RETURN BIDS TO:
RETOURNER LES SOUMISSIONS À:
Bid Receiving Public Works and Government Services Canada/Réception des soumissions Travaux publics et Services gouvernementaux Canada
Pacific Region
401 - 1230 Government Street
Victoria, B.C.
V8W 3X4
Bid Fax: (250) 363-3344

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

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 - Pacific Region
401 - 1230 Government Street
Victoria, B. C.
V8W 3X4

Title - Sujet
ngVLA Antenna Distortion Study

Solicitation No. - N° de l’invitation
31034-190377/A

Client Reference No. - N° de référence du client
31034-190377

GETS Reference No. - N° de référence de SEAG
PW-SVIC-251-7823

File No. - N° de dossier
VIC-9-42077 (251)

CCC No./N° CCC - FMS No./N° VME

Solicitation Closes - L’invitation prend fin
at - à  02:00 PM
on - le  2019-10-10

F.O.B. - F.A.B.

Plant-Usine:  Destination:  Other-Autre:  

Address Enquiries to: - Adresser toutes questions à:
Fletcher, Erin

Telephone No. - N° de téléphone
(250) 415-6020 ( )

FAX No. - N° de FAX  

Destination - of Goods, Services, and Construction:
Destination - des biens, services et construction:
NATIONAL RESEARCH COUNCIL CANADA
See herein

Instructions: See Herein
Instructions: Voir aux présentes

Delivery Required - Livraison exigée

Delivery Offered - Livraison proposée

See Herein

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

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PART 1 - GENERAL INFORMATION

1.1 Statement of Work

The Work to be performed is detailed under Article 6.2 of the resulting contract clauses.

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 Canadian Free Trade Agreement (CFTA).

1.4 Canadian Content

The requirement is subject to a preference for Canadian services.

1.5 epost Connect service

This bid solicitation allows bidders to use the epost Connect service provided by Canada Post Corporation to transmit their bid electronically. Bidders must refer to Part 2 entitled Bidder Instructions, and Part 3 entitled Bid Preparation Instructions, of the bid solicitation, for further information.

PART 2 - BIDDER INSTRUCTIONS

2.1 Standard Instructions, Clauses and Conditions


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 (2019-03-04) 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: 90 days

2.2 Submission of Bids

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

Address:
Bid Receiving Public Works and Government Services Canada
Pacific Region
401-1230 Government Street
Victoria, BC
V8W 3X4

e-post Connect email:
TPSGC.RPReceptiondessoumissions-PRBidReceiving.PWGSC@tpsgc-pwgsc.gc.ca

Note: Bids will not be accepted if emailed directly to this email address. This email address is to be used to open an epost Connect conversation, as detailed in Standard Instructions 2003, or to send bids through an epost Connect message if the bidder is using its own licensing agreement for epost Connect.

Facsimile number: (250) 363-3344

2.3 Former Public Servant

Contracts awarded to former public servants (FPS) in receipt of a pension or of a lump sum payment must bear the closest public scrutiny, and reflect fairness in the spending of public funds. In order to comply with Treasury Board policies and directives on contracts awarded to FPSs, bidders must provide the information required below before contract award. If the answer to the questions and, as applicable the information required have not been received by the time the evaluation of bids is completed, Canada will inform the Bidder of a time frame within which to provide the information. Failure to comply with Canada’s request and meet the requirement within the prescribed time frame will render the bid non-responsive.

Definitions

For the purposes of this clause,"former public servant" is any former member of a department as defined in the Financial Administration Act, R.S., 1985, c. F-11, a former member of the Canadian Armed Forces or a former member of the Royal Canadian Mounted Police. A former public servant may be:

a. an individual;
b. an individual who has incorporated;
c. a partnership made of former public servants; or
d. a sole proprietorship or entity where the affected individual has a controlling or major interest in the entity.

"lump sum payment period" means the period measured in weeks of salary, for which payment has been made to facilitate the transition to retirement or to other employment as a result of the implementation of various programs to reduce the size of the Public Service. The lump sum payment period does not include the period of severance pay, which is measured in a like manner.

"pension" means a pension or annual allowance paid under the Public Service Superannuation Act (PSSA), R.S., 1985, c. P-36, and any increases paid pursuant to the Supplementary Retirement Benefits Act, R.S., 1985, c. S-24 as it affects the PSSA. It does not include pensions payable pursuant to the Canadian Forces Superannuation Act, R.S., 1985, c. C-17, the Defence Services Pension Continuation Act, 1970, c. D-3, the Royal Canadian Mounted Police Pension Continuation Act, 1970, c. R-10, and the Royal Canadian Mounted Police Superannuation Act, R.S., 1985, c. R-11, the Members of Parliament Retiring Allowances Act, R.S. 1985, c. M-5, and that portion of pension payable to the Canada Pension Plan Act, R.S., 1985, c. C-8.
Former Public Servant in Receipt of a Pension

As per the above definitions, is the Bidder a FPS in receipt of a pension? Yes ( ) No ( )

If so, the Bidder must provide the following information, for all FPSs in receipt of a pension, as applicable:

a. name of former public servant;
   b. date of termination of employment or retirement from the Public Service.

By providing this information, Bidders agree that the successful Bidder’s status, with respect to being a former public servant in receipt of a pension, will be reported on departmental websites as part of the published proactive disclosure reports in accordance with Contracting Policy Notice: 2012-2 and the Guidelines on the Proactive Disclosure of Contracts.

Work Force Adjustment Directive

Is the Bidder a FPS who received a lump sum payment pursuant to the terms of the Work Force Adjustment Directive? Yes ( ) No ( )

If so, the Bidder must provide the following information:

a. name of former public servant;
b. conditions of the lump sum payment incentive;
c. date of termination of employment;
d. amount of lump sum payment;
e. rate of pay on which lump sum payment is based;
f. period of lump sum payment including start date, end date and number of weeks;
g. number and amount (professional fees) of other contracts subject to the restrictions of a work force adjustment program.

For all contracts awarded during the lump sum payment period, the total amount of fees that may be paid to a FPS who received a lump sum payment is $5,000, including Applicable Taxes.

2.4 Enquiries - Bid Solicitation

All enquiries must be submitted in writing to the Contracting Authority no later than 7 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.

2.5 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

- If the Bidder chooses to submit its bid electronically, Canada requests that the Bidder submits its bid in accordance with section 08 of the 2003 standard instructions. The epost Connect system has a limit of 1GB per single message posted and a limit of 20GB per conversation.

The bid must be gathered per section and separated as follows:

Section I: Technical Bid  
Section II: Financial Bid  
Section III: Certifications

- If the Bidder chooses to submit its bid in hard copies, Canada requests that the Bidder submits its bid in separately bound sections as follows:

Section I: Technical Bid (one (1) hard copy)  
Section II: Financial Bid (one (1) hard copy)  
Section III: Certifications (one (1) hard copy)

- If the Bidder is simultaneously providing copies of its bid using multiple acceptable delivery methods, and if there is a discrepancy between the wording of any of these copies and the electronic copy provided through epost Connect service, the wording of the electronic copy provided through epost Connect service will have priority over the wording of the other copies.

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

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 (https://www.tbs-sct.gc.ca/pol/doc-eng.aspx?id=32573). 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.

3.1.2 **Exchange Rate Fluctuation**

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

**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.

(c) The evaluation team will determine first if there are two or more bids with a valid Canadian Content certification. In that event, the evaluation process will be limited to the bids with the certification; otherwise, all bids will be evaluated. If some of the bids with a valid certification are declared non-responsive, or are withdrawn, and less than two responsive bids with a valid certification remain, the evaluation will continue among those bids with a valid certification. If all bids with a valid certification are subsequently declared non-responsive, or are withdrawn, then all the other bids received will be evaluated.

4.1.1 **Technical Evaluation**

4.1.1.1 **Mandatory Technical Criteria**

See Annex “C” - Mandatory Technical Criteria

4.1.2 **Financial Evaluation**


4.2 **Basis of Selection**
4.2.1 Basis of Selection – Mandatory Technical Criteria

A bid must comply with the requirements of the bid solicitation and meet all mandatory technical evaluation criteria to be declared responsive. The responsive bid with the lowest evaluated price will be recommended for award of a contract.

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 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 property agreement of the Ineligibility and Suspension Policy (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 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.

5.2.3 Additional Certifications Precedent to Contract Award

5.2.3.1 Canadian Content Certification

This procurement is conditionally limited to Canadian services.

Subject to the evaluation procedures contained in the bid solicitation, bidders acknowledge that only bids with a certification that the service offered is a Canadian service, as defined in clause A3050T, may be considered.

Failure to provide this certification completed with the bid will result in the service offered being treated as a non-Canadian service.

The Bidder certifies that:

( ) the service offered is a Canadian service as defined in paragraph 2 of clause A3050T.

5.2.3.1.1 SACC Manual clause A3050T (2018-12-06) Canadian Content Definition

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 performed the Work in accordance with the Statement of Work at Annex “A”.

6.3 Standard Clauses and Conditions


6.3.1 General Conditions

2010B (2018-06-21), General Conditions - Professional Services (Medium Complexity) apply to and form part of the Contract.

6.4 Term of Contract

6.4.1 Period of the Contract

The period of the Contract is from date of Contract to March 31, 2020, inclusive.

6.4.2 Delivery Date
All the deliverables for the firm requirement must be received on or before March 31, 2020.

6.4.3 Option to Extend the Contract

The Contractor grants to Canada the irrevocable option to extend the term of the Contract by up to one (1) 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.

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.

6.4.4 Optional Goods and/or Services

The Contractor grants to Canada the irrevocable option to acquire the goods, services or both described at Annex “A” of the Contract under the same conditions and at the prices and/or rates stated in the Contract. The option may only be exercised by the Contracting Authority and will be evidenced, for administrative purposes only, through a contract amendment.

The Contracting Authority may exercise the option at any time before the expiry of the Contract by sending a written notice to the Contractor.

6.5 Authorities

6.5.1 Contracting Authority

The Contracting Authority for the Contract is:

Name: Erin Fletcher
Title: Supply Specialist
Public Works and Government Services Canada
Acquisitions Branch
Directorate: Pacific Region
Address: 401-1230 Government St, Victoria, BC V8W 3X4

Telephone: 250-415-6020
E-mail address: erin.fletcher@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 Technical Authority

The Technical Authority for the Contract is: (to be provided at Contract award)

Name: __________
Title: __________
Organization: __________
Address: __________
Telephone: __ __ __
E-mail address: ________________

The Technical 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 Technical 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.

6.5.3 Contractor's Representative

Bidder to complete:

Name: __________
Title: __________
Organization: __________
Address: __________

Telephone: __ __ __
E-mail address: ________________

6.6 Proactive Disclosure of Contracts with Former Public Servants

By providing information on its status, with respect to being a former public servant in receipt of a Public Service Superannuation Act (PSSA) pension, the Contractor has agreed that this information will be reported on departmental websites as part of the published proactive disclosure reports, in accordance with Contracting Policy Notice: 2012-2 of the Treasury Board Secretariat of Canada.

6.7 Payment

6.7.1 Basis of Payment

In consideration of the Contractor satisfactorily completing all of its obligations under the Contract, the Contractor will be paid a firm price as specified in Annex "B" for a cost of $ __________. Customs duties and Applicable Taxes are extra.

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.

6.7.2 Limitation of Price

SACC Manual clause C6000C (2017-08-17), Limitation of Price

6.7.3 Milestone Payments

1. Canada will make milestone payments in accordance with the Schedule of Milestones detailed in the Contract and the payment provisions of the Contract, up to 100% of the amount claimed and approved by Canada if:

   a. an accurate and complete claim for payment using 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. the total amount of all milestone payments paid by Canada does not exceed 100 percent of the total amount to be paid under the Contract;
c. all the certificates appearing on form PWGSC-TPSGC 1111 have been signed by the respective authorized representatives;
d. all work associated with the milestone and as applicable any deliverable required have been completed and accepted by Canada.

2. The balance of the amount payable will be paid in accordance with the payment provisions of the Contract upon completion and delivery of all Work required under the Contract if the Work has been accepted by Canada and a final claim for the payment is submitted.

6.7.4 Electronic Payment of Invoices – Contract

The Contractor accepts to be paid using any of the following Electronic Payment Instrument(s): *(as indicated in Annex “D”)*

a. Visa Acquisition Card;
b. MasterCard Acquisition Card;
c. Direct Deposit (Domestic and International);
d. Electronic Data Interchange (EDI);
e. Wire Transfer (International Only);
f. Large Value Transfer System (LVTS) (Over $25M)

6.8 Invoicing Instructions

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

   Each claim must show:

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

2. Applicable Taxes must be calculated on the total amount of the claim before the holdback is applied. At the time the holdback is claimed, there will be no Applicable Taxes payable as it was claimed and payable under the previous claims for progress payments.

3. The Contractor must prepare and certify a copy of the claim on form PWGSC-TPSGC 1111, and forward it to NRC.InvoiceVic-FacturesVic.CNRC@nrc-cnrc.gc.ca for appropriate certification after inspection and acceptance of the Work takes place.

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

6.9 Certifications and Additional Information

6.9.1 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.
6.9.2 SACC Manual Clauses

SACC Manual Clause A3060C (2008-05-12), Canadian Content Certification

6.10 Applicable Laws

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

6.11 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 2010B (2018-06-21) General Conditions - Professional Services (Medium Complexity);
(c) Annex A, Statement of Work;
(d) Annex B, Basis of Payment;
(e) the Contractor's bid dated ________ (insert date of bid) *(If the bid was clarified or amended, insert at the time of contract award: ", as clarified on ________", or ", as amended on________, and insert date(s) of clarification(s) or amendment(s))

6.12 Insurance – No Specific Requirement

The Contractor is responsible for deciding if insurance coverage is necessary to fulfill its obligation under the Contract and to ensure compliance with any applicable law. Any insurance acquired or maintained by the Contractor is at its own expense and for its own benefit and protection. It does not release the Contractor from or reduce its liability under the Contract.
ANNEX "A" - STATEMENT OF WORK

(see attached)
[This document describes the statement of work for the primary surface mould and associated tooling for the ngVLA 18m Antenna Design project.]
## LIST OF ACRONYMS AND ABBREVIATIONS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAD</td>
<td>Computer Aided Design</td>
</tr>
<tr>
<td>CTE</td>
<td>Coefficient of Thermal Expansion</td>
</tr>
<tr>
<td>ngVLA</td>
<td>next generation Very Large Array</td>
</tr>
<tr>
<td>NRAO</td>
<td>National Radio Astronomy Observatory (USA)</td>
</tr>
<tr>
<td>NRC</td>
<td>National Research Council (Canada)</td>
</tr>
<tr>
<td>PID</td>
<td>Process Induced Distortions</td>
</tr>
<tr>
<td>RMS</td>
<td>Root Mean Square</td>
</tr>
<tr>
<td>SOW</td>
<td>Statement of Work</td>
</tr>
<tr>
<td>SRC</td>
<td>Single-piece Rim-supported Composite reflector</td>
</tr>
</tbody>
</table>
1 INTRODUCTION

The Next Generation Very Large Array (ngVLA) is a project of the National Radio Astronomy Observatory (NRAO) to design and build an astronomical observatory that will operate at centimetre wavelengths (25 to 0.26 centimetres, corresponding to a frequency range extending from 1.2 GHz to 116 GHz). The observatory will be a synthesis radio telescope comprised of approximately 214 reflector antennas each of 18 meters diameter, and 19 of 6 meters diameter operating in a phased or interferometric mode.

As a contribution to the ngVLA the National Research Council of Canada (NRC) through it’s Herzberg Astronomy and Astrophysics (HAA) Astronomy Technology Program is undertaking to design the 6m antennas. The design is an Offset Gregorian Feed-low Antenna based on NRC’s Single-piece, Rim-supported Composite (SRC) reflector technology.

The current phase of this study; concept design is to develop a design to sufficient level to determine if it is likely to meet the ngVLA requirements. A critical aspect is the surface accuracy requirement, operation at the highest frequencies requires the surface to be accurate to the design surface to within 160 microns RMS under operating conditions. Sources of distortion include wind, thermal, gravity and manufacturing errors. The latter of these is the focus of this Statement of Work (SOW). Manufacturing errors for a moulded composite part are a governed by the mould accuracy and the Process Induced Distortions (PID). An estimate of the expected PID errors is a critical input to the overall error budget.
2 STATEMENT OF WORK

2.1 Objective

To simulate the manufacturing induced distortion on the primary reflector of the ngVLA 6m, including geometry changes both in the part and in the mold. To quantify the expected effect such that corrections can be made to the mold shape to compensate for this effect. It is expected that this analysis will be carried out at the highest possible precision and with the greatest possible degree in an effort to compensate for PID induced errors in the primary reflector molded shape regardless of the apparent small size of the measured effect. The successful correction of errors as small as a few 10’s of microns are important in order to meet the overall error budget.

2.2 Tasks

Firm Requirement:

The following tasks are to be done during this investigation:

- Materials Characterization. It is expected that extensive materials characterization will be carried out by the contractor to fully describe the time and temperature dependent evolution of the material properties. This analysis must include Thermo-chemical as well as Thermo-mechanical characterizations.
- Mold shape characterization at the cure temperatures. The thermal-mechanical behavior of the mold during the cure cycle must be included in the overall PID analysis. This analysis may result in recommendations for changes in the mold design.
- Process Induced Distortion (PID) analysis of the structure using process simulation
- Sensitivity analysis including
  - Anisotropy of the in-plane CTEs
  - Fibre volume fraction
  - Fiber direction (misalignment of ±5°)

Optional Requirement:

- Characterization of mold shape of revised mold design based on feedback provided from initial analysis.

2.3 NRC Supplied

NRC will supply:

- Part 1
  - Primary surface shape file in a common file format such as STEP or IGES.
o Primary surface laminate schedule.
o All materials specifications.
o Details of manufacturing process.
o Resin, fabric, and other materials as required for contractor to fabricate test samples.
o Test panel fabrication. NRC will manufacture test panels as required by the contractor but NRC is not responsible for final coupon fabrication steps such as trimming and polishing (any such operations are left up to the contractor).

- Part 2
  - Mold design (as per manufacturer’s drawings and specifications).

If the vendor recommends modification to the mold design to reduce the PID and NRC chooses to have the mold design updated, NRC will provide an updated mold design to the vendor for re-analysis.

### 2.4 Deliverables

The contractor will deliver:

- An interim report summarizing the work performed to date and any results achieved.
- A 3D CAD file containing either a point cloud or a NURBS surface representing the part surface shape without mold compensated for the PID.
- A 3D CAD file containing either a point cloud or a NURBS surface representing the mold surface shape compensating for the PID.
- An engineering report (not just a PowerPoint presentation) containing details of the methods used to conduct the PID and sensitivity studies and the results.
- Any recommendations for mold redesign to reduce mold distortion at cure temperatures and through the cure profile.

Based on the outcome of the above the contractor may be asked to deliver:

- A 3D CAD file containing either a point cloud or a NURBS surface representing the updated mold surface shape compensating for the PID.
- An updated report containing details of the original PID study and sensitivity analysis and the results of the analysis performed with the revised mold design.
2.5 Schedule

Contract schedule is suggested, exact timing of milestones to be agreed upon with successful Bidder prior to Contract award.

<table>
<thead>
<tr>
<th>Milestone</th>
<th>Estimated Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contract awarded</td>
<td>21 Oct 2019</td>
</tr>
<tr>
<td>Kick-off meeting</td>
<td>25 Oct 2019</td>
</tr>
<tr>
<td>NRC Deliverables to contractor Part 1</td>
<td>1 Nov 2019</td>
</tr>
<tr>
<td>NRC Deliverables to contractor Part 2</td>
<td>13 Dec 2019</td>
</tr>
<tr>
<td>Interim Report</td>
<td>17 Jan 2020</td>
</tr>
<tr>
<td>Final Report</td>
<td>27 Mar 2020</td>
</tr>
</tbody>
</table>

All deliverables for the firm requirement must be received on or before March 31, 2020.

Kick-off meeting and status update meetings to be held via tele or video conference every 2 weeks.

Milestones and timing of optional analysis with revised mold design to be agreed upon with vendor prior to initiation of work.
## ANNEX "B" – BASIS OF PAYMENT / SCHEDULE OF MILESTONES

### EVALUATION OF PRICE:
The price of the bids will be evaluated in Canadian dollars, the Goods and Services Tax (GST) excluded.

**NOTE:** Pricing shall be inclusive of all direct and indirect expenses incurred in performing the Requirement including but not limited to all labour, fringe benefits, overhead, supervision, travel time, transportation costs, reports, general and administrative costs, profit required to do the work, all related duties and other costs paid by the Contractor. **No other charges will be accepted.**

GST is to be added as a separate line item on the invoice.

Pricing must be added for 1. Firm Requirement and 2. Optional Requirement.

1. **Firm Requirement**

<table>
<thead>
<tr>
<th>Milestone No.</th>
<th>Description</th>
<th>% of total Bid Price</th>
<th>Firm Amount CAD $</th>
<th>Estimated Due Dates (to be finalized at Contract award)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Interim Report</td>
<td>40%</td>
<td>$___________</td>
<td>2020-Jan-17</td>
</tr>
<tr>
<td>2</td>
<td>Final engineering report including:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• 3D CAD file containing either a point cloud or a NURBS surface representing</td>
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<tr>
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</tr>
<tr>
<td></td>
<td>the mold surface shape compensating for the PID</td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>60%</td>
<td>$___________</td>
<td>2020-Mar-27</td>
</tr>
</tbody>
</table>

### TOTAL FIRM REQUIREMENT

$___________
2. Optional Requirement

<table>
<thead>
<tr>
<th>#</th>
<th>Description</th>
<th>Firm Amount CAD $</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Characterization of mold shape of revised mold design based on feedback provided from initial analysis</td>
<td>$_________________</td>
</tr>
</tbody>
</table>

TOTAL EVALUATED PRICE = FIRM REQUIREMENT + OPTIONAL REQUIREMENT
ANNEX "C" – MANDATORY TECHNICAL EVALUATION CRITERIA

The bid must meet the mandatory technical criteria specified below. The Bidder must provide the necessary documentation to support compliance with this requirement.

Bids which fail to meet the mandatory technical criteria will be declared non-responsive. Each mandatory technical criterion should be addressed separately.

<table>
<thead>
<tr>
<th>#</th>
<th>Mandatory Technical Criterion</th>
<th>Bid Preparation Instructions</th>
<th>Meets? Y/N Comments</th>
</tr>
</thead>
</table>
| M1 | The Bidder must demonstrate having completed a minimum of three (3) projects in the last five (5) years where the bidder performed Process Induced Distortion Analysis. | The following information must, as a minimum, be provided:  
   i. Project Name  
   ii. Name of Client Organization  
   iii. Start and End Date of Project (mm/yyyy to mm/yyyy); and  
   iv. Brief description of the scope of the project and the work performed.  
   The following information should be provided:  
   v. Name and contact information of the client. |                                                                                      |
| M2 | The Bidder must demonstrate having completed a minimum of three (3) projects in the last five (5) years where the Bidder completed thermal-mechanical and thermo-chemical analysis of composite structures. | The following information must, as a minimum, be provided:  
   i. Project Name  
   ii. Name of Client Organization  
   iii. Start and End Date of Project (mm/yyyy to mm/yyyy); and  
   iv. Brief description of the scope of the project and the work performed.  
   The following information should be provided:  
   v. Name and contact information of the client. |                                                                                      |
| M3 | The Bidder must demonstrate having completed a minimum of three (3) projects in the last five (5) years where the Bidder analyzed Process Induced Distortion (PID) through process simulation software. | The following information must, as a minimum, be provided:  
   i. Project Name  
   ii. Name of Client Organization  
   iii. Start and End Date of Project (mm/yyyy to mm/yyyy); and  
   iv. Brief description of the scope of the project and the work performed.  
   The following information should be provided:  
   v. Name and contact information of the client. |                                                                                      |
| M4 | The Bidder must demonstrate having completed a minimum of three (3) projects in the last five (5) years where the Bidder performed sensitivity analysis for:  
|    | - Anisotrophy of in-Plane CTE's  
|    | - Fiber Volume Fraction  
|    | - Fiber Direction (misalignment of +/- 5 degrees) | The following information must, as a minimum, be provided:  
|    | i. Project Name  
|    | ii. Name of Client Organization  
|    | iii. Start and End Date of Project (mm/yyyy to mm/yyyy); and  
|    | iv. Brief description of the scope of the project and the work performed.  
|    | The following information should be provided:  
|    | v. Name and contact information of the client. | Bidders may reference the same project examples to address multiple criteria. |

<table>
<thead>
<tr>
<th>Solicitation No. - N° de l'invitation</th>
<th>Amd. No. - N° de la modif.</th>
<th>Buyer ID - Id de l'acheteur</th>
</tr>
</thead>
<tbody>
<tr>
<td>31034-190377/A</td>
<td></td>
<td>VIC 251</td>
</tr>
<tr>
<td>Client Ref. No. - N° de réf. du client</td>
<td>File No. - N° du dossier</td>
<td>CCC No./N° CCC - FMS No./N° VME</td>
</tr>
<tr>
<td>31034-190377</td>
<td>VIC-9-42077</td>
<td></td>
</tr>
</tbody>
</table>
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)
**Claim for Progress Payment**

**Demande de paiement progressif**

*If necessary, use form PWGSC-TPSGC 1112 to record detail costs*

*Si nécessaire, utiliser le formulaire PWGSC-TPSGC 1112 pour inscrire les coûts détaillés*

<table>
<thead>
<tr>
<th>Contractor’s Name and Address</th>
<th>Claim No. N° de la demande</th>
<th>Date YYYY-MM-DD / AAAA-MM-JJ</th>
<th>Contract Price - Prix contractuel</th>
</tr>
</thead>
<tbody>
<tr>
<td>File No. - N° du dossier</td>
<td>Financial Code(s) - Code(s) financier(s)</td>
<td>Contract Serial No. N° de série du contrat</td>
<td></td>
</tr>
</tbody>
</table>

**Contractor’s Procurement Business Number (PBN)**

Numéro d’entreprise-approvisionnement (NEA) de l’entrepreneur

**Contractor’s Report of Work Progress (if needed, use additional sheets)**

Compte rendu de l’avancement des travaux par l’entrepreneur (si nécessaire, utiliser des feuilles supplémentaires)

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**Period of work covered by the claim**

Période des travaux visée par la demande

<p>| Description: (Expenditures must be claimed in accordance with the basis and/or method of payment of the contract) |
| Description : (Les dépenses doivent être réclamées conformément à la base de paiement et (ou) à la méthode de paiement du contrat) |</p>
<table>
<thead>
<tr>
<th>Current Claim Demande courante</th>
<th>Previous Claims Demandes précédentes</th>
<th>Total to Date Total à date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description: (Expenditures must be claimed in accordance with the basis and/or method of payment of the contract)</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>Total to Date Total à date</td>
</tr>
</tbody>
</table>

**Contractor’s GST No.**

N° de TPS de l’entrepreneur

**Subtotal**

**Sous-total**

**Applicable taxes Taxes applicables**

<table>
<thead>
<tr>
<th>Contractor’s GST No. No. de TVQ de l’entrepreneur</th>
</tr>
</thead>
</table>

**Total**

Less holdbacks on expenditures only (Applicable taxes excluded) Moins les retenues sur les dépenses uniquement (Taxes applicables en sus)

<table>
<thead>
<tr>
<th>Percentage of the work completed Pourcentage des travaux achevés</th>
<th>Current Claim Demande courante</th>
<th>Amount due Montant dû</th>
</tr>
</thead>
</table>

**Total Amount of Claim (including applicable taxes)**

Montant total de la demande (incluant les taxes applicables)

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*PWGSC-TPSGC 1111 (2014-11)*
CERTIFICATE OF CONTRACTOR

I certify that:
- All authorizations required under the contract have been obtained. The claim is consistent with the progress of the work and is in accordance with the contract.
- Indirect costs have been paid for or accrued in the accounts.
- Direct materials and the subcontracted work have been received, accepted and either paid for or accrued in the accounts following receipt of invoice from supplier/subcontractor, and have been or will be used exclusively for the purpose of the contract.
- All direct labour costs have been paid for or accrued in the accounts and all such costs were incurred exclusively for the purpose of the contract; and
- All other direct costs have been paid for or accrued in the accounts following receipt of applicable invoice or expense voucher and all such costs were incurred exclusively for the purpose of the contract; and
- No liens, encumbrances, charges or other claims exist against the work except those which may arise by operation of law such as a lien in the nature of an unpaid contractor's lien and in respect of which a progress payment and/or advance payment has been or will be made by Canada.

Contractor's Signature - Signature de l'entrepreneur

Check the box if the claim is being made with respect to advance payment provisions included in the basis of payment of the contract.

This claim, or a portion of this claim, is for an advance payment.

I certify that:
- The funds received will be used solely for the purpose of the contract and attached is a complete description of the purpose to which the advance payment will be applied.
- The amount of the payment is established in accordance with the conditions of the contract.
- The contractor is not in default of its obligations under the contract.
- The payment is related to an identifiable part of the contractual work.

CERTIFICATES OF DEPARTMENTAL REPRESENTATIVES

Scientific/Project/Inspection Authority: I certify that the work meets the quality standards required under the contract, and its progress is in accordance with the conditions of the contract.

Inspection Authority (all other contracts): I certify that the quality of the work performed is in accordance with the standards required under the contract.

Signature of Scientific / Project / Inspection Authority

SIGNATURE OF L'ENTREPRENEUR

Date (YYYY-MM-DD / AAAA-MM-JJ)

CERTIFICATE OF DEPARTMENTAL REPRESENTATIVES

Scientific/Project/Inspection Authority: I certify that the work meets the quality standards required under the contract, and its progress is in accordance with the conditions of the contract.

Inspection Authority (all other contracts): I certify that the quality of the work performed is in accordance with the standards required under the contract.

Signature of Scientific / Project / Inspection Authority

SIGNATURE OF L'ENTREPRENEUR

Date (YYYY-MM-DD / AAAA-MM-JJ)

PWGSC Contracting Authority: I certify that, to the best of my knowledge, the claim is consistent with the progress of the work and is in accordance with the contract. This claim, however, may be subject to further verification and any necessary adjustment before final settlement.

Contracting Authority Signature de l'autorité

Date (YYYY-MM-DD / AAAA-MM-JJ)

Client's Authorized Signing Officer - (must sign the interim claim): I certify that the claim is in accordance with the contract.

Client's Authorized Signing Officer - (must sign the final claim): I certify that all goods have been received and all services have been rendered, that the work has been properly performed and that the claim is in accordance with the contract.

Signature du client

Date (YYYY-MM-DD / AAAA-MM-JJ)

Signature du client

Date (YYYY-MM-DD / AAAA-MM-JJ)

ATTESTATION DE L'ENTREPRENEUR

J'atteste que :
- Toutes les autorisations exigées en vertu du contrat ont été obtenues. La demande correspond à l'avancement des travaux et est conforme au contrat.
- Les coûts indirects ont été réglés ou portés aux livres.
- Les matières directes et les travaux de sous-traitance ont été reçus, et le tout a été accepté et payé, ou encore porté aux livres après réception de factures envoyées par le fournisseur ou le sous-traitant; ces matières et ces travaux ont été ou seront utilisés exclusivement aux fins du contrat.
- Tous les coûts de la main-d'oeuvre directe ont été réglés ou portés aux livres et tous ces coûts ont été engagés exclusivement aux fins du contrat.
- Tous les autres coûts indirects ont été réglés ou portés aux livres après réception des factures ou pièces justificatives pertinentes et tous ces coûts ont été engagés exclusivement aux fins du contrat.
- Il n'existe aucun privilège ni demande ou imputation à l'égard de ces travaux sauf ceux qui pourraient survenir par effet de la loi, notamment le privilège d'un entrepreneur non payé à l'égard duquel un paiement progressif et(ou) un paiement anticipé a été ou sera effectué par le Canada.

J'atteste que :
- Les fonds reçus ne serviront uniquement qu'aux fins du contrat; ci-joint est une description complète des fins auxquelles le paiement anticipé sera utilisé.
- Le montant du paiement est établi conformément aux conditions du contrat.
- L'entrepreneur n'a pas manqué à ses obligations en vertu du contrat.
- Le paiement porte sur une partie identifiable des travaux précisés dans le contrat.

J'atteste que :
- Les travaux sont conformes aux normes de qualité exigées en vertu du contrat et que leur avancement est conforme aux conditions du contrat.
- J'atteste que la qualité des travaux exécutés est conforme aux normes exigées en vertu du contrat.

J'atteste que :
- Tous les biens ont été reçus, que tous les services ont été rendus, que tous les travaux ont été exécutés convenablement, et que la demande est conforme au contrat.

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