure**
- Mount Revelstoke and Glacier National Parks Best Management Practices: **Vegetation Removal**

Section C: Cultural Resource Requirements

Indicate the types of Cultural Resource Impact Assessment (CRIA) that may be required:

- No additional CRIA is required based on an assessment conducted by the MRG CRM Advisor.
- A separate request for CRIA will be submitted to National Office for consideration.
- An Archaeological Overview Assessment or Archaeological Impact Assessment is required.
- The Accidental Finds Protocol applies to all project activities.
- Additional mitigations are required for Cultural Resources and are described in Section F below.

Section D: Consultation and Engagement

If required, indicate the type(s) of consultation/engagement planned:

- Public
- Stakeholder
- Aboriginal
- None at this time

Stakeholders are aware of the program of infrastructure work taking place in Glacier National Park and regular updates will be provided on the park website.

In advance of the project start date, the MRG field unit will notify local Indigenous groups that this work is occurring. This information will be bundled and sent via email with information pertaining to other capital projects occurring within MRG. If interest is received from an Indigenous partner, further information, a site visit, monitoring, or other consultation/engagement will be offered.



Section E: Permitting Requirements

Indicate the type(s) of permits that may be required:

- Restricted Activity Permits
- Business Licence
- Development/Building
- Lease/Licence of Occupation
- Add others as required (*Fisheries Act, Navigation Protection Act, Species at Risk Act, etc.*)

Restricted Activity Permits are expected to be required to authorize the following project activities:

- Ground disturbance
- Vegetation Clearing
- Fuel storage
- Land Aircraft

Section F: Additional Comments and Attachments

See attached Project Description for details regarding the proposed project activities, potential adverse effects, and mitigation measures. There are site-specific mitigation measures for Cultural Resources and for working within 50m of a watercourse that are outlined in the Project Description.

The Visitor Experience Manager will be present when field fitting the site at MDWS.

The following considerations apply when flying in caribou habitat:

- There must be a direct flight line into the site (no flight seeing)
- Do not fly close to the ground- 400m minimum off the deck
- Any large tracks (deer size or larger) you see about 1300m elevation after January 1 may be caribou, goat or wolverine
- If large tracks are observed, you must increase distance to 2km horizontal and 400m vertical distance
- If there are tracks, goats or caribou within 1 km of your destination, either cancel the trip or consult the park wildlife biologist (via Jasper Dispatch)
- Record and report any wildlife/track sightings.

With the application of the BMPs listed above, the Project activities are not expected to result in adverse effects to natural or cultural resources.

ANNEX "G"

INSURANCE REQUIREMENTS

1. 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 per accident or occurrence and in the annual aggregate.
2. The Commercial General Liability policy must include the following:
 - a. 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.
 - b. Bodily Injury and Property Damage to third parties arising out of the operations of the Contractor.
 - c. 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.
 - d. 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.
 - e. 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.
 - f. 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.
 - g. Employees and, if applicable, Volunteers must be included as Additional Insured.
 - h. Employers' Liability (or confirmation that all employees are covered by Worker's compensation (WSIB) or similar program)
 - i. 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.
 - j. Notice of Cancellation: The Insurer will endeavour to provide the Contracting Authority thirty (30) days written notice of policy cancellation.
 - k. 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.
 - l. Owners' or Contractors' Protective Liability: Covers the damages that the Contractor becomes legally obligated to pay arising out of the operations of a subcontractor.
 - m. Non-Owned Automobile Liability - Coverage for suits against the Contractor resulting from the use of hired or non-owned vehicles.
 - n. 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.

Solicitation No. - N° de l'invitation
5P435-180223/A
Client Ref. No. - N° de réf. du client
5P435-180223

Amd. No. - N° de la modif.
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Buyer ID - Id de l'acheteur
STN205
CCC No./N° CCC - FMS No./N° VME

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.