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167 Lombard Ave

Winnipeg

Manitoba

R3B 0T6

Bid Fax: (204) 983-0338

LETTER OF INTEREST

LETTRE D'INTÉRÊT

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/Travaux
publics et Services gouvernementaux Canada

Suite 1650

635 - 8th Ave. S.W.

Bureau 1650

635 - 8e avenue, SO

Calgary

Calgary

Alberta

T2P 3M3

Title - Sujet Ion Exchange Media	
Solicitation No. - N° de l'invitation ET959-182496/A	Date 2018-01-11
Client Reference No. - N° de référence du client ET959-182496	GETS Ref. No. - N° de réf. de SEAG PW-\$GMP-008-6704
File No. - N° de dossier GMP-7-40126 (008)	CCC No./N° CCC - FMS No./N° VME
Solicitation Closes - L'invitation prend fin at - à 02:00 PM on - le 2018-01-26	
Time Zone Fuseau horaire Central Standard Time CST	
F.O.B. - F.A.B. Plant-Usine: <input type="checkbox"/> Destination: <input checked="" type="checkbox"/> Other-Autre: <input type="checkbox"/>	
Address Enquiries to: - Adresser toutes questions à: Olson, Teresa	Buyer Id - Id de l'acheteur gmp008
Telephone No. - N° de téléphone (204) 230-4558 ()	FAX No. - N° de FAX (204) 983-7796
Destination - of Goods, Services, and Construction: Destination - des biens, services et construction: DEPARTMENT OF PUBLIC WORKS AND GOVERNMENT SERVICES CANADA 100-167 LOMBARD AVE WINNIPEG Manitoba R3B0T6 Canada	

Instructions: See Herein

Instructions: Voir aux présentes

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

Giant Mine Site – Off-site performance confirmation testing Bench Top Testing of Ion Exchange Media for Arsenic and Antimony Removal

1. BACKGROUND

1.1. Project Description

Currently, a long term closure and reclamation plan is being developed for the Giant Mine site. During the development of the plan, it was determined that it will be necessary to continue to pump and treat contaminated water at the mine site. To facilitate a long term sustainable treatment plant that consistently achieves the treated water quality objectives, a treatment solution is needed that balances process risk against capital and operating cost.

Analysis of the treatment options has been completed in the past. Previous analysis indicated that ion exchange media offered a cost effective method to reliably remove arsenic and antimony to achieve the treated water quality objectives. However, given the numerous other ions present within the mine water there is a risk that various proprietary ion exchange media will not function as designed. Additionally, given the other constituents within the raw water, it is difficult to accurately predict the operating cost associated with ion exchange media.

This procurement process is focused on determining candidate manufacturers that produce ion exchange media that can treat mine water to achieve the water quality objectives for the planned water treatment plant. This scope of work requires manufacturers to test their ion exchange media in an off-site laboratory using Owner supplied water from the mine site.

Successful participating manufacturers could potentially supply ion exchange media for the on-site testing phase for the treatment of arsenic and antimony at the Giant Mine site in 2018. If selected, the ion exchange media will be purchased from selected manufacturers separate to this process.

1.2. Existing Water Treatment

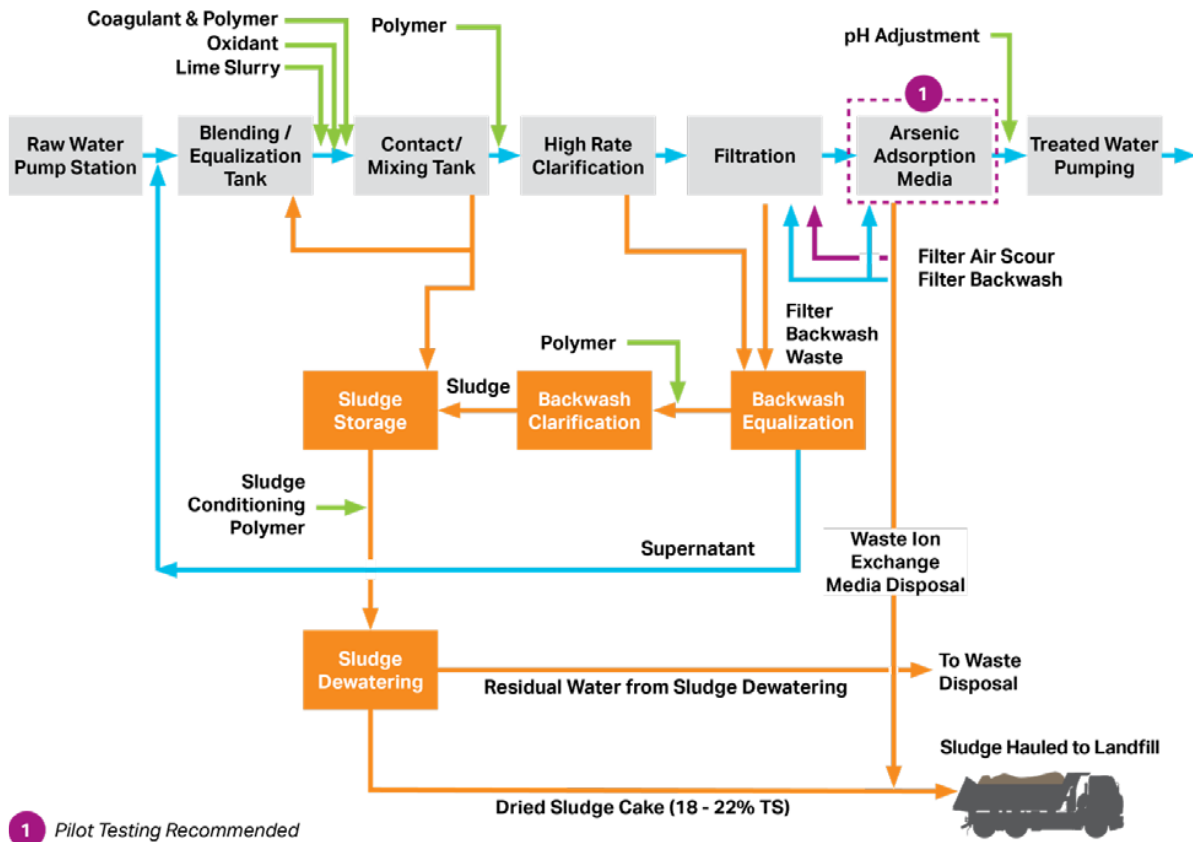
The existing Effluent Treatment Plant currently treats contaminated mine water pumped to surface storage ponds for treatment during the summer. The current treatment process consists of coagulation, pH adjustment and settling in two large earth effluent ponds. This approach has a proven operating history and does not need further testing. The treated effluent overflows an outlet weir and is then discharged to Baker Creek during summer.

Provided in **Appendix A** is a summary of the raw water quality at the Akaitcho Pump Station (SNP 43-21), and the typical treated water quality in the existing effluent pond (SNP 43-1). Sample point SNP 43-1 is located immediately upstream of the discharge to Baker Creek.

1.3. Future Water Treatment Plant

Figure 1 below provides a schematic showing the key process elements planned for the future long term treatment scheme at the Giant Mine site. This project explores the Arsenic and Antimony Adsorption Media process in the future water treatment plant.

Figure 1 – Future Water Treatment Plant Process Flow Schematic



Based on past analysis the key treatment process steps for the future Water Treatment Plant are as follows:

1. Clarification and neutralization of the raw water will be completed using a contactor mixing tank followed by clarification.
2. Following clarification, the plan is to filter the water for further removal of the particulate from the process stream.
3. Once the process stream is filtered, the final step will be an ion exchange system designed by a contactor to target the removal of arsenic and antimony. The ion exchange media will be specifically designed for the removal of arsenic to a concentration of 10 µg/L and antimony to a maximum concentration of 22 µg/L with a typical target concentration of 6 µg/L. The ion exchange media will be removed and replaced once it is exhausted and disposed of in the on-

site non-hazardous waste landfill. Given this the exhausted media must comply with the EPA's SW-846 Test Method 1311: Toxicity Characteristic Leaching Procedure.

4. The residuals flow from the clarification and filtration treatment steps will be equalized and clarified with the effluent returned to the head of the primary treatment process. The solids will be de-watered sufficiently to allow for the disposal in the onsite landfill.

2. OFF-SITE PERFORMANCE CONFIRMATION TESTING SCOPE

2.1. Intent of off-site performance confirmation testing

Prior to completing the on-site testing during the summer of 2018, the goal is to identify a number of candidate ion exchange media manufacturers with a proven track record of treating water with elevated levels of arsenic and antimony. Off-site performance testing is the first step of the screening process to identify suitable manufacturers. The completion of a successful off-site test may result in being selected for on-site arsenic and antimony testing planned for the summer of 2018.

Manufacturers are invited to review the current water quality data attached in **Appendix A** for mine water from Akaitcho Pumping Station (SNP 43-21) and the treated mine water from the effluent ponds (SNP 43-1), to determine the suitability of the ion exchange media at the Giant Mine. The ion exchange media will be tested off-site with treated mine water collected from the effluent ponds (SNP 43-1).

2.2. Invitation to Participate

Manufactures of ion exchange media, or representatives of manufacturers of ion exchange media, which can meet the treated water quality objectives given the water characteristics, as described in **Appendix A**, are invited to notify PSPC of their interest in participating in off-site performance confirmation testing. To notify PSPC, participants need to complete the form in **Appendix B**.

2.3. Water Sample for Testing

Manufactures of ion exchange media, or representatives of manufacturers of ion exchange media, that are selected for the off-site performance testing will be shipped water for the completion of an off-site bench top testing.

Manufacturers who participate in the off-site performance confirmation testing will be provided with water collected from the effluent pond (SNP 43-1). To collect the water, PSPC will drill a hole through the ice of the effluent pond, collect samples, and ship the samples to the selected manufacturers for off-site performance confirmation testing. Water samples will be collected and shipped by the Owner at no cost to the manufacturer.

Samples will be collected from a common point in the effluent pond, at the same time, for all participating manufacturers. PSPC will undertake an analysis of the water collected for the parameters

noted in the spreadsheet in **Appendix A** to verify the baseline water chemistry at the time of sample collection.

2.4 Selection of Media for On-site Testing

The minimum % removal efficiency rate is set for 80% for arsenic and 80% for antimony. Results that do not meet this minimum requirement will not be considered for on-site testing.

There will be a maximum of 5 separate media that will be included for the on-site testing.

Each media will be distinct. If there are multiple vendors testing the same media (same brand from same manufacturer) only one will be randomly selected to be included in the on-site testing program.

Up to 5 media will be selected for on-site testing randomly from the media which meets the minimum % removal requirement.

3. ON-SITE TESTING (not part of this scope of work)

3.1. Intent of On-site testing

During the summer of 2018, separate to this request, it is the goal to complete an on-site pilot test of one or more ion exchange media for the removal of arsenic and antimony. Manufacturers of ion exchange media, or representatives of manufacturers of ion exchange media, evaluated as suitable for further testing will be invited to participate in on-site testing.

3.2. On-Site Testing Participation

On-site testing is planned for the summer of 2018 for selected manufacturers that have successfully completed off-site performance confirmation testing. PSPC intends on purchasing media for on-site testing planned for the summer of 2018. If selected, manufacturers will need to provide media to the Mine Site by May 15, 2018. On-site testing (2 – 100 mm diameter gravity contactors) is planned for a maximum of 2-months during the summer of 2018.

3.3. On-Site Testing Preliminary Description

For the on-site testing of the ion exchange media, the intention is to divert chemically processed water from the existing Effluent Treatment Plant, filter the process stream through a pressure vessel, followed with diverting the effluent from the pressure vessel to different 100 mm diameter ion exchange test columns. The several different test columns will operate in parallel to confirm the removal of arsenic and antimony and the filter run duration prior to media adsorption capacity being exhausted.

The goal of the testing is to collect operating data to confirm the empty bed contact time necessary for consistent arsenic and antimony removal in addition to confirming the volume of water that can be processed prior to the media being exhausted. This process is intended to provide evidence that the planned treatment targets can be achieved with ion exchange.

The second goal of the testing is to improve the long term operating cost estimates associated with processing water with ion exchange media until it is exhausted resulting in the media being removed for disposal. It is recognized that this approach offers an operating cost premium, but eliminates the need for on-site management of the brine waste flow associated with the media regeneration.

4. SCHEDULE

Key project milestone dates provided below for the off-site performance confirmation testing are:

- Manufacturers interested in participating in the off-site performance testing must express their interest by January 18, 2018 by submitting the form in **Appendix C**;
- By January 26, 2018 all Manufacturers selected to participate in the off-site performance confirmation testing will be notified;
- During the period from January 29 to February 9, 2018, water samples will be collected by PSPC and shipped to the selected Manufacturers to undertake off-site performance confirmation testing.
- Once the Manufacturer is provided with the water sample from the Giant Mine Site, there will be a one week period to complete the testing and submit the provided test form in **Appendix C**. Completed forms are to be submitted to PSPC no later than February 16, 2018. Incomplete forms, or late forms, will not be considered.

5. SUBMISSION REQUIREMENTS AND QUESTIONS

Successful Manufacturer's need to make the following submissions:

- Provide notification of interest to participate in the off-site performance testing. Manufacturers are encouraged to provide any additional relevant information that would help demonstrate a proven track record using ion exchange for arsenic and antimony removal. Submit the form in **Appendix B**.
- Following completion of the off-site testing, submit the off-site performance testing form provided in Appendix C to PSPC within the time frame stipulated above. The form in **Appendix C** shall be completed, signed by an officer of the company to verify that all the information provided is accurate and testing was completed following the procedures noted. Manufacturers are encouraged to provide any additional information that will assist in describing the capabilities of their media to treat water at the Giant Mine site.
- Direct all questions and submit Appendix B noted above to:

Teresa Olson
Supply Specialist
Public Services and Procurement Canada
100-167 Lombard Ave.
Winnipeg, MB
R3B 0T6
Teresa.olson@pwgsc.gc.ca

APPENDIX A

EXISTING SITE WATER QUALITY



Table 1: Existing Site Water Quality Data 95th Percentile Concentrations 2011 to 2016

	Akaitcho Pump Station (Raw Water)		Treated Effluent Discharge	
	SNP 43-1		SNP 43-21	
	95 th Percentile	Median	95 th Percentile	Median
Conventional Parameters				
pH	8.1	7.9	8.1	7.9
Specific conductivity	3,455	2,910	3,310	2,775
Hardness, as CaCO ₃	1,480	1,360	1,370	1,240
Total alkalinity, as CaCO ₃	90	82	-	-
Total dissolved solids, measured	2,756	2,410	2,590	2,180
Total suspended solids	2.3	1.0	9.0	1.3
Total organic carbon	6.1	5.7	-	-
Dissolved organic carbon	6.2	5.3	-	-
Major Ions				
Bicarbonate, as CaCO ₃	92	83	-	-
Bromide	6.4	5.0	-	-
Calcium	426	397	389	348
Carbonate, as CaCO ₃	0.5	0.5	-	-
Chloride	505	412	-	-
Fluoride	0.54	0.2	-	-
Magnesium	102	91	98	90
Potassium	13	12	14	12
Sodium	201	168	215	173
Sulphate	1,214	1,140	-	-
Nutrients				
Nitrate	4.3	2.0	2.5	2.5
Nitrite	0.051	0.028	0.03	0.03
Nitrate + nitrite	4.6	2.2	2.5	2.5
Total ammonia	0.074	0.015	2.2	1.1
Total phosphorus	0.15	0.15	0.15	0.15
Dissolved phosphorus	0.15	0.15	0.15	0.15
Total Metals				
Total Aluminum	19	8.4	298	18
Total Antimony	460	403	1,671	738
Total Arsenic	355	298	68,925	27,850
Total Barium	19	16	54	43
Total Beryllium	0.02	0.02	2.5	2.5
Total Bismuth	0.05	0.05	0.25	0.13
Total Boron	370	340	399	360
Total Cadmium	0.07	0.024	0.66	0.31
Total Cesium	0.25	0.2	-	-
Total Chromium	0.72	0.33	5.0^(g)	5.0^(g)
Total Cobalt	10	5.0	82	51
Total Copper	17	13	9.5	4.8
Total Iron	86	47	677	209
Total Lead	0.24	0.05	3.6	0.97
Total Lithium	39	32	48	35
Total Manganese	41	12	768	596
Total Mercury	0.0025	0.0025	0.005	0.005
Total Molybdenum	26	22	24	21

Total Nickel	46	35	75	44
Total Rubidium	12	9.7	-	-
Total Selenium	1.0	0.78	0.5	0.25
Total Silicon	2,024	1,630	5,999	5,460
Total Silver	0.079	0.047	5.0 ⁽⁹⁾	5.0 ⁽⁹⁾
Total Strontium	4,220	3,330	4,979	4,145
Total Sulphur	409,600	360,000	-	-
Total Tellurium	0.5	0.5	-	-
Total Thallium	0.051	0.035	100 ⁽⁹⁾	100 ⁽⁹⁾
Total Thorium	0.1	0.1	-	-
Total Tin	0.1	0.1	15	15
Total Titanium	22	5.0	28	11
Total Tungsten	0.22	0.22	-	-
Total Uranium	4.5	3.8	9.0	7.3
Total Vanadium	2.8	1.3	15	15
Total Zinc	9.3	6.2	136	63
Total Zirconium	0.3	0.3	-	-
Dissolved Metals				
Dissolved Aluminum	7.5	3.0	15	5.0
Dissolved Antimony	449	393	1,605	721
Dissolved Arsenic	341	274	68,510	27,000
Dissolved Barium	18	15	52	42
Dissolved Beryllium	0.02	0.02	2.5	2.5
Dissolved Bismuth	0.05	0.05	0.25	0.13
Dissolved Boron	370	330	380	350
Dissolved Cadmium	0.056	0.05	0.66	0.29
Dissolved Cesium	-	-	-	-
Dissolved Chromium	0.52	0.26	5.0	5.0
Dissolved Cobalt	8.9	5.0	82	50
Dissolved Copper	14	9.4	6.9	3.7
Dissolved Iron	5.0	5.0	150	79
Dissolved Lead	0.05	0.05	2.1	0.67
Dissolved Lithium	39	30	45	33
Dissolved Manganese	29	2.5	766	583
Dissolved Mercury	0.0025	0.0025	0.0025	0.0025
Dissolved Molybdenum	25	22	23	21
Dissolved Nickel	44	34	74	42
Dissolved Rubidium	-	-	-	-
Dissolved Selenium	0.99	0.74	0.5	0.25
Dissolved Silicon	1,964	1,590	5,797	5,310
Dissolved Silver	0.038	0.01	5.0	5.0
Dissolved Strontium	4,221	3,285	4,899	4,110
Dissolved Sulphur	390,050	362,000	-	-
Dissolved Thallium	0.039	0.03	100	100
Dissolved Tin	0.1	0.1	15	15
Dissolved Titanium	20	5.0	25	11
Dissolved Uranium	4.5	3.7	8.9	7.2
Dissolved Vanadium	1.3	1.0	15	15
Dissolved Zinc	8.7	5.0	128	55
Dissolved Zirconium	0.3	0.3	-	-
Other				
Radium-226	0.005	0.005	-	-
Cyanide	0.0027	0.0025	0.025	0.014



APPENDIX B

NOTIFICATION OF INTEREST FORM

		Adsorptive Media DATA SHEET		 Indigenous and Northern Affairs Canada		Revision	
						A	
Client Doc. No.	60561021-ME-DSH-0001	Rev.	Date	By	Chkd	App.	
Doc. No.	60561021-ME-DSH-0001	A	12/18/2017	MD			
Location	Northwest Territories						
Project	Giant Mine Restortion						
1	Reference List						
2	Description	Units	Value				
3							
4	Operating Data						
5	Experimental Conditions						
6	Temperature	°C	17				
	pH	-		Vendor to Determine			
7	Media Mass	g	2.0				
8	Sample Volume	L	1.00				
9	Adsorption Time	Minutes	15				
10	Raw Water Quality	-		Given, see Water Constituent Tab			
11	Experiment Replication	Count	2				
12	Container	Desc		Vendor to Determine			
13	Mixing	Desc	Yes				
14	Sealed from Atmosphere	Desc	Yes				
15	Performance (Provided by Vendor)						
16	Output Data						
	Characterization of Arsenic	µg/L		Provide Method of Analysis			
	Characterization of Antimony	µg/L		Provide Method of Analysis			
23	Media Data						
24	Product ID	Desc					
Sheet 1 / 1							

APPENDIX C

OFF-SITE TESTING FORM

		Adsorptive Media DATA SHEET		 Indigenous and Northern Affairs Canada		Revision	
						A	
Client Doc. No.	60561021-ME-DSH-0001	Rev.	Date	By	Chkd	App.	
Doc. No.	60561021-ME-DSH-0001	A	12/18/2017	MD			
Location	Northwest Territories						
Project	Giant Mine Restoration						
1	General Requirements				Comments		
2	Description	Units	Value				
3	Sample water is collected from the Giant Mine Polishing Pond and distributed to vendor factories for testing. The water quality constituents listed in the Water constituent tab will be reported to each vendor. At the vendor's testing facility, sample water pH is adjusted to the vendor's optimal condition for media performance and placed in a 1 L container with 2.0 g of the vendor's adsorptive media for 15 minutes. Water samples are taken after the elapsed time and analyzed for arsenic and antimony. Testing shall be completed twice to demonstrate reproducible results.						
4	Operating Data						
5	Experimental Conditions						
6	Temperature	°C	17				
7	pH	-		Vendor to Determine			
8	Media Mass	g	2.0				
9	Sample Volume	L	1.00				
10	Adsorption Time	Minutes	15				
11	Raw Water Quality	-		Given, see Water Constituent Tab			
12	Experiment Replication	Count	2				
13	Container	Desc	Serum Bottle	100 mL			
14	Mixing	Desc	Yes				
15	Sealed from Atmosphere	Desc	Yes				
16	Performance (Provided by Vendor)						
17	Output Data						
18	Characterization of Arsenic	µg/L		Complete test to EPA SW-846 3005A/6020A, ICP OES & ICP MS in Water (Total Metals).			
19	Characterization of Antimony	µg/L		Complete test to EPA SW-846 3005A/6020A, ICP OES & ICP MS in Water (Total Metals).			
20	Media Data						
21	Product ID	Desc					
22	Functional Group	Desc		Iron Oxide, Titanium Dioxide, Etc.			
23	Bulk Density	kg/L					
24	Empty Bed Contact Time (Typical Maximum)	Minutes					
25	Empty Bed Contact Time (Typical Minimum)	Minutes					
26	Maximum Service Temperature	°C					
27	Minimum Service Temperature	°C					
28	Maximum Service Pressure	kPa		If Applicable			
29	Budgetary Media Cost	CAD/kg					
30	Vendor Contact						
31	Company	Desc					
32	Technical Representative	Desc					
33	Email Contact	Desc					
34	Phone Contact	Desc					
35	Vendor Credentials						
36	Volume of Proposed Media Sold Annually	m³					
37	Reference List (Treatment Plants Using Proposed Media with 1+ Years of Operation)						

38	Reference 1		
39	Facility ID	Desc	
40	Facility Contact Name	Desc	
41	Facility Contact Phone Number	Desc	
42	Facility Size	ML/d	
43	Facility Process Description (Brief)	Desc	
44	Reference 2		
45	Facility ID	Desc	
46	Facility Contact Name	Desc	
47	Facility Contact Phone Number	Desc	
48	Facility Size	ML/d	
49	Facility Process Description (Brief)	Desc	
50	Reference 3		
51	Facility ID	Desc	
52	Facility Contact Name	Desc	
53	Facility Contact Phone Number	Desc	
54	Facility Size	ML/d	
55	Facility Process Description (Brief)	Desc	
56	Disclaimer Vendor signing authority certifies that the information provided is true and correct. Name: _____ Signature: _____		
Sheet 1 / 1			