



**RETURN BIDS TO:
RETOURNER LES SOUMISSIONS À:**

Health Canada / Santé Canada

Attn: Sami Nouh

Email: sami.nouh@canada.ca

**REQUEST FOR PROPOSAL
DEMANDE DE PROPOSITION**

Proposal To: Health 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 thereof.

**Proposition à:
Santé 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-annexées, au(x) prix indiqué(s).

**Instructions : See Herein
Instructions: Voir aux présentes**

Issuing Office – Bureau de distribution
Health Canada / Santé Canada
200, Eglantine Driveway
Tunney's Pasture
Ottawa Ontario K1A 0K9

Title – Sujet Development of temporally and spatially resolved, satellite and chemical transport model-based PM2.5 estimates for Canada	
Solicitation No. – N° de l'invitation 1000233758	Date September 21, 2021
Solicitation Closes at – L'invitation prend fin à 12:00 PM on / le – October 21, 2021	Time Zone Fuseau horaire EDT
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 : Name: Sami Nouh Email: sami.nouh@canada.ca Telephone – téléphone : 613-941-2074	
Destination – of Goods, Services, and Construction: Destination – des biens, services et construction : See Herein – Voir ici	
Delivery required - Livraison exigée See Herein – Voir ici	
Vendor/firm Name and address Raison sociale et adresse du fournisseur/de l'entrepreneur	
Facsimile No. – N° de télécopieur : Telephone No. – N° de téléphone :	
Name and title of person authorized to sign on behalf of Vendor/firm Nom et titre de la personne autorisée à signer au nom du fournisseur/de l'entrepreneur	
<hr/> (type or print)/ (taper ou écrire en caractères d'imprimerie)	
<hr/> Signature	<hr/> Date



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PART 1 - GENERAL INFORMATION

1.1 Introduction

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

- Part 1 General Information: provides a general description of the requirement;
- Part 2 Bidder Instructions: provides the instructions, clauses and conditions applicable to the bid solicitation;
- Part 3 Bid Preparation Instructions: provides Bidders with instructions on how to prepare their bid;
- Part 4 Evaluation Procedures and Basis of Selection: indicates how the evaluation will be conducted, the evaluation criteria that must be addressed in the bid, and the basis of selection;
- Part 5 Certifications and Additional Information: includes the certifications and additional information to be provided;
- Part 6 Security, Financial and Other Requirements: includes specific requirements that must be addressed by Bidders; and
- Part 7 Resulting Contract Clauses: includes the clauses and conditions that will apply to any resulting contract.

The Annexes include the Statement of Work and the Basis of Payment.



1.2 Summary

The requirement is for the production of 1 km spatial resolution exposure surfaces for various indicators, chemical constituents and emission source sectors related to the air pollutant PM_{2.5} with coverage of all ten provinces of Canada during the period of 2000-2022. Surfaces are to be developed using an atmospheric model with emission, satellite and ground based measurement data inputs.

Health Canada is the client department.

The contract will begin in the fall of 2021 and be completed in February 2024, with potential option years during FY's 2024/2025 and 2025/2026.

Project tasks will be delivered semi-annually and interim payments made on the same schedule. Tasks include the development of:

- a) bi-weekly and annual PM_{2.5} mass and component concentrations at a 1 km spatial resolution for all 10 provinces in Canada for 2000-2020.
- b) Develop bi-weekly and annual, 1 km resolution estimates of particle oxidative aging for 2000-2020.
- c) Develop monthly, seasonal, and annual, 1 km resolution estimates of PM_{2.5} mass and PM_{2.5} component concentrations attributed to at least 7 major emissions source sectors across all 10 provinces in Canada and the contiguous US.
- d) Provide updates to the PM_{2.5} mass and component concentrations (item a), and particle oxidative aging (item b) exposure surfaces for 2021-2022.
- e) Two additional option to develop and apply a methodology for estimating individual, ambient particulate-phase trace metals concentrations for at least 10 metals on a monthly and annual basis for all 10 provinces in Canada.

1.3 Debriefings

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



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](#) (2020-05-28) Standard Instructions - Goods or Services - Competitive Requirements, are incorporated by reference into and form part of the bid solicitation.

2.2 Submission of Bids

Bids must be submitted only to the contact email on page 1 by the date and time indicated in the bid solicitation.

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

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 five (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.

2.5 Applicable Laws

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

Bidders may, at their discretion, substitute the applicable laws of a Canadian province or territory of their choice without affecting the validity of their bid, by deleting the name of the Canadian province or territory



specified and inserting the name of the Canadian province or territory of their choice. If no change is made, it acknowledges that the applicable laws specified are acceptable to the Bidders.

2.6 Bid Challenge and Recourse Mechanisms

- (a) Several mechanisms are available to potential suppliers to challenge aspects of the procurement process up to and including contract award.
- (b) Canada encourages suppliers to first bring their concerns to the attention of the Contracting Authority. Canada's [Buy and Sell](#) website, under the heading "[Bid Challenge and Recourse Mechanisms](#)" contains information on potential complaint bodies such as:
 - Office of the Procurement Ombudsman (OPO)
 - Canadian International Trade Tribunal (CITT)
- (c) Suppliers should note that there are **strict deadlines** for filing complaints, and the time periods vary depending on the complaint body in question. Suppliers should therefore act quickly when they want to challenge any aspect of the procurement process.



PART 3 - 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. Bidders must provide their bid in a single transmission.

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

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

Section I: Technical Bid

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

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

Section II: Financial Bid

Bidders must submit their financial bid in accordance with Annex B - Basis of Payment.

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 requirements are evaluated on a simple pass or fail basis. Failure by bidders to meet any of the mandatory requirements will render the bidder's proposal non-responsive. The treatment of mandatory requirements in any procurement process is absolute.

Proposers must meet all the mandatory requirements described below. This will be evaluated as either "Yes" or "No". Proposals not receiving "Yes" for any mandatory requirement will not be considered further.

Criteria ID	Mandatory criteria	Page reference #
M1	At least one active member of the project team MUST have a doctorate in atmospheric physics or chemistry with a specialization relevant to this project and at least 10 years of experience in developing ground-level air pollutant concentration estimates from satellite information (demonstrated by a record of grants and/or publications over time). A copy of the diploma(s) MUST be provided in the proposal.	
M2	The team MUST include at least one recognized expert in the use of satellite measurements to predict ground-level, ambient air pollution concentrations, as demonstrated through publications in established, relevant peer-reviewed scientific journals. The vendor must supply a bibliography of publications following a standard citation style and including, where possible, the doi (digital object identifier) identification code for each publication.	
M3	The Bidder MUST have a proven track record of successful innovation in developing methods to predict ground-based PM _{2.5} concentrations from a data fusion of satellite-based aerosol optical depth, chemical transport modelling, and ground-based measurements. A proven track record is defined as at least 2 publications on methods development/refinement in peer-reviewed scientific journals in the past 10 years and at least two (2) grants/contracts in the past 12 years.	
M4	The Bidder MUST have the capability to produce data-fused PM _{2.5} exposure surfaces (with the exception of the metals surfaces in the option years) that meet ALL of the following criteria: 1. Geographic extent covers all 10 provinces in Canada and the contiguous US 2. Spatial resolution of the final exposure surfaces is 1 km 3. Extends over long periods (defined as annual averages for at least 15 years)	



	This capability MUST be demonstrated through a track record of at least 1 publication in peer-reviewed scientific journals in the past 5 years.	
M5	<p>The Bidder MUST demonstrate that the methodology they propose for PM_{2.5} exposure surface development is capable of producing datasets compatible with those already linked with population-based cohorts in Canada. The methodology must be compatible with the following paper:</p> <p>van Donkelaar A, Martin RV, Li C, Burnett RT. 2019. Regional Estimates of Chemical Composition of Fine Particulate Matter using a Combined Geoscience-Statistical Method with Information from Satellites, Models, and Monitors. Environ Sci Technol. 53:2595-2611.</p> <p>The Bidder must provide citations to peer-reviewed publications or peer-reviewed reports where they developed datasets identical to, or compatible with, those described in the paper referenced above.</p>	
M6	<p>The Bidder MUST have a proven track record of applying a global chemical transport model to relate satellite observations of the atmospheric column to ground-level concentrations of air pollutants.</p> <p>A proven track record is considered to be at least 5 publications in peer-reviewed scientific journals in the past 10 years.</p>	
M7	The Bidder MUST have access to satellite data and chemical transport modelling data necessary to produce PM _{2.5} exposure surfaces described in the Statement of Work for all ten provinces of Canada and the continental United States. A description of the sources of the data that they intend to use to fulfil this requirement and how they will access it must be included.	

4.1.1.2 Point Rated Technical Criteria

A proposal with a score less than the specified minimum for technical compliance for any one criteria will be considered non responsive, and eliminated from the competition. To be considered responsive, a bid must obtain the required minimum overall points.

Criteria ID	Point rated technical criteria	Maximum points	Page reference #
R1	<p>Demonstration that the methodology proposed for PM_{2.5} exposure surface development is capable of producing datasets compatible with those already linked with population-based cohorts in Canada. The methodology must be compatible with the following paper:</p> <p>van Donkelaar A, Martin RV, Li C, Burnett RT. 2019. Regional Estimates of Chemical Composition of Fine Particulate Matter using a Combined Geoscience-Statistical Method with Information from Satellites, Models, and Monitors. Environ Sci Technol. 53:2595-2611.</p> <p>A description of the proposed methodology that presents the similarities and differences from the methods used in the above paper must be provided and describes how any differences will be addressed to ensure compatibility of the datasets. Supporting peer reviewed publications should be cited.</p>	25	



	<p>Excellent (25 points) – The Bidder’s response to this criterion is in depth and may exceed the requirement. The approach should ensure highly effective performance on this aspect of the work.</p> <p>Good (20 points) – The Bidder’s response to the criteria covers but does not exceed the requirement. The approach should ensure effective performance on this aspect of the work</p> <p>Satisfactory (15 points) - The Bidder’s response satisfactorily addresses this criterion. The approach indicates adequate performance on this aspect of the work.</p> <p>Minimal (10 points) – The Bidder’s response to this criterion is inadequate in certain areas of this criterion. The approach demonstrated is likely to be insufficient in terms of performance on this aspect of the work.</p> <p>Poor (5 point) – The Bidder’s response poorly addresses the criterion. The approach demonstrated is insufficient for the effective performance of the work.</p>		
R2	<p>Publication record on satellite measurements of aerosol optical depth in peer reviewed scientific journals will be evaluated based on number and pertinence. Publications in journals that do not have external peer review, or that are not considered to be relevant journals, do not count.</p> <p>The evaluation will be based on the following criteria:</p> <ol style="list-style-type: none"> 1. The paper meets ALL of the following criteria: <ol style="list-style-type: none"> i. derives ambient PM_{2.5} concentrations using satellite measurements as an input ii. involves application of global chemical transport models for improving the interpretation of satellite data iii. includes coverage over the 10 provinces in Canada 2. PM_{2.5} exposure surfaces in the paper have been linked to population-based cohorts in Canadian epidemiological studies. The Bidder must provide a list of epidemiological publications applying the surface(s). 3. The paper was published recently: <ol style="list-style-type: none"> i. from 2016-2021 – 1 point ii. from 2011-2015 – 0.5 point 4. The Bidder is the corresponding author of the paper, or is the direct supervisor of the first author of the paper at the time of publication <p><u>Evaluation criteria scoring method</u></p> <p>Criteria 1 – each paper meeting ALL sub-criteria (i-iii) will score 1 point, for a maximum of 10 points</p> <p>Criteria 2 – 1 point for each paper to a maximum of 10 points</p> <p>Criteria 3 – 1 point for each paper published in 2016-2021 and 0.5 point for each paper published in 2011-2015, for a maximum of 5 points.</p> <p>Criteria 4 – 0.5 point for each paper for a maximum of 5 points</p>	30	



R3	<p>Number of years of experience of the team leader in developing ground-level estimates of air pollutants (PM_{2.5} and/or NO₂) concentrations using satellite information.</p> <p><u>Evaluation criteria scoring method</u></p> <p>15 points = 15+ years 10 points = 10+ to 15 years 5 points = 5+ to 10 years 1 point = 0 to 5 years</p>	15	
R4	<p>Number of years of team experience in developing ground-level estimates of air pollutant (PM_{2.5} and/or NO₂) concentrations using satellite information.</p> <p>Team experience is defined as the cumulative years of experience over all members of the proposed project team.</p> <p><u>Evaluation criteria scoring method</u></p> <p>15 points = 15+ years 10 points = 10+ to 15 years 5 points = 5+ to 10 years 1 point = 0 to 5 years</p>	15	
R5	<p>The scientific soundness and completeness of the proposal will be evaluated based on the following criteria:</p> <ol style="list-style-type: none">1. The approach is explained clearly, is scientifically sound, and demonstrates an understanding of the project goals.2. The proposed methods are scientifically credible and well articulated.3. The development phases of the project align with the deliverables.4. Potential challenges in the development of the project are identified.5. The approach caters to the Canadian context and the end use in epidemiological analyses. <p><u>Evaluation criteria scoring method</u></p> <p>Up to 5 points may be awarded for each criterion, for a potential total of 25 points:</p> <p>Excellent (5 points) – The Bidder's response to this criterion is in depth and covers all of the factors and may exceed the requirement. The knowledge, experience or approach</p>	25	



	<p>demonstrated should ensure highly effective performance on this aspect of the work.</p> <p>Good (4 points) – The Bidder’s response to the criteria covers all of the factors but does not exceed the requirement. The knowledge, experience or approach demonstrated should ensure effective performance on this aspect of the work</p> <p>Satisfactory (3 points) - The Bidder’s response satisfactorily addresses this criterion while missing only a few key factors. The knowledge, experience or approach demonstrated indicates adequate performance on this aspect of the work.</p> <p>Minimal (2 points) – The Bidder’s response to this criterion is inadequate in certain areas of this criterion. The knowledge, experience or approach demonstrated is likely to be insufficient in terms of performance on this aspect of the work.</p> <p>Poor (1 point) – The Bidder’s response poorly addresses the criterion. The knowledge, experience or approach demonstrated is insufficient for the effective performance of the work.</p>		
R6	<p>The clarity and completeness of the work plan and schedule will be evaluated based on the following criteria:</p> <ol style="list-style-type: none"> 1. The work plan presents the tasks and activities listed in the Statement of Work. 2. The schedule aligns with the project deliverables. 3. The skillsets and/or relevant experience of the project team members are adequately described, with the roles of personnel elucidated. <p><u>Evaluation criteria scoring method</u></p> <p>Up to 5 points may be awarded for each criterion, for a potential total of 15 points:</p> <p>Excellent (5 points) – The Bidder’s response to this criterion is in depth and covers all of the factors and may exceed the requirement. The knowledge, experience or approach demonstrated should ensure highly effective performance on this aspect of the work.</p> <p>Good (4 points) – The Bidder’s response to the criteria covers all of the factors but does not exceed the requirement. The knowledge, experience or approach demonstrated should ensure effective performance on this aspect of the work</p> <p>Satisfactory (3 points) - The Bidder’s response satisfactorily addresses this criterion while missing only a few key factors. The knowledge, experience or approach demonstrated indicates adequate performance on this aspect of the work.</p> <p>Minimal (2 points) – The Bidder’s response to this criterion is inadequate in certain areas of this criterion. The knowledge, experience or approach demonstrated is likely to be insufficient in terms of performance on this aspect of the work.</p>	15	



	Poor (1 point) – The Bidder’s response poorly addresses the criterion. The knowledge, experience or approach demonstrated is insufficient for the effective performance of the work.		
	Maximum points	125	
	Minimum Number of Points to be Responsive	75	

4.2 Basis of Selection -

- a) To be declared responsive, a bid must:
 - i. comply with all the requirements of the bid solicitation;
 - ii. meet all mandatory technical evaluation criteria; and
 - iii. obtain the required minimum of 75 points overall for the technical evaluation criteria which are subject to point rating. The rating is performed on a scale of 125 points.

- b) Bids not meeting (a) or (b) or (c) will be declared non responsive.. The responsive bid with the highest number of points will be recommended for award of a contract, provided that the total evaluated price does not exceed the budget available for this requirement.

4.1.2 Financial Evaluation

The maximum funding available for the Contract resulting from the bid solicitation is \$ 270,000 for the initial contract period and \$90,000 per year for each of two option years (Applicable Taxes extra). Bids valued in excess of this amount will be considered non-responsive. This disclosure does not commit Canada to pay the maximum funding available.



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 Integrity 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 specified 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) (<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.



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 Statement of Work

The Contractor must perform the Work in accordance with the Statement of Work at Annex "A".

6.2 Standard Clauses and Conditions

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

6.2.1 General Conditions

[2035](#) (2020-05-28), General Conditions - Higher Complexity - Services, apply to and form part of the Contract.

6.2.2 Supplemental General Conditions

[4006](#) (2010-08-16) Contractor to Own Intellectual Property Rights in Foreground information, apply to and form part of the Contract.

6.3 Security Requirements

6.3.1 There is no security requirement applicable to the Contract.

6.4 Term of Contract

6.4.1 Period of the Contract

The Work is to be performed during the period of contract award to March 31, 2024.

6.4.2 Option to Extend the Contract

The Contractor grants to Canada the irrevocable option to extend the term of the Contract by up to two (2) additional one (1) year periods, 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 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

6.5 Authorities

6.5.1 Contracting Authority

The Contracting Authority for the Contract is:

Name: Sami Nouh
Title: Senior Procurement and Contracting Officer
Health Canada - Public Health Agency of Canada
Chief Financial Officer Branch
Telephone: 613-941-2074
E-mail address: sami.nouh@canada.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 *(insert at contract award)*:

Name: _____
Title: _____
Organization: _____
Address: _____

Telephone: ____-____-_____
Facsimile: ____-____-_____
E-mail address: _____

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.

6.5.3 Contractor's Representative

(insert at contract award)

Name: _____
Title: _____
Organization: _____
Address: _____
Telephone: ____-____-_____
Facsimile: ____-____-_____

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

6.7.2 Limitation of Price

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

6.7.3 Milestone Payments - Not subject to holdback

Canada will make milestone payments in accordance with the Schedule of Milestones detailed in the Contract and the payment provisions of the Contract if:

- a. all work associated with the milestone and as applicable any deliverable required has been completed and accepted by Canada.



The schedule of milestones for which payments will be made in accordance with the Contract is as follows:

Initial Contract Period (Contract Award to March 31, 2024)

Milestone Payment	Key Deliverables	Completion Date	Payment (%)
1	Deliver bi-weekly and annual PM _{2.5} mass concentration dataset for 2017-2020	February 15, 2022	32%
2	Deliver bi-weekly and annual PM _{2.5} component concentration dataset for 2017-2020	August 30, 2022	17%
3	Deliver bi-weekly and annual PM _{2.5} mass and component concentration dataset for 2000-2016 Deliver bi-weekly and annual particle aging datasets (SOA, POA, SOA:POA) for 2000-2020 Present results to date via a video conference presentation during Q4	February 15, 2023	17%
4	Deliver monthly, seasonal, and annual source-attributed PM _{2.5} mass and component concentration dataset for recent year (e.g., 2019)	August 30, 2023	17%
5	Deliver monthly, seasonal, and annual source-attributed PM _{2.5} mass and component concentration dataset for remaining two modelling years (early 2000s and intermediate year) Deliver bi-weekly and annual PM _{2.5} mass concentration, component concentrations, and particle aging datasets for 2021-2022	February 15, 2024	17%

6.7.4 Electronic Payment of Invoices – Contract

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

- a. Direct Deposit (Domestic and International);

6.8 Invoicing Instructions

The Contractor must submit invoices in accordance with the following. Invoices cannot be submitted until all work identified in the invoice is completed.

Invoices must be distributed as follows:

- a. One (1) copy must be forwarded to the following email address for certification and payment.
hc.p2p.east.invoices-factures.est.sc@canada.ca



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.

6.9.3 Applicable Laws

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

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 supplemental general conditions 4006 (2010-08-16), Contractor to Own Intellectual Property Rights in Foreground Information;
- (c) the general conditions 2010C (2018-06-21), General Conditions - Services (Medium Complexity);
- (d) Annex A, Statement of Work;
- (e) the Contractor's bid dated _____

6.11 Dispute Resolution

- (a) The parties agree to maintain open and honest communication about the Work throughout and after the performance of the contract.
- (b) The parties agree to consult and co-operate with each other in the furtherance of the contract and promptly notify the other party or parties and attempt to resolve problems or differences that may arise.
- (c) If the parties cannot resolve a dispute through consultation and cooperation, the parties agree to consult a neutral third party offering alternative dispute resolution services to attempt to address the dispute.
- (d) Options of alternative dispute resolution services can be found on Canada's Buy and Sell website under the heading "Dispute Resolution".



ANNEX "A"

STATEMENT OF WORK

1. TITLE

Development of temporally and spatially resolved, satellite and chemical transport model-based PM_{2.5} estimates for Canada

2. SCOPE

Health Canada is seeking proposals for the development of high-resolution exposure surfaces of PM_{2.5} mass and component concentrations, as well as alternative metrics to represent particle toxicity, from 2000 onward for Canada. Exposure surfaces developed through this contract will support Health Canada's epidemiological analyses and health impact assessment activities.

2.1 Background

Previous contracts administered by Health Canada supported the development of annual, 1 km, gridded estimates of ambient PM_{2.5} mass and its component concentrations from a fusion of remote sensing-based aerosol optical depth, chemical transport modelling, and monitoring observations for 1998 onward (e.g., van Donkelaar et al. 2019). Source attribution surfaces (Meng et al. 2019) and measures of ambient particle toxicity (i.e., oxidative potential/burden) were also developed. These exposure surfaces have been used to represent long-term ambient exposures through linkage to national, population-based cohorts in epidemiological studies that estimate associations between ambient PM_{2.5} exposure and risk of mortality and morbidity endpoints. Examples of epidemiological studies applying these PM_{2.5} exposure surfaces include analyses of the Canadian Census Health and Environment Cohort (CanCHEC; Crouse et al. 2012; Crouse et al. 2015; Pinault et al. 2017; Pappin et al. 2019) and the Canadian Community Health Survey-Mortality cohort (CCHS-Mortality; Christidis et al. 2019).

2.2 Objectives

. This contract seeks:

1) to further develop 1 km PM_{2.5} mass and component concentration exposure surfaces, specifically at a higher temporal resolution (i.e., bi-weekly estimates),

2) to develop a number of additional exposure surfaces for:

a) secondary organic aerosol (SOA) as a measure of oxidative particle aging,

b) source attribution of PM_{2.5} mass and components to major emissions sectors,

c) individual transition metals in the particulate phase. The Contractor will develop these exposure surfaces to represent long-term, population-level exposures to ambient PM_{2.5} across the entire 10 provinces in Canada. Exposure surfaces will combine satellite-based aerosol optical depth observations, chemical transport modelling outputs, and ground-based observations to create fused estimates compatible with those already linked to population-based datasets (van Donkelaar et al. 2019). Outputs of this contract will support epidemiological analyses of the health risks of short- and long-term PM_{2.5} exposure, as well as analyses of the health impacts of air pollution in Canada. Technical terms referring to "exposure surfaces" are defined in section 7.2.



2.3 Context

Ambient air pollution is the single largest environmental risk factor for premature mortality and morbidity worldwide (WHO 2016). In the 2019 Health Impacts of Air Pollution in Canada Report, Health Canada estimated that 15,300 premature deaths per year were attributable to ambient air pollution exposure in Canada. Among the criteria air contaminants of concern, PM_{2.5} has the largest health risks and impacts at ambient concentrations, with 10,000 of those deaths due to long-term PM_{2.5} exposure (Health Canada 2021).

Though a wide body of literature exists on the associations between PM_{2.5} mass concentrations and adverse health effects, less is known on the differential toxicity of ambient particles as affected by a number of parameters. PM_{2.5} is a complex mixture that varies in composition over both space and time. It depends on local and regional source characteristics, the transport pathway, and the degree of atmospheric processing. Recent epidemiological studies have sought to better understand particle toxicity through alternative metrics to PM_{2.5} mass concentration, including component concentrations, oxidative potential/burden, attribution of PM_{2.5} mass to emissions source sectors, particulate metals, etc. Evidence for specific PM_{2.5} components and other nonconventional measures has been inconclusive to date, and further research using large, population-based studies is needed.

Recent studies indicate that certain **combinations** of PM_{2.5} components may be relevant to health risks, with a particular focus on transition metals and sulphate. Specifically, higher levels of sulphate in PM_{2.5} makes the particle more acidic, which in turn increases the solubility of metals, which become more biologically available and more likely to participate in redox reactions that can cause oxidative stress in the lungs (Fang et al. 2017). Similarly, other evidence suggests that atmospheric aging of particles may impact their toxicity (Kodros et al. 2020; Li et al. 2013; Wong et al. 2019) but this question has not been thoroughly examined in population-based studies. In order to address these questions from an epidemiological perspective, exposure models are needed that can predict these metrics on a national scale for subsequent linkage with large, population-based cohorts available in Canada.

Health Canada and Statistics Canada have linked ambient, 1 km, satellite/chemical transport model-based PM_{2.5} exposure surfaces from previous contracts to large, population-based cohorts to examine associations with mortality and morbidity. Examples of epidemiological work that applies fused PM_{2.5} estimates from satellite remote sensing observations, chemical transport modelling, and ground-based observations are listed below. Additional publications are listed in section 7.1.

Chen H, Zhang ZL, van Donkelaar A, Bai L, Martin RV, Lavigne E, Kwong JC, Burnett RT. 2020. Understanding the joint impacts of fine particulate matter concentration and composition on the incidence and mortality of cardiovascular disease: a component-adjusted approach. *Environ Sci Technol.* 54:4388-4399.

Pappin AJ, Christidis T, Pinault LL, Crouse DL, Brook JR, Erickson A, Hystad P, Li C, Martin RV, Meng J, Weichenthal S, van Donkelaar A, Tjepkema M, Brauer M, Burnett RT. 2019. Examining the shape of the association between low levels of fine particulate matter and mortality across three cycles of the Canadian Census Health and Environment Cohort. *Environ Health Perspect* 127:107008.

Christidis T, Erickson AC, Pappin AJ, Crouse DL, Pinault LL, Weichenthal SA, Brook JR, van Donkelaar A, Hystad P, Martin RV, Tjepkema M, Burnett RT, Brauer M. 2019. Low concentrations of fine particle air pollution and mortality in the Canadian Community Health Survey cohort. *Environ Health* 18:84.



It will be necessary for the Contractor to produce exposure surfaces compatible with those already linked with population-based cohorts in Canada as delivered through previous contracts. Exposure surfaces delivered must apply methodology compatible with the following paper:

van Donkelaar A, Martin RV, Li C, Burnett RT. 2019. Regional Estimates of Chemical Composition of Fine Particulate Matter using a Combined Geoscience-Statistical Method with Information from Satellites, Models, and Monitors. *Environ Sci Technol.* 53:2595-2611.

Because of the exploratory nature of epidemiological studies in which the contract deliverables will be applied, Health Canada reserves the right to give written notice and terminate the contract if interim results indicate an inability to support the stated objective of appropriately supporting epidemiological research and health impact assessment activities in Canada.

3. REQUIREMENTS

3.1. Tasks, Activities, Deliverables and Milestones

The Contractor will meet quarterly with one of the Departmental Representatives for the purposes of status updates, discussions of project timelines, and review of deliverables. The Departmental Representative will help guide the Contractor as needed to ensure the project is achieving the objectives and goals in a timely manner.

To support epidemiological research and health impact assessment activities pertaining to ambient PM_{2.5} exposure in Canada, the Contractor will complete the following list of deliverables and milestones. A detailed budget and timeline follows in Table 2. For consistency with PM_{2.5} exposure surfaces already linked to population-based datasets in Canada, it is anticipated that all exposure surfaces delivered through this contract must apply a fusion of remote sensing-based aerosol optical depth, chemical transport modelling, and ground monitoring data. To ensure that high-resolution PM_{2.5} exposure data continues to be procured, PM_{2.5} mass, component, particle aging, and source attribution exposure surfaces must have a spatial resolution of 1 km.

- a) Develop bi-weekly and annual PM_{2.5} mass and component concentrations at a 1 km spatial resolution for all 10 provinces in Canada for 2000-2020. PM_{2.5} components must include, but are not limited to, sulfate, nitrate, ammonium, organic matter/organic carbon, black carbon, dust, and sea salt.
- b) Develop bi-weekly and annual, 1 km resolution estimates of particle oxidative aging for 2000-2020. Metrics indicative of oxidative aging will be: PM_{2.5} secondary organic aerosol (SOA) and primary organic aerosol (POA) mass concentrations, and the ratio of SOA:POA. Alternative but related metrics may be specified at a later date by the Technical Authority, as agreed upon by the Contractor.
- c) Develop monthly, seasonal, and annual, 1 km resolution estimates of PM_{2.5} mass and PM_{2.5} component concentrations attributed to at least 7 major emissions source sectors across all 10 provinces in Canada and the contiguous US. Source-attributed exposure surfaces will be produced for 3 modelling years: one year capturing the early 2000s, one recent year prior to or deemed to be unaffected by COVID-19 (e.g., 2019, or slightly earlier), and one year in between. The Technical Authority will specify the years for which modelling is to be undertaken at the time of initiation of the work. The final number and identification of source sectors will be decided upon in consultation with the Technical Authority at the time of initiation of the work. Source sectors may include, but are not limited to, transportation, residential combustion, industry, agriculture, biogenic SOA, power generation, wildfires, dust, sea salt, and other sources.



- d) Provide updates to the PM_{2.5} mass and component concentrations (item a), and particle oxidative aging (item b) exposure surfaces for 2021-2022.
- e) [Option years 1-2*] Develop and apply a methodology for estimating individual, ambient particulate-phase trace metals concentrations for at least 10 metals on a monthly and annual basis for all 10 provinces in Canada. Metals surfaces will be produced for 2000-2023 or 2000-2024, depending upon availability of input data to the exposure surfaces; to be decided upon in consultation with the Technical Authority at the time of initiation of the work. Metals surfaces may include, but are not limited to, Fe, Mn, Ni, Si, Ca, Al, Ti, K, Mg, As, Cd, and Pb, Cu, and Zn. The Technical Authority will specify the list of metals at the time of initiation of the work.
- f) [Option year 2*] Update PM_{2.5} mass and component concentrations (item a), and particle oxidative aging (item b) exposure surfaces for 2023-2024, depending upon availability of satellite and emissions data; to be decided upon in consultation with the Technical Authority at the time of the initiation of the work. Develop source attribution surface for a recent, post-2020 year as specified by the Technical Authority at the time of initiation of the work.

Table 2. Timeline

Initial Contract Period		
Quarter	Project Task ⁺	Due Date
2021-2022 Q4	Deliver bi-weekly and annual PM _{2.5} mass concentration dataset for 2017-2020	February 15, 2022
2022-2023 Q2	Deliver bi-weekly and annual PM _{2.5} component concentration dataset for 2017-2020	August 30, 2022
2022-2023 Q4	Deliver bi-weekly and annual PM _{2.5} mass and component concentration dataset for 2000-2016 Deliver bi-weekly and annual particle aging datasets (SOA, POA, SOA:POA) for 2000-2020 Present results to date via a video conference presentation during Q4	February 15, 2023
2023-2024 Q2	Deliver monthly, seasonal, and annual source-attributed PM _{2.5} mass and component concentration dataset for recent year (e.g., 2019)	August 30, 2023
2023-2024 Q4	Deliver monthly, seasonal, and annual source-attributed PM _{2.5} mass and component concentration dataset for remaining two modelling years (early 2000s and intermediate year) Deliver bi-weekly and annual PM _{2.5} mass concentration, component concentrations, and particle aging datasets for 2021-2022	February 15, 2024



Option Period #1		
2024-2025 Q2 (Option year 1; item e) above)*	Deliver report detailing methodology for estimating individual, trace metals concentration surfaces	August 30, 2024
2024-2025 Q4 (Option year 1; item e) above)*	Deliver report detailing preliminary performance evaluation of trace metals concentration surfaces against observations for select time periods	February 15, 2025
Option Period #2		
2025-2026 Q2 (Option year 2; item e) above)*	Deliver individual, trace metals concentration datasets for 2000-2023/2024 Present results to date via a video conference presentation during Q2	August 30, 2025
2025-2026 Q4 (Option year 2; item f) above)*	Deliver bi-weekly and annual PM _{2.5} mass concentration, component concentrations, and particle aging datasets for 2023-2024 Deliver monthly, seasonal, and annual source-attributed PM _{2.5} mass and component concentration datasets for a recent year specified by the Technical Authority	February 15, 2026

* All project tasks are as described in items a) through f), above.

* One two-year extension to this contract spanning FYs 2024-2026 may be invoked by Health Canada for the deliverables described in e) and f) and listed in Table 2.

3.2. Specifications and Standards

All datasets and reports delivered to Health Canada through this contract are expected to be based on scientifically credible methods and of high quality. Emissions modelling undertaken to develop the exposure surfaces will use the most up-to-date emissions estimates from the Air Pollutant Emissions Inventory (APEI) at the time of initiation of the contract or the option period.

All dataset deliverables will be accompanied by a report describing the methodologies and processes used for the exposure surface development; the sources of data for all inputs to the exposure surface (including any models used to generate inputs); the spatial and temporal resolutions of all input and final data; the timespan of the dataset; and a performance evaluation of the final PM_{2.5} mass, components, and metals exposure surfaces against ground-based monitoring observations (performance evaluation is dependent upon availability of appropriate PM_{2.5} speciation monitoring data; to be determined in consultation with the Technical Authority). The Technical Authority will specify the performance evaluation metrics to be used in the quarterly meetings with the Contractor. Publications, or draft articles under consideration for publication, may be included in the reports as supplemental material covering these details, but the main body of the report must adequately cover the items listed above if the publications do not. The report must state if the methods, timespans, and resolutions differ from those described in the publications for the purposes of Health Canada's internal tracking.



The Contractor will allow a minimum of 10 business days for Health Canada to review the deliverables. More than one draft may be needed. The work will be deemed complete pending a quality review and acceptance by the Departmental Representatives.

All draft and final deliverables must be sent to Health Canada in electronic form as MS Word (.doc or .docx) and/or PDF formats, as applicable. All data files containing spatio-temporal exposure surfaces must be delivered in ASCII file format, with exposure estimates identified by the latitude and longitude of the centroid of each grid cell. Additional information included in the file must be formatted such that it is readable by the GIS software, ArcGIS. A description of the file naming convention, and all variables in the ASCII files, must be provided.

3.3. Technical, Operational and Organizational Environment

The work will be completed by the Contractor at their place of employment. The Contractor will ensure that all the technical, organizational and operational requirements are in place to carry out the work in a timely manner.

3.4. Method and Source of Acceptance

The Contractor will provide Health Canada with the deliverables described in section 3.1 and will ensure the completion of all deliverables in a timely and responsive manner. All reports, deliverables and services rendered are subject to inspection and approval by the Project Authority. The Departmental Representatives will assess all deliverables in terms of the quality of exposure model development, the nature and presentation of analyses, and the appropriateness of the interpretation of results. Should a deliverable not be to the satisfaction of the Technical Authority, the Crown reserves the right to refuse acceptance and require its correction within the agreed upon scope of the project.

3.5. Reporting Requirements

In addition to the timely submission of all deliverables and the fulfilment of all obligations listed within this contract, it is the responsibility of the Contractor to facilitate and maintain regular communication with Health Canada. Communication is defined as all reasonable efforts to inform all parties of plans, decisions, proposed approaches, implementation, and results of work, to ensure that the work is progressing well and in accordance with expectations as well as the regulations of this contract. Communication may include: phone calls, emails, and meetings. The Contractor is to immediately notify the Departmental Representatives of any issues, problems, or areas of concern in relation to any work under this contract, as they arise.

3.6. Project Management Control Procedures

The Departmental Representatives will monitor and control the work through regular meetings with the Contractor and provision of feedback via email and/or telephone/video conference calls as needed. The Contractor will provide Health Canada updates via regular emails, and/or telephone/video conference calls for the purposes of status updates, discussions of project timelines and review of deliverables. The updates will include specification of any challenges faced or foreseen which could compromise the quality or timeliness of the work. The Contractor will provide invoices upon completion of the deliverables as per section 3.1. Any changes to the agreement will be made through written amendment(s) to the agreement signed by the parties reflecting such change(s).



3.7 Change Management Procedures

Any change to the scope (Refer to section 2 herein) and the schedule for the work will need to be presented in writing for the consideration of Health Canada's Departmental Representatives, who are the Scientific and Technical Project Authorities. In identifying a suggested change in the scope or any element of the Statement of Work, the Contractor will need to clearly justify why the change is being recommended outside the current Statement of Work estimated cost and timelines. Health Canada will respond within ten (10) working days regarding the decision to approve or not approve the recommended change. If the change is approved, a formal proposal will be required from the Contractor for the review and acceptance by Health Canada and a written contract amendment will be processed accordingly.

3.8 Ownership of Intellectual Property

The Contractor is to own the intellectual property (IP) created under this contract, with an extensive licence given to the Crown to use the IP. The license includes permission to post data summaries for public access.

4. ADDITIONAL INFORMATION

4.1. Canada's Obligations

Health Canada will provide the following in support of this contract:

- a) Ensure the availability of staff with whom the Contractor may need to consult
- b) Provide comments on draft reports within ten (10) business days

4.2. Contractor's Obligations

- Unless otherwise specified, the Contractor must use its own equipment and software for the performance of this Statement of Work.

4.3. Location of Work, Work site and Delivery Point

The work is expected to be completed in a location chosen by the Contractor. It is expected that none of the work will be carried out at a Health Canada location. Health Canada will not be providing office accommodation, secretarial services, office materials, office equipment or provide the use of a telephone for the Contractor. Deliverables will be provided via email and meetings will be held via video conference, teleconference or in person on Health Canada premises.

Unscreened contractors must be escorted by an employee or Commissionaire at all times when visiting Government of Canada facilities. Information which is to be used in the development of the contracted product, as reference material or otherwise made available to the Contractor must be unclassified material and considered to be releasable to the public by Health Canada.

No Protected or Classified information is to be made available to the Contractor, used in the production of the contracted product, or produced as a result of this contract.

4.4. Language of Work

The language of necessary communications and deliverables (i.e., emails, meetings, research, reports, etc.), as outlined in this Statement of Work, is English.



4.5. Travel and Living

No Travel will be paid via this contract

5. APPLICABLE DOCUMENTS AND GLOSSARY

5.1. Applicable Documents

It will be necessary for the Contractor to produce results compatible with those already linked with population-based cohorts in Canada as delivered through previous contracts. PM_{2.5} mass and component exposure surfaces delivered must apply methodology compatible with the following paper:

van Donkelaar A, Martin RV, Li C, Burnett RT. 2019. Regional Estimates of Chemical Composition of Fine Particulate Matter using a Combined Geoscience-Statistical Method with Information from Satellites, Models, and Monitors. *Environ Sci Technol.* 53:2595-2611.

Exposure surfaces attributing PM_{2.5} mass and components to source sectors must apply methodology compatible with the following paper:

Meng J, Martin RV, Li C, van Donkelaar A, Tzompa-Sosa ZA, Yue X, Xu J-W, Weagle CL, Burnett RT. 2019. Source Contributions to Ambient Fine Particulate Matter for Canada. *Environ Sci Technol.* 53:10269-10278.

Additional examples of research where fusions of satellite, chemical transport model, and monitoring data are applied in epidemiological analyses are listed below. Further examples are listed in section 2.3.

Bai L, Shin SH, Burnett RT, Kwong JC, Hystad P, van Donkelaar A, Goldberg MS, Lavigne E, Weichenthal S, Copes R, Martin R, Kopp A, Chen H. 2020. Long-term exposure to air pollution and the incidence of lung and breast cancer: ONPHEC cohort. *Int J Cancer.* 146(9):2450-2459. doi: 10.1002/ijc.32575.

Crouse DL, Peters PA, Hystad P, Brook JR, van Donkelaar A, Martin RV, et al. . 2015. Ambient PM_{2.5}, O₃, and NO₂ exposures and associations with mortality over 16 years of follow-up in the Canadian Census Health and Environment Cohort (CanCHEC). *Environ Health Perspect* 123(11):1180–1186. Doi: 10.1289/ehp.1409276. - DOI - PMC - PubMed

Crouse DL, Peters PA, van Donkelaar A, Goldberg MS, Villeneuve PJ, Brion O, et al. . 2012. Risk of nonaccidental and cardiovascular mortality in relation to long-term exposure to low concentrations of fine particulate matter: a Canadian national-level cohort study. *Environ Health Perspect* 120(5):708–714Doi: 10.1289/ehp.1104049.

Ilango S, Chen H, Hystad P, van Donkelaar A, Kwong JC, Tu K, Martin RV, and Benmarhnia T. 2019. The role of cardiovascular disease in the relationship of chronic exposure to air pollution and dementia. *Int J Epidemiol.* DOI: 10.1093/ije/dyz154

Lavigne É, Talarico R, van Donkelaar A, Martin RV, Stieb DM, Crighton E, Weichenthal S, Smith-Doiron M, Burnett RT, Chen H. 2021. Fine particulate matter concentration and composition and the incidence of childhood asthma. *Environ Int.* 152:106486.

Lavigne É, Bélair MA, Rodriguez Duque D, Do MT, Stieb DM, Hystad P, van Donkelaar A, Martin RV, Crouse DL, Crighton E, Chen H, Burnett RT, Weichenthal S, Villeneuve PJ, To T, Brook JR, Johnson M,



Cakmak S, Yasseen AS 3rd, Walker M. 2018. Effect modification of perinatal exposure to air pollution and childhood asthma incidence. *Eur Respir J.* 51(3):1701884.

Pinault LL, Weichenthal S, Crouse DL, Brauer M, Erickson A, Donkelaar AV, et al. 2017. Associations between fine particulate matter and mortality in the 2001 Canadian Census Health and Environment Cohort. *Environ Res* 159:406–415. Shin S, Bai L, Burnett RT, Kwong JC, Hystad P, van Donkelaar A, Lavigne E, Weichenthal S, Copes R, Tu K, Martin RV, Kopp A, Chen H. 2020. Air Pollution as a risk factor for incident COPD and asthma: 15-Year population-based cohort study. *Amer J Resp Critical Care Med.* 203(9):1138-1148. DOI: 10.1164/rccm.201909-1744OC.

Other documents referenced in this RFP are listed below:

Health Canada. 2021. Health Impacts of Air Pollution in Canada: Estimates of Premature Deaths and Nonfatal Outcomes. H144-51/2021E-PDF. Ottawa, Ontario, Canada: Health Canada.

Li Q, Shang J, Zhu T. 2013. Physicochemical characteristics and toxic effects of ozone-oxidized black carbon particles. *Atmos Environ* 81: 68-75.

Kodros JK, Papanastasiou DK, Paglione M, Masiol M, Squizzato S, Florou K, Skyllakou K, Kaltsonoudis C, Nenes A, Pandis SN. 2020. Rapid dark aging of biomass burning as an overlooked source of oxidized organic aerosol. *PNAS* <https://doi.org/10.1073/pnas.2010365117>.

Wong JPS, Tsagkaraki, Tsiodra I, Mihalopoulos N, Violaki K, Kanakidou M, Sciare J, Nenes A, Weber RJ. 2019. Effects of atmospheric processing on the oxidative potential of biomass burning organic aerosols. *Environ Sci Technol* 53: 6747-6756.

WHO. 2016. Ambient air pollution: a global assessment of exposure and burden of disease. Geneva www.who.int/phe/publications/air-pollution-global-assessment/en.

5.2. Relevant Terms, Acronyms and Glossaries

- **SOA – secondary organic aerosol**
- **POA – primary organic aerosol**
- **PM_{2.5} mass exposure surface** – Annual and bi-weekly gridded estimates of PM_{2.5} mass concentration ($\mu\text{g}/\text{m}^3$) at a 1 km spatial resolution covering all 10 provinces in Canada.
- **PM_{2.5} component exposure surface** – Annual and bi-weekly gridded estimates of PM_{2.5} component/constituent mass concentrations at a 1 km spatial resolution covering all 10 provinces in Canada. PM_{2.5} components may include, but are not limited to, sulfate, nitrate, ammonium, organic matter, black carbon, dust, and sea salt.
- **Particle aging exposure surface** – Annual and bi-weekly gridded estimates of PM_{2.5} SOA, POA, and the ratio of SOA:POA at a 1 km spatial resolution covering all 10 provinces in Canada.
- **Source attribution exposure surface** – Annual, monthly, and seasonal 1 km gridded estimates of PM_{2.5} mass and component concentrations attributed to major source sectors across Canada and the US.
- **Metals exposure surface** – Annual and monthly gridded estimates of individual, ambient particulate-phase trace metals concentrations covering all 10 provinces in Canada. Trace metals may include, but are not limited to, Fe, Mn, Ni, Si, Ca, Al, Ti, K, Mg, As, Cd, and Pb, Cu, and Zn.



- **Exposure surface** – refers generally to any surface described above, which represents gridded estimates of PM_{2.5} as represented by mass concentration, component concentrations, particle aging metrics, source-attributed mass concentrations, and metals concentrations. PM_{2.5} mass, component, particle aging, and source attribution exposure surfaces must apply a fusion of satellite-based aerosol optical depth observations, chemical transport modelling outputs, and ground-based observations. It is expected that individual metals surfaces will be produced using chemical transport modelling or a similar data fusion approach to the other surfaces.



ANNEX "B"

BASIS OF PAYMENT

A- Contract Period (From contract award to March 31, 2024)

During the period of the Contract, for Work performed in accordance with the Contract, the Contractor will be paid as specified below.

B- 1 Initial Contract Period

Milestone Payment	Key Deliverables	Completion Date	Payment (%)	Payment (\$)
1	Deliver bi-weekly and annual PM _{2.5} mass concentration dataset for 2017-2020	February 15, 2022	32%	\$
2	Deliver bi-weekly and annual PM _{2.5} component concentration dataset for 2017-2020	August 30, 2022	17%	\$
3	Deliver bi-weekly and annual PM _{2.5} mass and component concentration dataset for 2000-2016 Deliver bi-weekly and annual particle aging datasets (SOA, POA, SOA:POA) for 2000-2020 Present results to date via a video conference presentation during Q4	February 15, 2023	17%	\$
4	Deliver monthly, seasonal, and annual source-attributed PM _{2.5} mass and component concentration dataset for recent year (e.g., 2019)	August 30, 2023	17%	\$
5	Deliver monthly, seasonal, and annual source-attributed PM _{2.5} mass and component concentration dataset for remaining two modelling years (early 2000s and intermediate year) Deliver bi-weekly and annual PM _{2.5} mass concentration, component concentrations, and particle aging datasets for 2021-2022	February 15, 2024	17%	\$
Initial Contract Period Total				\$

Note: Firm Price maximum budget for the initial contract period cannot go over \$270,000.00 (taxes extra)



B- 2 Option to Extend the Term of the Contract

This section is only applicable if the option to extend the Contract is exercised by Canada. During the extended period of the Contract specified below, the Contractor will be paid as specified below to perform all the Work in relation to the Contract extension.

Extended Contract Period (From April 1, 2024 to March 31, 2025)

Milestone Payment	Key Deliverables	Completion Date	Payment (%)	Payment (\$)
1	Deliver bi-weekly and annual PM _{2.5} mass concentration dataset for 2017-2020	February 15, 2022	50%	\$
2	Deliver bi-weekly and annual PM _{2.5} component concentration dataset for 2017-2020	August 30, 2022	50%	\$
Option Period #1 Total				\$

Note: Firm Price maximum budget for Option Period #1 cannot go over \$90,000.00 (taxes extra)

B- 3 Option to Extend the Term of the Contract

This section is only applicable if the option to extend the Contract is exercised by Canada. During the extended period of the Contract specified below, the Contractor will be paid as specified below to perform all the Work in relation to the Contract extension.

Extended Contract Period (From April 1, 2025 to March 31, 2026)

Milestone Payment	Key Deliverables	Completion Date	Payment (%)	Payment (\$)
1	Deliver bi-weekly and annual PM _{2.5} mass concentration dataset for 2017-2020	February 15, 2022	50%	\$
2	Deliver bi-weekly and annual PM _{2.5} component concentration dataset for 2017-2020	August 30, 2022	50%	\$
Option Period #1 Total				\$

Note: Firm Price maximum budget for Option Period #2 cannot go over \$90,000.00 (taxes extra)



Financial Score

Contract Period	Firm Price (\$)
B-1 Initial Contract Period	\$
B-2 Option Period #1	\$
B-3 Option Period #2	\$
Overall Firm Price =	\$

The maximum funding available for the Contract resulting from the bid solicitation is \$450,000.00 (Applicable Taxes extra). Bids valued in excess of this amount will be considered non-responsive. This disclosure does not commit Canada to pay the maximum funding available.