

**Pre-Remedial Design Investigation
Data Report**

South State Street MGP Site
Bellingham, Washington

for
Puget Sound Energy

June 28, 2023



APPENDIX D
Laboratory Analytical Reports



21 October 2021

Brian Tracy
GeoEngineers
17425 Union Hill Road Suite 250
Redmond, WA 98052

RE: South State Street PRDI

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

<u>Associated Work Order(s)</u>	<u>Associated SDG ID(s)</u>
2110294	N/A

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclosed Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, LLC

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.

Shelly Fishel, Project Manager



Chain of Custody Record & Laboratory Analysis Request



Analytical Resources, Incorporated
 Analytical Chemists and Consultants
 4611 South 134th Place, Suite 100
 Tukwila, WA 98168
 206-695-6200 206-695-6201 (fax)
 www.arilabs.com

ARI Assigned Number: 2110294		Turn-around Requested: Std			Page: 1 of 1								
ARI Client Company: GEI		Phone:			Date: 9/20/21	Ice Present?							
Client Contact: Brian Tracy		No. of Coolers:			Cooler Temps: 5.6; 32								
Client Project Name: SSS Dry Season GW Sampling		Analysis Requested:				Notes/Comments							
Client Project #: 186-890-03	Samplers: KRA/BA/BRD												
Sample ID	Date	Time	Matrix	No. Containers	GX (NMPT-G)	DX (NMPT-D)	(EPA 8260D) Benzene & Naphthalene only	Di. Ss, Metals Lead, Selenium & Iron (6010/6020)	Total Iron (6010/6020)	Total Cyn & WRAB Cyn for water	Nitrate (EPA 353.2)	Sulfate (EPA 375.2)	TOC (SM-5310 B)
MW-28-092021	9/20/21	1010	W	12	X	X	X	X	X	X	X	X	X
MW-24-092021		1111											
MW-60-092021		1130											
MW-55-092021		1229											
MW-42-092021		1235											
MW-54-092021		1354											
TB-1-092021		-		1	X		X						
TB-2-092021		-		1	X		X						
KA													
Comments/Special Instructions	Relinquished by: Brian Tracy (Signature)		Received by: Mark McLeod (Signature)		Relinquished by: Mark McLeod (Signature)		Received by: Dimitri Lamjedze (Signature)						
	Printed Name: Brian Tracy		Printed Name: Mark McLeod		Printed Name: Mark McLeod		Printed Name: Dimitri Lamjedze						
	Company: Geo Engineers		Company: Geo Engineers		Company: Geo Engineers		Company: Geo Engineers						
	Date & Time: 9/21/21 1336		Date & Time: 9/21/21 1336		Date & Time: 9/21/21 338		Date & Time: 09/21/21 1536						

Limits of Liability: ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.



WORK ORDER

21I0294

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: GeoEngineers

Project Manager: Shelly Fishel

Project: South State Street PRDI

Project Number: Project #186-890-03 Tsk 300

Preservation Confirmation

Container ID	Container Type	pH	
21I0294-01 A	Small OJ, 500 mL		
21I0294-01 B	Small OJ, 500 mL, NaOH	>12	Pass
21I0294-01 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-01 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-01 E	Glass NM, Amber, 500 mL		
21I0294-01 F	Glass NM, Amber, 500 mL		
21I0294-01 G	VOA Vial, Clear, 40 mL, HCL		
21I0294-01 H	VOA Vial, Clear, 40 mL, HCL		
21I0294-01 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-01 J	VOA Vial, Clear, 40 mL, HCL		
21I0294-01 K	VOA Vial, Clear, 40 mL, HCL		
21I0294-02 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	<2	Pass
21I0294-03 A	Small OJ, 500 mL		
21I0294-03 B	Small OJ, 500 mL, NaOH	>12	Pass
21I0294-03 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-03 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-03 E	Glass NM, Amber, 500 mL		
21I0294-03 F	Glass NM, Amber, 500 mL		
21I0294-03 G	VOA Vial, Clear, 40 mL, HCL		
21I0294-03 H	VOA Vial, Clear, 40 mL, HCL		
21I0294-03 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-03 J	VOA Vial, Clear, 40 mL, HCL		
21I0294-03 K	VOA Vial, Clear, 40 mL, HCL		
21I0294-04 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	<2	Pass
21I0294-05 A	Small OJ, 500 mL		
21I0294-05 B	Small OJ, 500 mL, NaOH	<2	Fail
21I0294-05 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-05 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-05 E	Glass NM, Amber, 500 mL		
21I0294-05 F	Glass NM, Amber, 500 mL		
21I0294-05 G	VOA Vial, Clear, 40 mL, HCL		
21I0294-05 H	VOA Vial, Clear, 40 mL, HCL		
21I0294-05 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-05 J	VOA Vial, Clear, 40 mL, HCL		



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Project: South State Street PRDI

Project Number: Project #186-890-03 Tsk 300

21I0294-05 K	VOA Vial, Clear, 40 mL, HCL		
21I0294-06 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	12	Pass
21I0294-07 A	Small OJ, 500 mL		
21I0294-07 B	Small OJ, 500 mL, NaOH	>12	Pass
21I0294-07 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-07 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-07 E	Glass NM, Amber, 500 mL		
21I0294-07 F	Glass NM, Amber, 500 mL		
21I0294-07 G	VOA Vial, Clear, 40 mL, HCL		
21I0294-07 H	VOA Vial, Clear, 40 mL, HCL		
21I0294-07 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-07 J	VOA Vial, Clear, 40 mL, HCL		
21I0294-07 K	VOA Vial, Clear, 40 mL, HCL		
21I0294-08 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	Star <2 >2	Fail
21I0294-09 A	Small OJ, 500 mL		
21I0294-09 B	Small OJ, 500 mL, NaOH	<2	Fail
21I0294-09 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-09 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-09 E	Glass NM, Amber, 500 mL		
21I0294-09 F	Glass NM, Amber, 500 mL		
21I0294-09 G	VOA Vial, Clear, 40 mL, HCL	Bubble	
21I0294-09 H	VOA Vial, Clear, 40 mL, HCL	Bubble	
21I0294-09 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-09 J	VOA Vial, Clear, 40 mL, HCL		
21I0294-09 K	VOA Vial, Clear, 40 mL, HCL		
21I0294-10 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	<2	Pass
21I0294-11 A	Small OJ, 500 mL		
21I0294-11 B	Small OJ, 500 mL, NaOH	>12	Pass
21I0294-11 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-11 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-11 E	Glass NM, Amber, 500 mL		
21I0294-11 F	Glass NM, Amber, 500 mL		
21I0294-11 G	VOA Vial, Clear, 40 mL, HCL		
21I0294-11 H	VOA Vial, Clear, 40 mL, HCL		
21I0294-11 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-11 J	VOA Vial, Clear, 40 mL, HCL		



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Project Number: Project #186-890-03 Tsk 300

21I0294-11 K	VOA Vial, Clear, 40 mL, HCL		
21I0294-12 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	SA	Pass
21I0294-13 A	VOA Vial, Clear, 40 mL, HCL		
21I0294-14 A	VOA Vial, Clear, 40 mL, HCL		

SS

09/21/2021

Preservation Confirmed By

Date



Cooler Receipt Form

ARI Client: Geoengineers

Project Name: SSG Dry season GW Sampling

COC No(s): _____ ~~NA~~

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: 2110294

Tracking No: _____ ~~NA~~

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of the cooler? YES NO

Were custody papers included with the cooler? YES NO

Were custody papers properly filled out (ink, signed, etc.) YES NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)

Time 1538 56 32

If cooler temperature is out of compliance fill out form 00070F

Temp Gun ID#: DOO 2565

Cooler Accepted by: JL Date: 09/21/21 Time: 1538

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? YES NO

What kind of packing material was used? ... Bubble Wrap Wet Ice Gel Packs Baggies Foam Block Paper Other: _____

Was sufficient ice used (if appropriate)? NA YES NO

How were bottles sealed in plastic bags? Individually Grouped NO

Did all bottles arrive in good condition (unbroken)? YES NO

Were all bottle labels complete and legible? YES NO

Did the number of containers listed on COC match with the number of containers received? YES NO

Did all bottle labels and tags agree with custody papers? YES NO

Were all bottles used correct for the requested analyses? YES NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) ... NA YES NO

Were all VOC vials free of air bubbles? NA YES NO

Was sufficient amount of sample sent in each bottle? YES NO

Date VOC Trip Blank was made at ARI: NA 09/14/2021

Were the sample(s) split by ARI? NA YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: JL Date: 09/21/2021 Time: 1753 Labels checked by: JL

**** Notify Project Manager of discrepancies or concerns ****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

vials w/air bubbles marked on preservation sheet, lab to determine sizes.

By: JL Date: 09/21/2021



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Client: GeoEngineers

Project Manager: Shelly Fishel

Project: South State Street PRDI

Project Number: Project #186-890-03 Tsk 300

Preservation Confirmation

Container ID	Container Type	pH	
21I0294-01 A	Small OJ, 500 mL		
21I0294-01 B	Small OJ, 500 mL, NaOH	>12	Pass
21I0294-01 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-01 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-01 E	Glass NM, Amber, 500 mL		
21I0294-01 F	Glass NM, Amber, 500 mL		
21I0294-01 G	VOA Vial, Clear, 40 mL, HCL		
21I0294-01 H	VOA Vial, Clear, 40 mL, HCL		
21I0294-01 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-01 J	VOA Vial, Clear, 40 mL, HCL		
21I0294-01 K	VOA Vial, Clear, 40 mL, HCL		
21I0294-02 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	<2	Pass
21I0294-03 A	Small OJ, 500 mL		
21I0294-03 B	Small OJ, 500 mL, NaOH	>12	Pass
21I0294-03 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-03 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-03 E	Glass NM, Amber, 500 mL		
21I0294-03 F	Glass NM, Amber, 500 mL		
21I0294-03 G	VOA Vial, Clear, 40 mL, HCL		
21I0294-03 H	VOA Vial, Clear, 40 mL, HCL		
21I0294-03 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-03 J	VOA Vial, Clear, 40 mL, HCL		
21I0294-03 K	VOA Vial, Clear, 40 mL, HCL		
21I0294-04 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	<2	Pass
21I0294-05 A	Small OJ, 500 mL		
21I0294-05 B	Small OJ, 500 mL, NaOH	<2	Fail (1)
21I0294-05 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-05 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-05 E	Glass NM, Amber, 500 mL		
21I0294-05 F	Glass NM, Amber, 500 mL		
21I0294-05 G	VOA Vial, Clear, 40 mL, HCL		
21I0294-05 H	VOA Vial, Clear, 40 mL, HCL		
21I0294-05 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-05 J	VOA Vial, Clear, 40 mL, HCL		



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Project Number: Project #186-890-03 Tsk 300

21I0294-05 K	VOA Vial, Clear, 40 mL, HCL		
21I0294-06 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	(2)	Pass
21I0294-07 A	Small OJ, 500 mL		
21I0294-07 B	Small OJ, 500 mL, NaOH	>12	Pass
21I0294-07 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-07 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-07 E	Glass NM, Amber, 500 mL		
21I0294-07 F	Glass NM, Amber, 500 mL		
21I0294-07 G	VOA Vial, Clear, 40 mL, HCL		
21I0294-07 H	VOA Vial, Clear, 40 mL, HCL		
21I0294-07 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-07 J	VOA Vial, Clear, 40 mL, HCL		
21I0294-07 K	VOA Vial, Clear, 40 mL, HCL		
21I0294-08 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	5-12 <2 >2	Fail
21I0294-09 A	Small OJ, 500 mL		
21I0294-09 B	Small OJ, 500 mL, NaOH	<2	Fail (1)
21I0294-09 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-09 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-09 E	Glass NM, Amber, 500 mL		
21I0294-09 F	Glass NM, Amber, 500 mL		
21I0294-09 G	VOA Vial, Clear, 40 mL, HCL	Bubble	
21I0294-09 H	VOA Vial, Clear, 40 mL, HCL	Bubble	
21I0294-09 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-09 J	VOA Vial, Clear, 40 mL, HCL		
21I0294-09 K	VOA Vial, Clear, 40 mL, HCL		
21I0294-10 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	<2	Pass
21I0294-11 A	Small OJ, 500 mL		
21I0294-11 B	Small OJ, 500 mL, NaOH	>12	Pass
21I0294-11 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-11 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-11 E	Glass NM, Amber, 500 mL		
21I0294-11 F	Glass NM, Amber, 500 mL		
21I0294-11 G	VOA Vial, Clear, 40 mL, HCL		
21I0294-11 H	VOA Vial, Clear, 40 mL, HCL		
21I0294-11 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-11 J	VOA Vial, Clear, 40 mL, HCL		



WORK ORDER

2110294

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: GeoEngineers

Project Manager: Shelly Fishel

Project: South State Street PRDI

Project Number: Project #186-890-03 Tsk 300

2110294-11 K	VOA Vial, Clear, 40 mL, HCL		
2110294-12 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	52	Pass
2110294-13 A	VOA Vial, Clear, 40 mL, HCL		
2110294-14 A	VOA Vial, Clear, 40 mL, HCL		

[Signature]

Preservation Confirmed By

09/21/2021

Date

① 2110294-05B negative for S, Cl
 2110294-09B negative for Cl, positive for S
 preserved to pH > 12 w/ ~2mL 6N NaOH
 CKI 09/21/21 18:30



WORK ORDER

21I0294

Samples will be discarded 90 days after submission of a final report unless other instructions are received.

Client: GeoEngineers

Project Manager: Shelly Fishel

Project: South State Street PRDI

Project Number: Project #186-890-03 Tsk 300

Preservation Confirmation

Container ID	Container Type	pH	
21I0294-01 A	Small OJ, 500 mL		
21I0294-01 B	Small OJ, 500 mL, NaOH	>12	Pass
21I0294-01 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-01 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-01 E	Glass NM, Amber, 500 mL		
21I0294-01 F	Glass NM, Amber, 500 mL		
21I0294-01 G	VOA Vial, Clear, 40 mL, HCL		
21I0294-01 H	VOA Vial, Clear, 40 mL, HCL		
21I0294-01 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-01 J	VOA Vial, Clear, 40 mL, HCL		
21I0294-01 K	VOA Vial, Clear, 40 mL, HCL		
21I0294-02 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	<2	Pass
21I0294-03 A	Small OJ, 500 mL		
21I0294-03 B	Small OJ, 500 mL, NaOH	>12	Pass
21I0294-03 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-03 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-03 E	Glass NM, Amber, 500 mL		
21I0294-03 F	Glass NM, Amber, 500 mL		
21I0294-03 G	VOA Vial, Clear, 40 mL, HCL		
21I0294-03 H	VOA Vial, Clear, 40 mL, HCL		
21I0294-03 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-03 J	VOA Vial, Clear, 40 mL, HCL		
21I0294-03 K	VOA Vial, Clear, 40 mL, HCL		
21I0294-04 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	<2	Pass
21I0294-05 A	Small OJ, 500 mL		
21I0294-05 B	Small OJ, 500 mL, NaOH	<2	Fail
21I0294-05 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-05 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-05 E	Glass NM, Amber, 500 mL		
21I0294-05 F	Glass NM, Amber, 500 mL		
21I0294-05 G	VOA Vial, Clear, 40 mL, HCL		
21I0294-05 H	VOA Vial, Clear, 40 mL, HCL		
21I0294-05 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-05 J	VOA Vial, Clear, 40 mL, HCL		



WORK ORDER

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Client: GeoEngineers

Project Manager: Shelly Fishel

Project: South State Street PRDI

Project Number: Project #186-890-03 Tsk 300

21I0294-05 K	VOA Vial, Clear, 40 mL, HCL		
21I0294-06 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	12	Pass
21I0294-07 A	Small OJ, 500 mL		
21I0294-07 B	Small OJ, 500 mL, NaOH	7/2	Pass
21I0294-07 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-07 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-07 E	Glass NM, Amber, 500 mL		
21I0294-07 F	Glass NM, Amber, 500 mL		
21I0294-07 G	VOA Vial, Clear, 40 mL, HCL		
21I0294-07 H	VOA Vial, Clear, 40 mL, HCL		
21I0294-07 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-07 J	VOA Vial, Clear, 40 mL, HCL		
21I0294-07 K	VOA Vial, Clear, 40 mL, HCL		
21I0294-08 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	32 <2 >2	Fail (1)
21I0294-09 A	Small OJ, 500 mL		
21I0294-09 B	Small OJ, 500 mL, NaOH	<2	Fail
21I0294-09 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-09 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-09 E	Glass NM, Amber, 500 mL		
21I0294-09 F	Glass NM, Amber, 500 mL		
21I0294-09 G	VOA Vial, Clear, 40 mL, HCL	Bubble	
21I0294-09 H	VOA Vial, Clear, 40 mL, HCL	Bubble	
21I0294-09 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-09 J	VOA Vial, Clear, 40 mL, HCL		
21I0294-09 K	VOA Vial, Clear, 40 mL, HCL		
21I0294-10 A	HDPE NM, 500 mL, 1:1 HNO3 (FF)	<2	Pass
21I0294-11 A	Small OJ, 500 mL		
21I0294-11 B	Small OJ, 500 mL, NaOH	7/2	Pass
21I0294-11 C	Glass NM, Amber, 250 mL, 9N H2SO4	<2	Pass
21I0294-11 D	HDPE NM, 500 mL, 1:1 HNO3	<2	Pass
21I0294-11 E	Glass NM, Amber, 500 mL		
21I0294-11 F	Glass NM, Amber, 500 mL		
21I0294-11 G	VOA Vial, Clear, 40 mL, HCL		
21I0294-11 H	VOA Vial, Clear, 40 mL, HCL		
21I0294-11 I	VOA Vial, Clear, 40 mL, HCL		
21I0294-11 J	VOA Vial, Clear, 40 mL, HCL		



WORK ORDER

2110294

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Client: GeoEngineers

Project Manager: Shelly Fishel

Project: South State Street PRDI

Project Number: Project #186-890-03 Tsk 300

2110294-11 K	VOA Vial, Clear, 40 mL, HCL		
2110294-12 A	HDPE NM, 500 mL, 1:1 HNO ₃ (FF)	52	Pass
2110294-13 A	VOA Vial, Clear, 40 mL, HCL		
2110294-14 A	VOA Vial, Clear, 40 mL, HCL		

SS

Preservation Confirmed By

09/21/2021

Date

① Preserved to pH < 2.0
with 0.75 mL conc.
HNO₃ (J10414). SD 10/7/21



GeoEngineers
17425 Union Hill Road Suite 250
Redmond, WA 98052

Project: South State Street PRDI
Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
10/21/2021 10:51

ANALYTICAL REPORT FOR SAMPLES

Laboratory ID	Sample ID	Matrix	Date Sampled	Date Received
21I0294-01	MW-28_092021	Water	09/20/21 10:10	09/21/21 15:38
21I0294-02	MW-28_092021	Water	09/20/21 10:10	09/21/21 15:38
21I0294-03	MW-24_092021	Water	09/20/21 11:11	09/21/21 15:38
21I0294-04	MW-24_092021	Water	09/20/21 11:11	09/21/21 15:38
21I0294-05	MW-60_092021	Water	09/20/21 11:30	09/21/21 15:38
21I0294-06	MW-60_092021	Water	09/20/21 11:30	09/21/21 15:38
21I0294-07	MW-55_092021	Water	09/20/21 12:29	09/21/21 15:38
21I0294-08	MW-55_092021	Water	09/20/21 12:29	09/21/21 15:38
21I0294-09	MW-42_092021	Water	09/20/21 12:35	09/21/21 15:38
21I0294-10	MW-42_092021	Water	09/20/21 12:35	09/21/21 15:38
21I0294-11	MW-54_092021	Water	09/20/21 13:54	09/21/21 15:38
21I0294-12	MW-54_092021	Water	09/20/21 13:54	09/21/21 15:38
21I0294-13	TB-1_092021	Water	09/20/21 10:10	09/21/21 15:38
21I0294-14	TB-2_092021	Water	09/20/21 10:10	09/21/21 15:38



GeoEngineers
17425 Union Hill Road Suite 250
Redmond WA, 98052

Project: South State Street PRDI
Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
21-Oct-2021 10:51

Case Narrative

Client: GeoEngineers
Project: South State Street PRDI
Work Order: 2110294

Sample receipt

Samples as listed on the preceding page were received 21-Sep-2021 15:38 under ARI work order 2110294. For details regarding sample receipt, please refer to the Cooler Receipt Form.

Gasoline by NWTPH-g (GC/MS)

The sample(s) were analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Volatiles - EPA Method SW8260D

The sample(s) were analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements except as follows. Surrogate 1,2-Dichloroethane-d14 which was out of control high in the second source calibration verification SJI0050-SCV1 in association with the calibration sequence. Naphthalene was out of control high in the low concentration verification SJI0371-LCV1 which is in association with sample 2110294-03RE1.

Sample 2110294-14 was analyzed sequence SJI0440 which was set up on a Friday and ran over night. The instrument autosampler failed to inject the closing continuing calibration verification SJI0440-CCV1. Only one sample vial for this sample was received. The vial had been at room temperature and punctured until Monday morning. 10 ml of sample had evaporated when discovered. The data has been reported without the closing CCV.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Total and Dissolved Metals - EPA Method 6020B



GeoEngineers
17425 Union Hill Road Suite 250
Redmond WA, 98052

Project: South State Street PRDI
Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
21-Oct-2021 10:51

Case Narrative

The sample(s) were digested and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Sample specific QC was performed in association with sample 2110294-02 in Dissolved Metals batch BJJ0192. The duplicate (DUP) relative percent difference (RPD) were within advisory control limits. The matrix spike/matrix spike duplicate (MS/MSD) spike recoveries and relative percent difference (RPD) were within advisory control limits.

Wet Chemistry

The sample(s) were prepared and analyzed within the recommended holding times except Nitrate/Nitrite for which the instrument malfunctioned and analysis was delayed. Affected samples and QC have been flagged.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Sample specific QC was performed in association with sample 2110294-01 in Nitrate/Nitrite batch BJI0609, Total Cyanide batch BJI0844 and Total Organic Carbon batch BJJ0250, in association with sample 2110291-01RE1 in Sulfate batch BJJ070 and in association with sample 2110294-03 in WAD Cyanide batch BJI0884. The duplicate (DUP) relative percent difference (RPD) were within advisory control limits. The matrix spike/matrix spike duplicate (MS/MSD) spike recoveries and relative percent difference (RPD) were within advisory control limits.

Diesel/Heavy Oil Range Organics - WA-Ecology Method NW-TPHDx

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits except Motor Oil Range Organics RPD which has been flagged.



GeoEngineers
17425 Union Hill Road Suite 250
Redmond WA, 98052

Project: South State Street PRDI
Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
21-Oct-2021 10:51

Case Narrative



QUALIFIERS AND NOTES

Qualifier	Definition
Y1	Raised reporting limit due to interference
U	This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
Q	Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria (<20% RSD, <20% drift or minimum RRF)
J	Estimated concentration value detected below the reporting limit.
HC	The natural concentration of the spiked analyte is so much greater than the concentration spiked that an accurate determination of spike recovery is not possible
H	Hold time violation - Hold time was exceeded.
E	The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL)
D	The reported value is from a dilution
B	This analyte was detected in the method blank.
*	Flagged value is not within established control limits.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference



Form I
ORGANIC ANALYSIS DATA SHEET
NWTPHg
Gasoline Range Organics (GC/MS)

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-01 H

SDG: 2110294

Sampled: 09/20/21 10:10

Prepared: 09/22/21 08:41

File ID: V209222134G.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/22/21 18:32

Batch: BJI0605

Sequence: SJI0364

Initial/Final: 0.1 mL / 10 ml

Instrument: NT2

Column: RTX-VMS

Calibration: EI00019

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
GRO	Gasoline Range Organics (Tol-Nap)	1	22600		1360	10000

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
Toluene-d8	5.0000	5.02	100	80 - 120	
4-Bromofluorobenzene	5.0000	4.79	95.7	80 - 120	



Form I
ORGANIC ANALYSIS DATA SHEET
NWTPHg
Gasoline Range Organics (GC/MS)

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-03 H

SDG: 2110294

Sampled: 09/20/21 11:11

Prepared: 09/22/21 08:41

File ID: V209222135G.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/22/21 18:55

Batch: BJI0605

Sequence: SJI0364

Initial/Final: 1 mL / 10 ml

Instrument: NT2

Column: RTX-VMS

Calibration: EI00019

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
GRO	Gasoline Range Organics (Tol-Nap)	1	26900		136	1000

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
Toluene-d8	5.0000	4.97	99.5	80 - 120	
4-Bromofluorobenzene	5.0000	4.95	98.9	80 - 120	



Form I
ORGANIC ANALYSIS DATA SHEET
NWTPHg
Gasoline Range Organics (GC/MS)

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-05 K

SDG: 2110294

Sampled: 09/20/21 11:30

Prepared: 09/24/21 12:54

File ID: V309242120G.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/24/21 18:02

Batch: BJI0716

Sequence: SJI0460

Initial/Final: 10 mL / 10 ml

Instrument: NT3

Column: RTX-VMS

Calibration: EI00046

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
GRO	Gasoline Range Organics (Tol-Nap)	1	100	U	13.6	100

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
Toluene-d8	5.0000	5.08	102	80 - 120	
4-Bromofluorobenzene	5.0000	5.13	103	80 - 120	



Form I
ORGANIC ANALYSIS DATA SHEET
NWTPHg
Gasoline Range Organics (GC/MS)

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-07 H

SDG: 2110294

Sampled: 09/20/21 12:29

Prepared: 09/24/21 12:54

File ID: V309242121G.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/24/21 18:28

Batch: BJI0716

Sequence: SJI0460

Initial/Final: 10 mL / 10 ml

Instrument: NT3

Column: RTX-VMS

Calibration: EI00046

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
GRO	Gasoline Range Organics (Tol-Nap)	1	100	U	13.6	100

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
Toluene-d8	5.0000	4.74	94.8	80 - 120	
4-Bromofluorobenzene	5.0000	5.10	102	80 - 120	



Form I
ORGANIC ANALYSIS DATA SHEET
NWTPHg
Gasoline Range Organics (GC/MS)

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-09 J

SDG: 2110294

Sampled: 09/20/21 12:35

Prepared: 09/24/21 12:54

File ID: V309242122G.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/24/21 18:53

Batch: BJI0716

Sequence: SJI0460

Initial/Final: 10 mL / 10 ml

Instrument: NT3

Column: RTX-VMS

Calibration: EI00046

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
GRO	Gasoline Range Organics (Tol-Nap)	1	100	U	13.6	100

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
Toluene-d8	5.0000	4.86	97.2	80 - 120	
4-Bromofluorobenzene	5.0000	5.12	102	80 - 120	



Form I
ORGANIC ANALYSIS DATA SHEET
NWTPHg
Gasoline Range Organics (GC/MS)

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-11 H

SDG: 2110294

Sampled: 09/20/21 13:54

Prepared: 09/24/21 12:54

File ID: V309242123G.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/24/21 19:19

Batch: BJI0716

Sequence: SJI0460

Initial/Final: 10 mL / 10 ml

Instrument: NT3

Column: RTX-VMS

Calibration: EI00046

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
GRO	Gasoline Range Organics (Tol-Nap)	1	100	U	13.6	100

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
Toluene-d8	5.0000	4.78	95.6	80 - 120	
4-Bromofluorobenzene	5.0000	5.07	101	80 - 120	



Form I
ORGANIC ANALYSIS DATA SHEET
NWTPHg
Gasoline Range Organics (GC/MS)

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-13 A

SDG: 2110294

Sampled: 09/20/21 10:10

Prepared: 09/22/21 08:41

File ID: V209222109G.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/22/21 09:50

Batch: BJI0605

Sequence: SJI0364

Initial/Final: 10 mL / 10 ml

Instrument: NT2

Column: RTX-VMS

Calibration: EI00019

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
GRO	Gasoline Range Organics (Tol-Nap)	1	100	U	13.6	100

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
Toluene-d8	5.0000	4.89	97.8	80 - 120	
4-Bromofluorobenzene	5.0000	4.42	88.4	80 - 120	



Form I
ORGANIC ANALYSIS DATA SHEET
NWTPHg
Gasoline Range Organics (GC/MS)

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-14 A

SDG: 2110294

Sampled: 09/20/21 10:10

Prepared: 09/24/21 12:54

File ID: V309242111G.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/24/21 14:02

Batch: BJI0716

Sequence: SJI0460

Initial/Final: 10 mL / 10 ml

Instrument: NT3

Column: RTX-VMS

Calibration: EI00046

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
GRO	Gasoline Range Organics (Tol-Nap)	1	100	U	13.6	100

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
Toluene-d8	5.0000	4.95	99.0	80 - 120	
4-Bromofluorobenzene	5.0000	5.16	103	80 - 120	



Form I
METHOD BLANK DATA SHEET
NWTPHg

Blank

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Laboratory ID:	<u>BJI0605-BLK1</u>
Sampled:	<u>N/A</u>	Prepared:	<u>09/22/21 09:29</u>
Solids:		Preparation:	<u>EPA 5030C (Purge and Trap)</u>
Batch:	<u>BJI0605</u>	Sequence:	<u>SJI0364</u>
Instrument:	<u>NT2</u>	Column:	<u>RTX-VMS</u>
		File ID:	<u>V209222108G.D</u>
		Analyzed:	<u>09/22/21 09:29</u>
		Initial/Final:	<u>10 mL / 10 ml</u>
		Calibration:	<u>EI00019</u>

CAS NO.	COMPOUND	DILUTION	CONC. (ug/L)	Q	DL	RL
GRO	Gasoline Range Organics (Tol-Nap)	1	100	U	13.6	100
SURROGATES		ADDED (ug/L)	CONC. (ug/L)	% REC	QC LIMITS	Q
Toluene-d8		5.0000	4.99	99.9	80 - 120	
4-Bromofluorobenzene		5.0000	4.52	90.4	80 - 120	



Form I
METHOD BLANK DATA SHEET
NWTPHg

Blank

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Laboratory ID:	<u>BJI0716-BLK2</u>
Sampled:	<u>N/A</u>	Prepared:	<u>09/24/21 12:54</u>
Solids:		Preparation:	<u>EPA 5030C (Purge and Trap)</u> Initial/Final:
Batch:	<u>BJI0716</u>	Sequence:	<u>SJI0460</u>
Instrument:	<u>NT3</u>	Column:	<u>RTX-VMS</u>
		File ID:	<u>V309242109G.D</u>
		Analyzed:	<u>09/24/21 13:12</u>
		Calibration:	<u>EI00046</u>
			<u>10 mL / 10 ml</u>

CAS NO.	COMPOUND	DILUTION	CONC. (ug/L)	Q	DL	RL
GRO	Gasoline Range Organics (Tol-Nap)	1	100	U	13.6	100
SURROGATES		ADDED (ug/L)	CONC. (ug/L)	% REC	QC LIMITS	Q
Toluene-d8		5.0000	4.86	97.3	80 - 120	
4-Bromofluorobenzene		5.0000	5.10	102	80 - 120	



LCS / LCS DUPLICATE RECOVERY
NWTPHg

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Analyzed: 09/22/21 07:47

Batch: BJI0605

Laboratory ID: BJI0605-BS1

Preparation: EPA 5030C (Purge and Trap)

Sequence Name: LCS

Initial/Final: 10 mL / 10 ml

COMPOUND	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	Q	LCS % REC. #	QC LIMITS REC.
Gasoline Range Organics (Tol-Nap)	1000	1070		107	72 - 128

* Indicates values outside of QC limits

COMPOUND	SPIKE ADDED (ug/L)	LCSD CONCENTRATION (ug/L)	Q	LCSD % REC. #	% RPD #	QC LIMITS	
						RPD	REC.
Gasoline Range Organics (Tol-Nap)	1000	1040		104	2.17	30	72 - 128

* Indicates values outside of QC limits



LCS / LCS DUPLICATE RECOVERY
NWTPHg

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Analyzed: 09/24/21 11:31

Batch: BJI0716

Laboratory ID: BJI0716-BS2

Preparation: EPA 5030C (Purge and Trap)

Sequence Name: LCS

Initial/Final: 10 mL / 10 ml

COMPOUND	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	Q	LCS % REC. #	QC LIMITS REC.
Gasoline Range Organics (Tol-Nap)	1000	1150		115	72 - 128

* Indicates values outside of QC limits

COMPOUND	SPIKE ADDED (ug/L)	LCSD CONCENTRATION (ug/L)	Q	LCSD % REC. #	% RPD #	QC LIMITS	
						RPD	REC.
Gasoline Range Organics (Tol-Nap)	1000	1110		111	4.21	30	72 - 128

* Indicates values outside of QC limits



INITIAL CALIBRATION DATA

NWTPHg

Laboratory:	Analytical Resources, LLC	SDG:	21I0294
Client:	GeoEngineers	Project:	South State Street PRDI
Calibration:	EI00006	Instrument:	NT3
Calibration Date:	09/02/2021	Column (1):	RTX-VMS

COMPOUND	Mean RRF	RRF RSD	Linear COD	Quad COD	Limit Type & Limit	Q
Gasoline Range Organics (Tol-Nap)	46920.99	7.7			RSD (15)	
Toluene-d8	1.254832	1.7			RSD (15)	
4-Bromofluorobenzene	0.4214541	2.1			RSD (15)	



SECOND-SOURCE CALIBRATION VERIFICATION

NWTPHg

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EI00006

Laboratory ID: SJH0422-SCV1

Sequence: SJH0422

Standard ID: J009399

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Gasoline Range Organics (Tol-Nap)	1000.0	968	-3.2	20.00
Toluene-d8	5.0000	4.89	-2.2	
4-Bromofluorobenzene	5.0000	5.09	1.7	

* Values outside of QC limits



SECOND-SOURCE CALIBRATION VERIFICATION

NWTPHg

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EI00019

Laboratory ID: SJI0070-SCV1

Sequence: SJI0070

Standard ID: J009600

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Gasoline Range Organics (Tol-Nap)	1000.0	919	-8.1	20.00
Toluene-d8	5.0000	4.90	-2.0	
4-Bromofluorobenzene	5.0000	4.98	-0.4	

* Values outside of QC limits



**SECOND-SOURCE
CONTINUING CALIBRATION CHECK
NWTPHg**

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Instrument ID:	<u>NT3</u>	Calibration:	<u>EI00006</u>
Lab File ID:	<u>V308272123G.D</u>	Calibration Date:	<u>09/02/2021</u>
Sequence:	<u>SJH0422</u>	Injection Date:	<u>08/27/21</u>
Lab Sample ID:	<u>SJH0422-SCV1</u>	Injection Time:	<u>17:46</u>
Sequence Name:	<u>Gas SCV 1</u>		

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR (RRF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Gasoline Range Organics (Tol-Nap)	A	1000.0	968	46920.99	45423.9		-3.2	+/-20
Toluene-d8	A	5.0000	4.89	1.2548320	1.2273200		-2.2	
4-Bromofluorobenzene	A	5.0000	5.09	0.4214541	0.4287149		1.7	

* Values outside of QC limits



CONTINUING CALIBRATION CHECK NWTPHg

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>21I0294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>NT2</u>	Calibration: <u>EI00019</u>
Lab File ID: <u>V209222137G.D</u>	Calibration Date: <u>09/02/2021</u>
Sequence: <u>SJI0364</u>	Injection Date: <u>09/22/21</u>
Lab Sample ID: <u>SJI0364-CCV1</u>	Injection Time: <u>19:39</u>
Sequence Name: <u>CCV</u>	

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR (RRF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Gasoline Range Organics (Tol-Nap)	A	1000.0	895	33940.58	30378.89		-10.5	+/-20
Toluene-d8	A	5.0000	5.09	1.0820160	1.1009110		1.7	
4-Bromofluorobenzene	A	5.0000	4.96	0.3517071	0.3487456		-0.8	

* Values outside of QC limits



INITIAL CALIBRATION CHECK

NWTPHg

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>21I0294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>NT2</u>	Calibration: <u>EI00019</u>
Lab File ID: <u>V209222103G.D</u>	Calibration Date: <u>09/02/2021</u>
Sequence: <u>SJI0364</u>	Injection Date: <u>09/22/21</u>
Lab Sample ID: <u>SJI0364-ICV1</u>	Injection Time: <u>07:47</u>
Sequence Name: <u>ICV</u>	

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR			% DRIFT/DIFF	
		STD	ICV	ICAL	ICV	MIN	ICV	LIMIT
Gasoline Range Organics (Tol-Nap)	A	1000.0	1070	33940.5800	36184.7400		6.6	+/-20
Toluene-d8	A	5.0000	5.05	1.0820160	1.0921770		0.9	
4-Bromofluorobenzene	A	5.0000	4.75	0.3517071	0.3344281		-4.9	

* Values outside of QC limits



INITIAL CALIBRATION CHECK

NWTPHg

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>21I0294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>NT3</u>	Calibration: <u>EI00046</u>
Lab File ID: <u>V309242105G.D</u>	Calibration Date: <u>09/08/2021</u>
Sequence: <u>SJI0460</u>	Injection Date: <u>09/24/21</u>
Lab Sample ID: <u>SJI0460-ICV1</u>	Injection Time: <u>11:31</u>
Sequence Name: <u>ICV</u>	

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR			% DRIFT/DIFF	
		STD	ICV	ICAL	ICV	MIN	ICV	LIMIT
Gasoline Range Organics (Tol-Nap)	A	1000.0	1150	46920.9900	54185.7600		15.5	+/-20
Toluene-d8	A	5.0000	5.06	1.1539230	1.1666280		1.1	
4-Bromofluorobenzene	A	5.0000	4.98	0.3964982	0.3947520		-0.4	

* Values outside of QC limits



ANALYSIS BATCH (SEQUENCE) SUMMARY

NWTPHg

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJH0422

Instrument: NT3

Calibration: EI00006

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
MS Tune	SJH0422-TUN1	V308272103G.D	NA	08/27/21 08:59
Gas 0.1	SJH0422-CAL9	V308272116G.D	NA	08/27/21 14:50
Gas 0.25	SJH0422-CALA	V308272117G.D	NA	08/27/21 15:15
Gas 0.5	SJH0422-CALB	V308272118G.D	NA	08/27/21 15:40
Gas 1	SJH0422-CALC	V308272119G.D	NA	08/27/21 16:05
Gas 2.5	SJH0422-CALD	V308272120G.D	NA	08/27/21 16:30
Gas 5	SJH0422-CALE	V308272121G.D	NA	08/27/21 16:56
Initial Cal Blank	SJH0422-ICB1	V308272122G.D	NA	08/27/21 17:21
Gas SCV 1	SJH0422-SCV1	V308272123G.D	NA	08/27/21 17:46



ANALYSIS BATCH (SEQUENCE) SUMMARY

NWTPHg

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0070

Instrument: NT2

Calibration: EI00019

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
MS Tune	SJI0070-TUN1	V209022102G.D	NA	09/02/21 06:49
Gas 0.1	SJI0070-CAL9	V209022114G.D	NA	09/02/21 11:13
Gas 0.25	SJI0070-CALA	V209022115G.D	NA	09/02/21 11:33
Gas 0.5	SJI0070-CALB	V209022116G.D	NA	09/02/21 11:54
Gas 1	SJI0070-CALC	V209022117G.D	NA	09/02/21 12:14
Gas 2.5	SJI0070-CALD	V209022118G.D	NA	09/02/21 12:35
Gas 5	SJI0070-CALE	V209022119G.D	NA	09/02/21 12:55
Initial Cal Blank	SJI0070-ICB1	V209022120G.D	NA	09/02/21 13:16
Gas SCV 1	SJI0070-SCV1	V209022121G.D	NA	09/02/21 13:37



ANALYSIS BATCH (SEQUENCE) SUMMARY

NWTPHg

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0229

Instrument: NT3

Calibration: EI00046

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
MS Tune	SJI0229-TUN1	V309082108G.D	NA	09/08/21 12:24



ANALYSIS BATCH (SEQUENCE) SUMMARY

NWTPHg

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0364

Instrument: NT2

Calibration: EI00019

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
BFB	SJI0364-TUN1	V209222102G.D	NA	09/22/21 07:15
ICV	SJI0364-ICV1	V209222103G.D	NA	09/22/21 07:47
LCS	BJI0605-BS1	V209222103LCSSG.D	Water	09/22/21 07:47
ZZZZZ	BJI0606-BS1	V209222103LCSSG.D	Solid	09/22/21 07:47
LCS Dup	BJI0605-BSD1	V209222105G.D	Water	09/22/21 08:28
ZZZZZ	BJI0606-BSD1	V209222105LCSDSG.D	Solid	09/22/21 08:28
Blank	BJI0605-BLK1	V209222108G.D	Water	09/22/21 09:29
ZZZZZ	BJI0606-BLK1	V209222108MBSG.D	Solid	09/22/21 09:29
TB-1_092021	21I0294-13	V209222109G.D	Water	09/22/21 09:50
ZZZZZ	21I0290-01	V209222126G.D	Solid	09/22/21 15:44
ZZZZZ	21I0290-02	V209222127G.D	Solid	09/22/21 16:05
MW-28_092021	21I0294-01	V209222134G.D	Water	09/22/21 18:32
MW-24_092021	21I0294-03	V209222135G.D	Water	09/22/21 18:55
CCV	SJI0364-CCV1	V209222137G.D	NA	09/22/21 19:39



ANALYSIS BATCH (SEQUENCE) SUMMARY

NWTPHg

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0460

Instrument: NT3

Calibration: EI00046

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
BFB	SJI0460-TUN1	V309242102G.D	NA	09/24/21 10:00
ICV	SJI0460-ICV1	V309242105G.D	NA	09/24/21 11:31
LCS	BJI0716-BS2	V309242105GLCS.D	Water	09/24/21 11:31
LCS Dup	BJI0716-BSD2	V309242107G.D	Water	09/24/21 12:21
Blank	BJI0716-BLK2	V309242109G.D	Water	09/24/21 13:12
TB-2_092021	21I0294-14	V309242111G.D	Water	09/24/21 14:02
MW-60_092021	21I0294-05	V309242120G.D	Water	09/24/21 18:02
MW-55_092021	21I0294-07	V309242121G.D	Water	09/24/21 18:28
MW-42_092021	21I0294-09	V309242122G.D	Water	09/24/21 18:53
MW-54_092021	21I0294-11	V309242123G.D	Water	09/24/21 19:19



SURROGATE RECOVERY SUMMARY

NWTPHg

Laboratory: Analytical Resources, LLC

SDG/WO: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJH0422

Instrument: NT3

Calibration: EI00006

Calibration Date: 08/27/2021

Surrogate Compound	Spike Level ug/L	% Recovery	Recovery Limits	Q
SJH0422-ICB1 (Water) Lab File ID: V308272122G.D Analyzed: 08/27/21 17:21				
Toluene-d8			80 - 120	
4-Bromofluorobenzene			80 - 120	
SJH0422-SCV1 (Water) Lab File ID: V308272123G.D Analyzed: 08/27/21 17:46				
Toluene-d8	5.0000	97.8	0 - 200	
4-Bromofluorobenzene	5.0000	102	0 - 200	



SURROGATE RECOVERY SUMMARY

NWTPHg

Laboratory: Analytical Resources, LLC

SDG/WO: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0070

Instrument: NT2

Calibration: EI00019

Calibration Date: 09/02/2021

Surrogate Compound	Spike Level ug/L	% Recovery	Recovery Limits	Q
SJI0070-ICB1 (Water)				
Lab File ID: V209022120G.D		Analyzed: 09/02/21 13:16		
Toluene-d8			80 - 120	
4-Bromofluorobenzene			80 - 120	
SJI0070-SCV1 (Water)				
Lab File ID: V209022121G.D		Analyzed: 09/02/21 13:37		
Toluene-d8	5.0000	98.0	0 - 200	
4-Bromofluorobenzene	5.0000	99.6	0 - 200	



SURROGATE RECOVERY SUMMARY

NWTPHg

Laboratory: Analytical Resources, LLC

SDG/WO: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0364

Instrument: NT2

Calibration: EI00019

Calibration Date: 09/02/2021

Surrogate Compound	Spike Level ug/L	% Recovery	Recovery Limits	Q
BJI0605-BS1 (Water) Lab File ID: V209222103LCSG.D Analyzed: 09/22/21 07:47				
Toluene-d8	5.0000	101	80 - 120	
4-Bromofluorobenzene	5.0000	95.1	80 - 120	
SJI0364-ICV1 (Water) Lab File ID: V209222103G.D Analyzed: 09/22/21 07:47				
Toluene-d8	5.0000	101	0 - 200	
4-Bromofluorobenzene	5.0000	95.1	0 - 200	
BJI0605-BSD1 (Water) Lab File ID: V209222105G.D Analyzed: 09/22/21 08:28				
Toluene-d8	5.0000	105	80 - 120	
4-Bromofluorobenzene	5.0000	97.4	80 - 120	
BJI0605-BLK1 (Water) Lab File ID: V209222108G.D Analyzed: 09/22/21 09:29				
Toluene-d8	5.0000	99.9	80 - 120	
4-Bromofluorobenzene	5.0000	90.4	80 - 120	
21I0294-13 (Water) Lab File ID: V209222109G.D Analyzed: 09/22/21 09:50				
Toluene-d8	5.0000	97.8	80 - 120	
4-Bromofluorobenzene	5.0000	88.4	80 - 120	
21I0294-01 (Water) Lab File ID: V209222134G.D Analyzed: 09/22/21 18:32				
Toluene-d8	5.0000	100	80 - 120	
4-Bromofluorobenzene	5.0000	95.7	80 - 120	
21I0294-03 (Water) Lab File ID: V209222135G.D Analyzed: 09/22/21 18:55				
Toluene-d8	5.0000	99.5	80 - 120	
4-Bromofluorobenzene	5.0000	98.9	80 - 120	
SJI0364-CCV1 (Water) Lab File ID: V209222137G.D Analyzed: 09/22/21 19:39				
Toluene-d8	5.0000	102	0 - 200	
4-Bromofluorobenzene	5.0000	99.2	0 - 200	



SURROGATE RECOVERY SUMMARY

NWTPHg

Laboratory: Analytical Resources, LLC

SDG/WO: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0460

Instrument: NT3

Calibration: EI00046

Calibration Date: 09/08/2021

Surrogate Compound	Spike Level ug/L	% Recovery	Recovery Limits	Q
BJI0716-BS2 (Water) Lab File ID: V309242105GLCS.D Analyzed: 09/24/21 11:31				
Toluene-d8	5.0000	101	80 - 120	
4-Bromofluorobenzene	5.0000	99.6	80 - 120	
SJI0460-ICV1 (Water) Lab File ID: V309242105G.D Analyzed: 09/24/21 11:31				
Toluene-d8	5.0000	101	0 - 200	
4-Bromofluorobenzene	5.0000	99.6	0 - 200	
BJI0716-BSD2 (Water) Lab File ID: V309242107G.D Analyzed: 09/24/21 12:21				
Toluene-d8	5.0000	102	80 - 120	
4-Bromofluorobenzene	5.0000	101	80 - 120	
BJI0716-BLK2 (Water) Lab File ID: V309242109G.D Analyzed: 09/24/21 13:12				
Toluene-d8	5.0000	97.3	80 - 120	
4-Bromofluorobenzene	5.0000	102	80 - 120	
21I0294-14 (Water) Lab File ID: V309242111G.D Analyzed: 09/24/21 14:02				
Toluene-d8	5.0000	99.0	80 - 120	
4-Bromofluorobenzene	5.0000	103	80 - 120	
21I0294-05 (Water) Lab File ID: V309242120G.D Analyzed: 09/24/21 18:02				
Toluene-d8	5.0000	102	80 - 120	
4-Bromofluorobenzene	5.0000	103	80 - 120	
21I0294-07 (Water) Lab File ID: V309242121G.D Analyzed: 09/24/21 18:28				
Toluene-d8	5.0000	94.8	80 - 120	
4-Bromofluorobenzene	5.0000	102	80 - 120	
21I0294-09 (Water) Lab File ID: V309242122G.D Analyzed: 09/24/21 18:53				
Toluene-d8	5.0000	97.2	80 - 120	
4-Bromofluorobenzene	5.0000	102	80 - 120	
21I0294-11 (Water) Lab File ID: V309242123G.D Analyzed: 09/24/21 19:19				
Toluene-d8	5.0000	95.6	80 - 120	
4-Bromofluorobenzene	5.0000	101	80 - 120	



INTERNAL STANDARD AREA AND RT SUMMARY

NWTPHg

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJH0422

Instrument: NT3

Calibration: EI00006

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
Initial Cal Blank (SJH0422-ICB1)		(Water)	Lab File ID: V308272122G.D			Analyzed: 08/27/21 17:21			
Pentafluorobenzene	239642	5.138				50 - 200		+/-0.50	
Chlorobenzene-d5	399800	7.578				50 - 200		+/-0.50	
1,4-Difluorobenzene	400406	5.521				50 - 200		+/-0.50	
1,4-Dichlorobenzene-d4	222438	9.263				50 - 200		+/-0.50	
Secondary Cal Check (SJH0422-SCV1)		(Water)	Lab File ID: V308272123G.D			Analyzed: 08/27/21 17:46			
Pentafluorobenzene	253528	5.138				50 - 200		+/-0.50	
Chlorobenzene-d5	412120	7.578				50 - 200		+/-0.50	
1,4-Difluorobenzene	426531	5.526				50 - 200		+/-0.50	
1,4-Dichlorobenzene-d4	243750	9.263				50 - 200		+/-0.50	



INTERNAL STANDARD AREA AND RT SUMMARY

NWTPHg

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0070

Instrument: NT2

Calibration: EI00019

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
Initial Cal Blank (SJI0070-ICB1)		(Water)	Lab File ID: V209022120G.D			Analyzed: 09/02/21 13:16			
Pentafluorobenzene	267928	5.278	296861	5.278	90	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	395127	7.729	433036	7.729	91	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	453393	5.667	507834	5.667	89	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	181667	9.419	209416	9.419	87	50 - 200	0.000	+/-0.50	
Secondary Cal Check (SJI0070-SCV1)		(Water)	Lab File ID: V209022121G.D			Analyzed: 09/02/21 13:37			
Pentafluorobenzene	274736	5.273	296861	5.278	93	50 - 200	-0.005	+/-0.50	
Chlorobenzene-d5	401910	7.73	433036	7.729	93	50 - 200	0.001	+/-0.50	
1,4-Difluorobenzene	469009	5.668	507834	5.667	92	50 - 200	0.001	+/-0.50	
1,4-Dichlorobenzene-d4	189813	9.421	209416	9.419	91	50 - 200	0.002	+/-0.50	



INTERNAL STANDARD AREA AND RT SUMMARY

NWTPHg

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Sequence: SJI0364

SDG: 21I0294
Project: South State Street PRDI
Instrument: NT2
Calibration: EI00019

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
LCS (BJI0605-BS1)		(Water)	Lab File ID: V209222103LCSG.D			Analyzed: 09/22/21 07:47			
Pentafluorobenzene	296388	5.275	296388	5.275	100	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	472544	7.732	472544	7.732	100	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	541352	5.664	541352	5.664	100	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	224444	9.416	224444	9.416	100	50 - 200	0.000	+/-0.50	
Initial Cal Check (SJI0364-ICV1)		(Water)	Lab File ID: V209222103G.D			Analyzed: 09/22/21 07:47			
Pentafluorobenzene	296388	5.275	296388	5.275	100	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	472544	7.732	472544	7.732	100	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	541352	5.664	541352	5.664	100	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	224444	9.416	224444	9.416	100	50 - 200	0.000	+/-0.50	
LCS Dup (BJI0605-BS1)		(Water)	Lab File ID: V209222105G.D			Analyzed: 09/22/21 08:28			
Pentafluorobenzene	242319	5.272	296388	5.275	82	50 - 200	-0.003	+/-0.50	
Chlorobenzene-d5	387369	7.728	472544	7.732	82	50 - 200	-0.004	+/-0.50	
1,4-Difluorobenzene	427840	5.667	541352	5.664	79	50 - 200	0.003	+/-0.50	
1,4-Dichlorobenzene-d4	182967	9.419	224444	9.416	82	50 - 200	0.003	+/-0.50	
Blank (BJI0605-BLK1)		(Water)	Lab File ID: V209222108G.D			Analyzed: 09/22/21 09:29			
Pentafluorobenzene	232848	5.278	296388	5.275	79	50 - 200	0.003	+/-0.50	
Chlorobenzene-d5	377515	7.729	472544	7.732	80	50 - 200	-0.003	+/-0.50	
1,4-Difluorobenzene	421704	5.667	541352	5.664	78	50 - 200	0.003	+/-0.50	
1,4-Dichlorobenzene-d4	171472	9.419	224444	9.416	76	50 - 200	0.003	+/-0.50	
TB-1_092021 (21I0294-13)		(Water)	Lab File ID: V209222109G.D			Analyzed: 09/22/21 09:50			
Pentafluorobenzene	224976	5.276	296388	5.275	76	50 - 200	0.001	+/-0.50	
Chlorobenzene-d5	372218	7.733	472544	7.732	79	50 - 200	0.001	+/-0.50	
1,4-Difluorobenzene	409946	5.666	541352	5.664	76	50 - 200	0.002	+/-0.50	
1,4-Dichlorobenzene-d4	163052	9.424	224444	9.416	73	50 - 200	0.008	+/-0.50	
MW-28_092021 (21I0294-01)		(Water)	Lab File ID: V209222134G.D			Analyzed: 09/22/21 18:32			
Pentafluorobenzene	258120	5.272	296388	5.275	87	50 - 200	-0.003	+/-0.50	
Chlorobenzene-d5	405739	7.729	472544	7.732	86	50 - 200	-0.003	+/-0.50	
1,4-Difluorobenzene	450259	5.667	541352	5.664	83	50 - 200	0.003	+/-0.50	
1,4-Dichlorobenzene-d4	194878	9.419	224444	9.416	87	50 - 200	0.003	+/-0.50	



INTERNAL STANDARD AREA AND RT SUMMARY NWTPHg

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0364

Instrument: NT2

Calibration: EI00019

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
MW-24_092021 (2110294-03)		(Water)	Lab File ID: V209222135G.D		Analyzed: 09/22/21 18:55				
Pentafluorobenzene	246515	5.272	296388	5.275	83	50 - 200	-0.003	+/-0.50	
Chlorobenzene-d5	393776	7.729	472544	7.732	83	50 - 200	-0.003	+/-0.50	
1,4-Difluorobenzene	429970	5.667	541352	5.664	79	50 - 200	0.003	+/-0.50	
1,4-Dichlorobenzene-d4	200601	9.419	224444	9.416	89	50 - 200	0.003	+/-0.50	



INTERNAL STANDARD AREA AND RT SUMMARY

NWTPHg

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0460

Instrument: NT3

Calibration: EI00046

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
LCS (BJI0716-BS2)		(Water)	Lab File ID: V309242105GLCS.D			Analyzed: 09/24/21 11:31			
Pentafluorobenzene	269120	5.138	269120	5.138	100	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	409067	7.572	409067	7.572	100	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	434771	5.526	434771	5.526	100	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	236305	9.257	236305	9.257	100	50 - 200	0.000	+/-0.50	
Initial Cal Check (SJI0460-ICV1)		(Water)	Lab File ID: V309242105G.D			Analyzed: 09/24/21 11:31			
Pentafluorobenzene	269120	5.138	269120	5.138	100	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	409067	7.572	409067	7.572	100	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	434771	5.526	434771	5.526	100	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	236305	9.257	236305	9.257	100	50 - 200	0.000	+/-0.50	
LCS Dup (BJI0716-BSD2)		(Water)	Lab File ID: V309242107G.D			Analyzed: 09/24/21 12:21			
Pentafluorobenzene	262070	5.138	269120	5.138	97	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	385301	7.573	409067	7.572	94	50 - 200	0.001	+/-0.50	
1,4-Difluorobenzene	406748	5.521	434771	5.526	94	50 - 200	-0.005	+/-0.50	
1,4-Dichlorobenzene-d4	225202	9.258	236305	9.257	95	50 - 200	0.001	+/-0.50	
Blank (BJI0716-BLK2)		(Water)	Lab File ID: V309242109G.D			Analyzed: 09/24/21 13:12			
Pentafluorobenzene	290513	5.138	269120	5.138	108	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	412304	7.573	409067	7.572	101	50 - 200	0.001	+/-0.50	
1,4-Difluorobenzene	447324	5.521	434771	5.526	103	50 - 200	-0.005	+/-0.50	
1,4-Dichlorobenzene-d4	232053	9.258	236305	9.257	98	50 - 200	0.001	+/-0.50	
TB-2_092021 (2110294-14)		(Water)	Lab File ID: V309242111G.D			Analyzed: 09/24/21 14:02			
Pentafluorobenzene	258264	5.138	269120	5.138	96	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	390745	7.573	409067	7.572	96	50 - 200	0.001	+/-0.50	
1,4-Difluorobenzene	407012	5.521	434771	5.526	94	50 - 200	-0.005	+/-0.50	
1,4-Dichlorobenzene-d4	232030	9.258	236305	9.257	98	50 - 200	0.001	+/-0.50	
MW-60_092021 (2110294-05)		(Water)	Lab File ID: V309242120G.D			Analyzed: 09/24/21 18:02			
Pentafluorobenzene	213426	5.139	269120	5.138	79	50 - 200	0.001	+/-0.50	
Chlorobenzene-d5	321122	7.573	409067	7.572	79	50 - 200	0.001	+/-0.50	
1,4-Difluorobenzene	330200	5.521	434771	5.526	76	50 - 200	-0.005	+/-0.50	
1,4-Dichlorobenzene-d4	187581	9.258	236305	9.257	79	50 - 200	0.001	+/-0.50	



INTERNAL STANDARD AREA AND RT SUMMARY

NWTPHg

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0460

Instrument: NT3

Calibration: EI00046

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
MW-55_092021 (2110294-07)		(Water)	Lab File ID: V309242121G.D			Analyzed: 09/24/21 18:28			
Pentafluorobenzene	273264	5.133	269120	5.138	102	50 - 200	-0.005	+/-0.50	
Chlorobenzene-d5	404059	7.573	409067	7.572	99	50 - 200	0.001	+/-0.50	
1,4-Difluorobenzene	446153	5.521	434771	5.526	103	50 - 200	-0.005	+/-0.50	
1,4-Dichlorobenzene-d4	238734	9.258	236305	9.257	101	50 - 200	0.001	+/-0.50	
MW-42_092021 (2110294-09)		(Water)	Lab File ID: V309242122G.D			Analyzed: 09/24/21 18:53			
Pentafluorobenzene	282241	5.129	269120	5.138	105	50 - 200	-0.009	+/-0.50	
Chlorobenzene-d5	415562	7.574	409067	7.572	102	50 - 200	0.002	+/-0.50	
1,4-Difluorobenzene	445175	5.517	434771	5.526	102	50 - 200	-0.009	+/-0.50	
1,4-Dichlorobenzene-d4	238783	9.259	236305	9.257	101	50 - 200	0.002	+/-0.50	
MW-54_092021 (2110294-11)		(Water)	Lab File ID: V309242123G.D			Analyzed: 09/24/21 19:19			
Pentafluorobenzene	244793	5.138	269120	5.138	91	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	367239	7.573	409067	7.572	90	50 - 200	0.001	+/-0.50	
1,4-Difluorobenzene	395524	5.521	434771	5.526	91	50 - 200	-0.005	+/-0.50	
1,4-Dichlorobenzene-d4	218119	9.258	236305	9.257	92	50 - 200	0.001	+/-0.50	



HOLDING TIME SUMMARY

Analysis: NWTPhg

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sample Name	Date Collected	Date Received	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
MW-28_092021 21I0294-01	09/20/21 10:10	09/21/21 15:38	09/22/21 08:41	1	14	09/22/21 18:32	2	14	
MW-24_092021 21I0294-03	09/20/21 11:11	09/21/21 15:38	09/22/21 08:41	1	14	09/22/21 18:55	2	14	
MW-60_092021 21I0294-05	09/20/21 11:30	09/21/21 15:38	09/24/21 12:54	4	14	09/24/21 18:02	4	14	
MW-55_092021 21I0294-07	09/20/21 12:29	09/21/21 15:38	09/24/21 12:54	4	14	09/24/21 18:28	4	14	
MW-42_092021 21I0294-09	09/20/21 12:35	09/21/21 15:38	09/24/21 12:54	4	14	09/24/21 18:53	4	14	
MW-54_092021 21I0294-11	09/20/21 13:54	09/21/21 15:38	09/24/21 12:54	3	14	09/24/21 19:19	4	14	
TB-1_092021 21I0294-13	09/20/21 10:10	09/21/21 15:38	09/22/21 08:41	1	14	09/22/21 09:50	2	14	
TB-2_092021 21I0294-14	09/20/21 10:10	09/21/21 15:38	09/24/21 12:54	4	14	09/24/21 14:02	4	14	

* Indicates hold time exceedance.



Analytical Resources, Incorporated
Analytical Chemists and Consultants

**METHOD DETECTION
AND REPORTING LIMITS**
NWTPHg

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Instrument: NT2

Analyte	MDL	RL	Units
Gasoline Range Organics (Tol-Nap)	13.6	100	ug/L



METHOD DETECTION AND REPORTING LIMITS

NWTPHg

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Instrument: NT3

Analyte	MDL	RL	Units
Gasoline Range Organics (Tol-Nap)	13.6	100	ug/L



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 Phone: 866.272.0932 Fax: 866.509.5146 www.o2si.com



ISO 17025 Accredited Chemical Testing Lab
 Cert. No. 3031.01

Date Received: _____

Certificate of Analysis

Rev 1

Page 1 of 1

Catalog No.: 120002-01 **Lot No.:** 354941 **Storage:** -18°C +/- 4°C
 -5PAK **Solvent:** P/T Methanol **Exp. Date:** 1-Sep-2022 **Description:** 8260B Surrogate Solution, 2,000 mg/L, 5 x 1 ml

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
4-bromofluorobenzene (BFB)	460-00-4	99.5	135.7.1P	2036 ± 7.1 mg/L
dibromofluoromethane	1868-53-7	99.4	136.282.7P	2025 ± 7.34 mg/L
1,2-dichloroethane-d ₄	17060-07-0	99.5	138.271.2P	2023 ± 12.33 mg/L
toluene-d ₈	2037-26-5	99.9	137.120.3.2P	2018 ± 7.31 mg/L

G008020

8260B Surrogate Solution
 Expires 9/1/2021
 Prepared By Paul Campbell 9/5/2018

Certified By: _____

Kara Catron

Manufacture Date 28-Aug-2018

Follow all storage requirements, keep tightly closed when not in use, and use good laboratory practices when handling. This Reference Material was manufactured, produced, and/or certified under a quality management system that is accredited to ISO 17034 and ISO/IEC 17025.

All weights are traceable through N. I. S. T. Test No. 822/264157-00. Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.

The stated uncertainty is the expanded uncertainty with a coverage factor of two to give a 95% confidence level.



Reference Materials Producer
Cert #2495.01

SPEXertificate®

Certificate of Reference Material



Chemical Testing
Cert #2495.02

Catalog Number: GAS-20 **Lot No.** TS180521004

Description: BTEX Characterized Gasoline Standard

Matrix: Methanol (Purge & Trap Grade)

Ship Date:

Expiration Date:

This SPEXOrganics® Certified Reference Material, CRM, is intended primarily for use as a calibration standard or quality control standard for organic chromatography instrumentation such as GC, GC-MS, LC, and LC-MS. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Compounds:

<u>Compound</u>	<u>CAS #</u>	<u>Labeled</u>	<u>Purity</u>	<u>Certified†</u>	<u>Uncertainty</u>
Regular Unleaded Gas-87octane	86290-81-5	20 mg/mL	100%	20.0 mg/mL	± 0.72 mg/mL

I006737

Gas 20 Primary
Expires 7/22/2023
Prepared By Paul Campbell 8/3/2020

Final Solution Verification:

Final solution integrity verified by Gas Chromatography/Mass Spectrometry. The mass spectrum of each compound was confirmed against the NIST mass spectral database.

† Certified concentration based on gravimetric weights and corrected for the purity of the compound(s) used to prepare the standard. Analytical balance calibration is verified daily with C1 weight set #23-190006 which is registered with Atlantic Scale, and traceable to NIST and NJ Division of Weights and Measures.

This CRM is guaranteed stable and accurate to within the uncertainty listed for the certified value. This includes uncertainty components due to preparation, homogeneity, short term and long term stability. During the stated period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution. For further information, contact the Sales Support Department at crmsales@spexcsp.com.

Date of Certification: _____

Certifying Officer: Shannon More



CERTIFIED WEIGHT REPORT

Part Number: 19267
Lot Number: 030918
Description: p-Bromofluorobenzene
EPA Method 502/524 Surrogate Standard #2
Expiration Date: 030923
Recommended Storage: Refrigerate (4 °C)
Nominal Concentration (µg/mL): 2000
NIST Test ID#: 2506734D
Weight(s) shown below were combined and diluted to (mL): 100.0

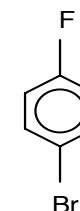
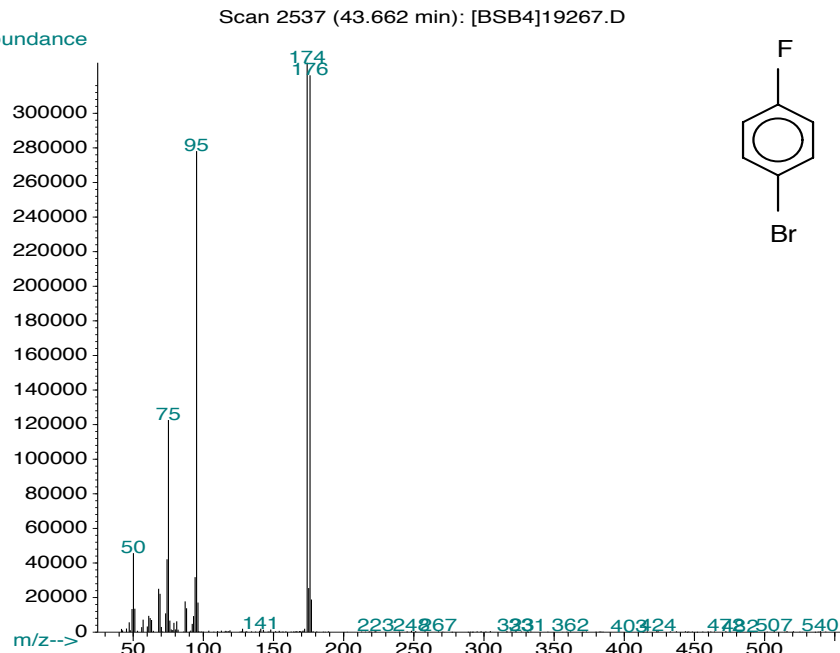
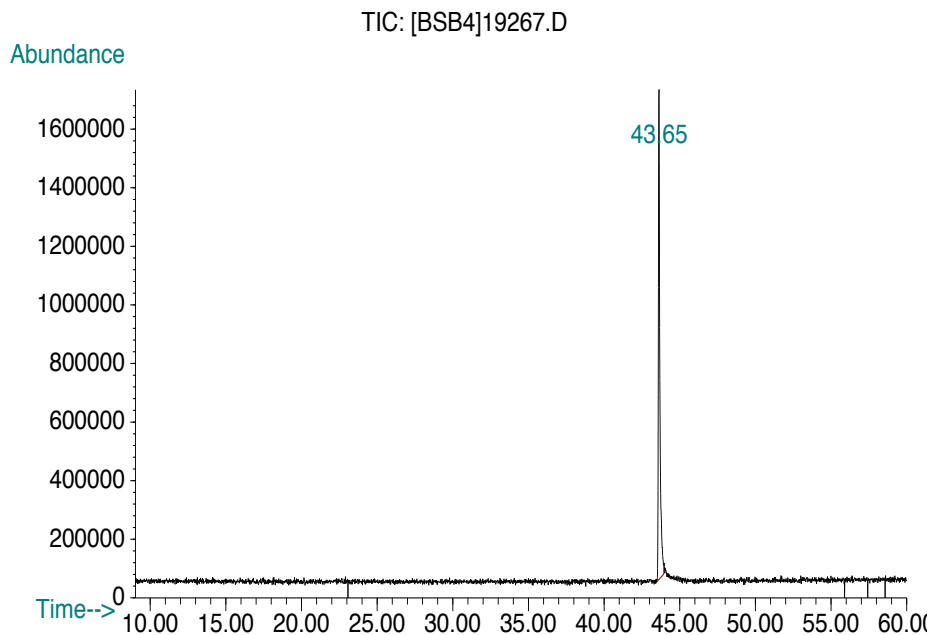
Solvent(s): Methanol
Lot#: DS435

5E-05 Balance Uncertainty
0.001 Flask Uncertainty

		030918
Formulated By:	Jason Criscio	DATE
		030918
Reviewed By:	Pedro L. Rentas	DATE

Compound	RM#	Lot Number	Nominal Conc (µg/mL)	Purity (%)	Uncertainty Purity	Target Weight(g)	Actual Weight(g)	Actual Conc (µg/mL)	Expanded Uncertainty (+/-) (µg/mL)	SDS Information (Solvent Safety Info. On Attached pg.)		
										CAS#	OSHA PEL (TWA)	LD50
1. p-Bromofluorobenzene	48	01127COV	2000	99	0.2	0.20204	0.20234	2002.9	8.2	460-00-4	N/A	orl-rat 2700mg/kg

Method: GC6MSD-1; **Detector:** Mass Selective Detector; **Column:** Vocol (60m X 0.25mm ID X 1.5µm film thickness); **Oven Profile:** Temp. 1 = 35°C (Time1=10min.), Temp. 2 = 200°C (Time2=8.75 min.), Rate = 4°C/min., **Injector Temp.:** = 200°C, **Detector Temp.:** = 220°C; **Analyst:** Candice Warren.



- The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- All Standards, after opening ampule, should be stored with caps tight and under appropriate laboratory conditions.
- Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, DC, (1994).

J001274

BFB stock
Expires 3/9/2023
Prepared By Paul Campbell 2/4/2021

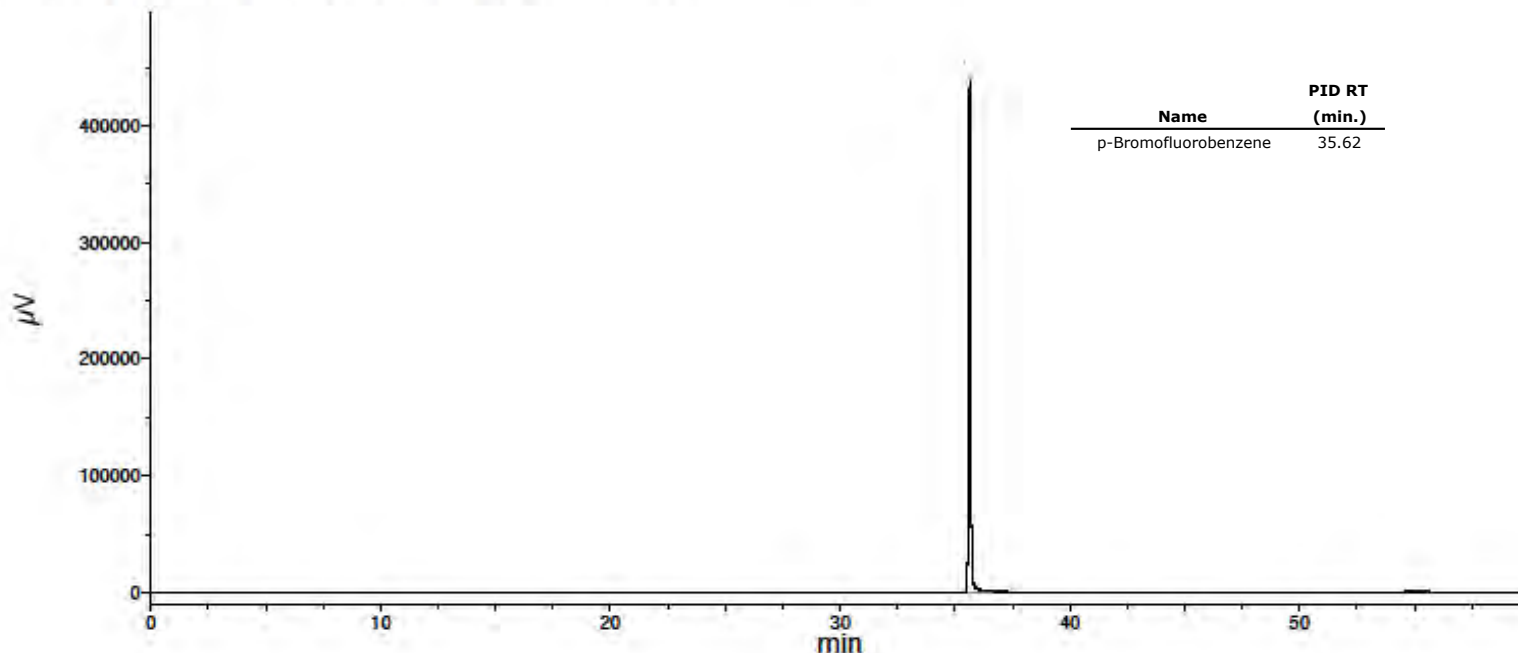


Run 37, "P19267 L030918 [2000µg/mL in MeOH]"

Run Length: 60.00 min, 36000 points at 10 points/second.
Created: Mon, Mar 12, 2018 at 10:30:10 AM.
Sampled: Sequence "030818-GC1", Method "GC1-M7".
Analyzed using Method "GC1-M7".

Comments

GC1-M7 Analysis by Candice Warren
Column ID SPB-Vocol 105 meter X 0.53mm X 3.0µm film thickness
Flow rates: Total flow=150mL/min., Helium (carrier)=10mL/min.,
Helium(make-up)=40mL/min., Hydrogen(make-up)=100mL/min.
Oven Profile: Temp. 1=35°C (Time 1=10 min.), Temp 2=200°C (Time 2=8.75 min.),
Rate = 4°C/min., Total run time=60 min. Injector temp.=200°C, FID Temp.=200°C.
ELCD Signal = Edaq Channel 1 PID Signal = Edaq Channel 2
Standard injection = 0.5µL, Range=4 Purge Valve = 8 min.





CERTIFIED WEIGHT REPORT

Part Number: 51047
Lot Number: 060420
Description: Unleaded Gasoline 87 Octane - ETOH

Solvent(s): Methanol
Lot# DX932-US

Expiration Date: 060425
Recommended Storage: Refrigerate (4 °C)
Nominal Concentration (µg/mL): 20000
NIST Test ID#: 23060

Weight(s) shown below were combined and diluted to (mL): 50.0 0.007 Balance Uncertainty Flask Uncertainty

Note: Technical Grade Purity

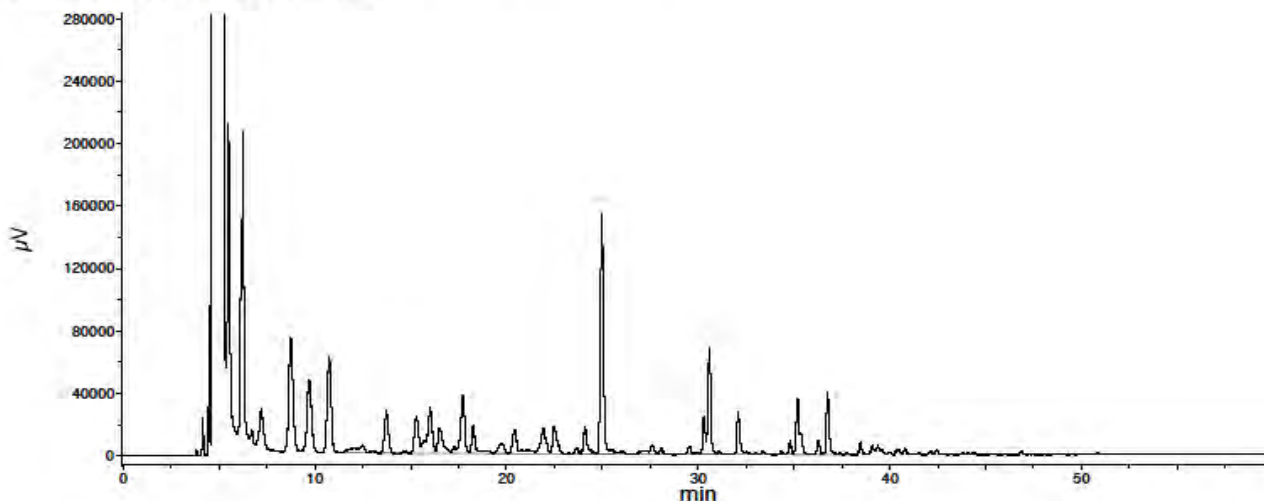
		060420
Formulated By:	Prashant Chauhan	DATE
		060420
Reviewed By:	Pedro L. Rentas	DATE

Compound	RM#	Lot Number	Nominal Conc (µg/mL)	Purity (%)	Uncertainty Purity	Target Weight(g)	Actual Weight(g)	Actual Conc (µg/mL)	Expanded Uncertainty (+/-) (µg/mL)	SDS Information (Solvent Safety Info. On Attached pg.)		
										CAS#	OSHA PEL (TWA)	LD50
1. Unleaded Gasoline 87 Octane - ETOH	2700	010908	20000	99	0.2	1.01005	1.01055	20009.8	81.0	86290-81-5	N/A	N/A

- The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- All Standards, after opening ampule, should be stored with caps tight and under appropriate laboratory conditions.
- Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, DC, (1994).

Comments

GC13-M1 Analysis by Candice Warren
Column ID SPB-Vocol 105 meter X 0.53mm X 3.0µm film thickness
Flow rates: Total flow=290mL/min., Helium (carrier)=10mL/min., Helium(make-up)=10mL/min., Hydrogen(make-up)=40mL/min., Air(make-up)=230mL/min.
Oven Profile: Temp. 1=35°C (Time 1=10 min.), Temp 2=200°C (Time 2=8.75 min.), Rate = 4°C/min., Total run time=60 min. Injector temp.=200°C, FID Temp.=200°C.
FID Signal = Edaq Channel 1
Standard injection = 0.5µL, Range=4



J004282
Gas 20 Secondary AS
Expires 6/4/2025
Prepared By Lani Hertzog 4/21/2021



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Date Received: _____

Certificate of Analysis

Rev 0

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Catalog No.: 020246-S5	Lot No.: 398454	Storage: ≤ -10 Degrees C	Solvent: P/T Methanol	Exp. Date: 1-Oct-2023	Description: Gasoline (Unleaded) Solution in P/T Methanol, 50,000 mg/L, 1 ml
-------------------------------	------------------------	---------------------------------	------------------------------	------------------------------	---

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
gasoline, unleaded, regular	8006-61-9	100	246.109.3P	50030 ± 180.39 mg/L

J004740

Gas 50 O2SI
 Expires 10/23/2023
 Prepared By Paul Campbell 5/3/2021

Certified By: _____

Kayla Coleman
 Manufacture Date 2-Oct-2018

Follow all storage requirements, keep tightly closed when not in use, and use good laboratory practices when handling. This Reference Material was manufactured, produced, and/or certified under a quality management system that is accredited to ISO 17034 and ISO/IEC 17025.

All weights are traceable through N. I. S. T. Test No. 822/264157-00. Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically. The stated uncertainty is the expanded uncertainty with a coverage factor of two to give a 95% confidence level.

Certificate of Analysis

Page 2 of 1

Catalog No.: 020246-S5

Lot No.: 398454

Expiration Date: 1-Oct-2023

Compound

CAS No.

Purity (%) Neat Material Lot No.

Concentration



Certified By: _____

Kayla Coleman

Manufacture Date 2-Oct-2018

Follow all storage requirements, keep tightly closed when not in use, and use good laboratory practices when handling.

This Reference Material was manufactured, produced, and/or certified under a quality management system that is accredited to ISO 17034 and ISO/IEC 17025.

All weights are traceable through N. I. S. T. Test No. 822/264157-00. Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.

The stated uncertainty is the expanded uncertainty with a coverage factor of two to give a 95% confidence level.

Certificate of Analysis

Product Name: 1,2-Dichlorobenzene-d4 Standard

Product Number: STS-210-1

Lot Issue Date: 11-Aug-2020

Lot Number: 0006552847

Expiration Date: 30-Sep-2024

Description:

This analytical reference material (RM) was manufactured and verified in accordance with an ISO 9001 registered quality system, and analyte concentrations were verified by an ISO 17025 accredited laboratory. The concentration and uncertainty value at the 95% confidence level for each analyte, determined gravimetrically, is listed below.

Analyte	CAS#	Analyte Lot	Concentration ± Uncertainty
1,2-dichlorobenzene-d4	002199-69-1	RM11038	2002 ± 10 µg/mL

Matrix: methanol (methyl alcohol)

Storage Conditions: Store Frozen (-25° to -10°C).

Traceability:

The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCCL Z540.3, ISO 9001, ISO 17025, and ISO 17034. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 1088.

Homogeneity:

This RM was unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

Intended Use:

This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods, and continuing calibration verification.

Instructions for Use:

Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening the container and should be processed without delay for the certified values to be valid within the stated uncertainties.

Hazards:

Refer to the Safety Data Sheet on www.agilent.com for information regarding this RM.

Expiration of Certification:

The certification of this RM is valid until the expiration date specified above, provided the RM is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the RM is damaged, contaminated, or otherwise modified.

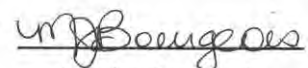
Maintenance of Certification:

If substantive changes are noted that affect the certification before the expiration of this certificate, Agilent will notify the purchaser.

J007623

d4 1,2 Dichlorobenzene Stock
Expires 9/30/2024
Prepared By Paul Campbell 7/23/2021

Sample lot approver:


Monica Bourgeois
QMS Representative



ISO 17034 Cert
No. AR-1936

RM was produced in accordance with TUV USA Inc registered ISO 9001 Quality Management System. Cert # 56 100 18560026

Page: 1 of 1

www.agilent.com/quality/



ISO 17025 Cert
No. AT-1937



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ISO 17025 Accredited Chemical Testing Lab
 Cert. No. 3031.01

Date Received: _____

Certificate of Analysis

Rev 0

Page 1 of 1

Catalog No.: 120002-01 **Lot No.:** 456477 **Storage:** -18°C +/- 4°C
 -5PAK **Solvent:** P/T Methanol **Exp. Date:** 22-Jul-2026 **Description:** 8260B Surrogate Solution, 2,000 mg/L, 5 x 1 ml

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
4-bromofluorobenzene (BFB)	460-00-4	99.5	135.7.1P	1982 ± 25.4 mg/L
dibromofluoromethane	1868-53-7	99	136.290.3P	2008 ± 28.96 mg/L
1,2-dichloroethane-d4	17060-07-0	99.8	138.120.2P	1992 ± 25.6 mg/L
toluene-d ₈	2037-26-5	100	137.12.4P	2003 ± 25.74 mg/L

J008077
 8260B Surrogate Solution
 Expires 7/22/2026
 Prepared By Paul Campbell 8/5/2021

Certified By: _____

Jared Ball

Manufacture Date 23-Jul-2021

Follow all storage requirements, keep tightly closed when not in use, and use good laboratory practices when handling. This Reference Material was manufactured, produced, and/or certified under a quality management system that is accredited to ISO 17034 and ISO/IEC 17025.

All weights are traceable through N. I. S. T. Test No. 822/264157-00. Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.

The stated uncertainty is the expanded uncertainty with a coverage factor of two to give a 95% confidence level.



Form I
ORGANIC ANALYSIS DATA SHEET
EPA 8260D
Volatile Organic Compounds

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-01 H

SDG: 2110294

Sampled: 09/20/21 10:10

Prepared: 09/22/21 08:41

File ID: V209222134.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/22/21 18:32

Batch: BJI0605

Sequence: SJI0363

Initial/Final: 0.1 mL / 10 ml

Instrument: NT2

Column: RTX-VMS

Calibration: EI00012

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
71-43-2	Benzene	1	4890		5.31	20.0
91-20-3	Naphthalene	1	4170		27.4	50.0

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
1,2-Dichloroethane-d4	5.0000	5.67	113	80 - 129	
Toluene-d8	5.0000	5.02	100	80 - 120	
4-Bromofluorobenzene	5.0000	4.79	95.7	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	5.18	104	80 - 120	



Form I
ORGANIC ANALYSIS DATA SHEET
EPA 8260D
Volatile Organic Compounds

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-03 H

SDG: 2110294

Sampled: 09/20/21 11:11

Prepared: 09/22/21 08:41

File ID: V209222135.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/22/21 18:55

Batch: BJI0605

Sequence: SJI0363

Initial/Final: 1 mL / 10 ml

Instrument: NT2

Column: RTX-VMS

Calibration: EI00012

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
71-43-2	Benzene	1	152		0.53	2.00
91-20-3	Naphthalene	1	2280	E	2.74	5.00

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
1,2-Dichloroethane-d4	5.0000	5.53	111	80 - 129	
Toluene-d8	5.0000	4.97	99.5	80 - 120	
4-Bromofluorobenzene	5.0000	4.95	98.9	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	5.01	100	80 - 120	



Form I
ORGANIC ANALYSIS DATA SHEET
EPA 8260D
Volatile Organic Compounds

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-03RE11

SDG: 2110294

Sampled: 09/20/21 11:11

Prepared: 09/23/21 10:15

File ID: V309232117.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/23/21 16:29

Batch: BJI0674

Sequence: SJI0371

Initial/Final: 0.05 mL / 10 ml

Instrument: NT3

Column: RTX-VMS

Calibration: EI00035

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
71-43-2	Benzene	1	101		10.6	40.0
91-20-3	Naphthalene	1	3720		54.7	100

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
1,2-Dichloroethane-d4	5.0000	4.59	91.8	80 - 129	
Toluene-d8	5.0000	4.98	99.6	80 - 120	
4-Bromofluorobenzene	5.0000	4.89	97.9	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	4.94	98.8	80 - 120	



Form I
ORGANIC ANALYSIS DATA SHEET
EPA 8260D
Volatile Organic Compounds

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-05 K

SDG: 2110294

Sampled: 09/20/21 11:30

Prepared: 09/24/21 12:54

File ID: V309242120.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/24/21 18:02

Batch: BJI0716

Sequence: SJI0440

Initial/Final: 10 mL / 10 ml

Instrument: NT3

Column: RTX-VMS

Calibration: EI00035

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
71-43-2	Benzene	1	0.07	J	0.05	0.20
91-20-3	Naphthalene	1	0.50	U	0.27	0.50

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
1,2-Dichloroethane-d4	5.0000	5.26	105	80 - 129	
Toluene-d8	5.0000	5.08	102	80 - 120	
4-Bromofluorobenzene	5.0000	5.13	103	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	5.13	103	80 - 120	



Form I
ORGANIC ANALYSIS DATA SHEET
EPA 8260D
Volatile Organic Compounds

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-07 H

SDG: 2110294

Sampled: 09/20/21 12:29

Prepared: 09/24/21 12:54

File ID: V309242121.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/24/21 18:28

Batch: BJI0716

Sequence: SJI0440

Initial/Final: 10 mL / 10 ml

Instrument: NT3

Column: RTX-VMS

Calibration: EI00035

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
71-43-2	Benzene	1	0.20	U	0.05	0.20
91-20-3	Naphthalene	1	0.50	U	0.27	0.50

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
1,2-Dichloroethane-d4	5.0000	5.80	116	80 - 129	
Toluene-d8	5.0000	4.74	94.8	80 - 120	
4-Bromofluorobenzene	5.0000	5.10	102	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	4.92	98.5	80 - 120	



Form I
ORGANIC ANALYSIS DATA SHEET
EPA 8260D
Volatile Organic Compounds

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-09 J

SDG: 2110294

Sampled: 09/20/21 12:35

Prepared: 09/24/21 12:54

File ID: V309242122.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/24/21 18:53

Batch: BJI0716

Sequence: SJI0440

Initial/Final: 10 mL / 10 ml

Instrument: NT3

Column: RTX-VMS

Calibration: EI00035

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
71-43-2	Benzene	1	0.20	U	0.05	0.20
91-20-3	Naphthalene	1	0.50	U	0.27	0.50

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
1,2-Dichloroethane-d4	5.0000	5.47	109	80 - 129	
Toluene-d8	5.0000	4.86	97.2	80 - 120	
4-Bromofluorobenzene	5.0000	5.12	102	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	5.15	103	80 - 120	



Form I
ORGANIC ANALYSIS DATA SHEET
EPA 8260D
Volatile Organic Compounds

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-11 H

SDG: 2110294

Sampled: 09/20/21 13:54

Prepared: 09/24/21 12:54

File ID: V309242123.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/24/21 19:19

Batch: BJI0716

Sequence: SJI0440

Initial/Final: 10 mL / 10 ml

Instrument: NT3

Column: RTX-VMS

Calibration: EI00035

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
71-43-2	Benzene	1	0.20	U	0.05	0.20
91-20-3	Naphthalene	1	0.50	U	0.27	0.50

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
1,2-Dichloroethane-d4	5.0000	5.55	111	80 - 129	
Toluene-d8	5.0000	4.78	95.6	80 - 120	
4-Bromofluorobenzene	5.0000	5.07	101	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	4.99	99.8	80 - 120	



Form I
ORGANIC ANALYSIS DATA SHEET
EPA 8260D
Volatile Organic Compounds

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-13 A

SDG: 2110294

Sampled: 09/20/21 10:10

Prepared: 09/22/21 08:41

File ID: V209222109.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/22/21 09:50

Batch: BJI0605

Sequence: SJI0363

Initial/Final: 10 mL / 10 ml

Instrument: NT2

Column: RTX-VMS

Calibration: EI00012

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
71-43-2	Benzene	1	0.20	U	0.05	0.20
91-20-3	Naphthalene	1	0.50	U	0.27	0.50

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
1,2-Dichloroethane-d4	5.0000	5.99	120	80 - 129	
Toluene-d8	5.0000	4.89	97.8	80 - 120	
4-Bromofluorobenzene	5.0000	4.42	88.4	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	5.13	103	80 - 120	



Form I
ORGANIC ANALYSIS DATA SHEET
EPA 8260D
Volatile Organic Compounds

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-14 A

SDG: 2110294

Sampled: 09/20/21 10:10

Prepared: 09/24/21 12:54

File ID: V309242111.D

% Solids:

Preparation: EPA 5030C (Purge and Trap)

Analyzed: 09/24/21 14:02

Batch: BJI0716

Sequence: SJI0440

Initial/Final: 10 mL / 10 ml

Instrument: NT3

Column: RTX-VMS

Calibration: EI00035

CAS NO.	COMPOUND	DILUTION	(ug/L)	Q	DL	RL
71-43-2	Benzene	1	0.20	U	0.05	0.20
91-20-3	Naphthalene	1	0.50	U	0.27	0.50

SURROGATES	ADDED:(ug/L)	(ug/L)	% REC	QC LIMITS	Q
1,2-Dichloroethane-d4	5.0000	5.06	101	80 - 129	
Toluene-d8	5.0000	4.95	99.0	80 - 120	
4-Bromofluorobenzene	5.0000	5.16	103	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	4.74	94.7	80 - 120	



PREPARATION BATCH SUMMARY

EPA 8260D

Laboratory: Analytical Resources, LLC SDG: 21I0294
Client: GeoEngineers Project: South State Street PRDI
Batch: BJI0605 Batch Matrix: Water Preparation: EPA 5030C (Purge and Trap)

SAMPLE NAME	LAB SAMPLE ID	LAB FILE ID	DATE PREPARED	OBSERVATIONS
MW-28_092021	21I0294-01	V209222134.D	09/22/21 08:41	Check Version
MW-24_092021	21I0294-03	V209222135.D	09/22/21 08:41	Check Version
TB-1_092021	21I0294-13	V209222109.D	09/22/21 08:41	Check Version
Blank	BJI0605-BLK2	V209222108.D	09/22/21 09:29	
LCS	BJI0605-BS2	V209222104LCS.D	09/22/21 08:08	
LCS Dup	BJI0605-BSD2	V209222106.D	09/22/21 08:48	



Form I
METHOD BLANK DATA SHEET
EPA 8260D

Blank

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Laboratory ID:	<u>BJI0605-BLK2</u>
Sampled:	<u>N/A</u>	Prepared:	<u>09/22/21 09:29</u>
Solids:		Preparation:	<u>EPA 5030C (Purge and Trap)</u>
Batch:	<u>BJI0605</u>	Sequence:	<u>SJI0363</u>
Instrument:	<u>NT2</u>	Column:	<u>RTX-VMS</u>
		File ID:	<u>V209222108.D</u>
		Analyzed:	<u>09/22/21 09:29</u>
		Initial/Final:	<u>10 mL / 10 ml</u>
		Calibration:	<u>EI00012</u>

CAS NO.	COMPOUND	DILUTION	CONC. (ug/L)	Q	DL	RL
71-43-2	Benzene	1	0.20	U	0.05	0.20
91-20-3	Naphthalene	1	0.50	U	0.27	0.50

SURROGATES	ADDED (ug/L)	CONC. (ug/L)	% REC	QC LIMITS	Q
1,2-Dichloroethane-d4	5.0000	5.93	119	80 - 129	
Toluene-d8	5.0000	4.99	99.9	80 - 120	
4-Bromofluorobenzene	5.0000	4.52	90.4	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	5.15	103	80 - 120	



Form I
METHOD BLANK DATA SHEET
EPA 8260D

Blank

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Laboratory ID:	<u>BJI0674-BLK1</u>
Sampled:	<u>N/A</u>	Prepared:	<u>09/23/21 10:15</u>
Solids:		Preparation:	<u>EPA 5030C (Purge and Trap)</u>
Batch:	<u>BJI0674</u>	Sequence:	<u>SJI0371</u>
Instrument:	<u>NT3</u>	Column:	<u>RTX-VMS</u>
		File ID:	<u>V309232110.D</u>
		Analyzed:	<u>09/23/21 13:31</u>
		Initial/Final:	<u>10 mL / 10 ml</u>
		Calibration:	<u>EI00035</u>

CAS NO.	COMPOUND	DILUTION	CONC. (ug/L)	Q	DL	RL
71-43-2	Benzene	1	0.20	U	0.05	0.20
91-20-3	Naphthalene	1	0.50	U	0.27	0.50

SURROGATES	ADDED (ug/L)	CONC. (ug/L)	% REC	QC LIMITS	Q
1,2-Dichloroethane-d4	5.0000	4.89	97.7	80 - 129	
Toluene-d8	5.0000	4.84	96.7	80 - 120	
4-Bromofluorobenzene	5.0000	5.03	101	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	5.03	101	80 - 120	



Form I
METHOD BLANK DATA SHEET
EPA 8260D

Blank

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Laboratory ID:	<u>BJI0716-BLK1</u>
Sampled:	<u>N/A</u>	Prepared:	<u>09/24/21 12:54</u>
Solids:		Preparation:	<u>EPA 5030C (Purge and Trap)</u>
Batch:	<u>BJI0716</u>	Sequence:	<u>SJI0440</u>
Instrument:	<u>NT3</u>	Column:	<u>RTX-VMS</u>
		File ID:	<u>V309242109.D</u>
		Analyzed:	<u>09/24/21 13:12</u>
		Initial/Final:	<u>10 mL / 10 ml</u>
		Calibration:	<u>EI00035</u>

CAS NO.	COMPOUND	DILUTION	CONC. (ug/L)	Q	DL	RL
71-43-2	Benzene	1	0.20	U	0.05	0.20
91-20-3	Naphthalene	1	0.50	U	0.27	0.50

SURROGATES	ADDED (ug/L)	CONC. (ug/L)	% REC	QC LIMITS	Q
1,2-Dichloroethane-d4	5.0000	4.86	97.3	80 - 129	
Toluene-d8	5.0000	4.86	97.3	80 - 120	
4-Bromofluorobenzene	5.0000	5.10	102	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	5.04	101	80 - 120	



LCS / LCS DUPLICATE RECOVERY
EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Analyzed: 09/23/21 11:48

Batch: BJI0674

Laboratory ID: BJI0674-BS1

Preparation: EPA 5030C (Purge and Trap)

Sequence Name: LCS

Initial/Final: 10 mL / 10 ml

COMPOUND	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	Q	LCS % REC. #	QC LIMITS REC.
Benzene	10.0	9.72		97.2	80 - 120
Naphthalene	10.0	10.0		100	50 - 134

* Indicates values outside of QC limits

COMPOUND	SPIKE ADDED (ug/L)	LCSD CONCENTRATION (ug/L)	Q	LCSD % REC. #	% RPD #	QC LIMITS	
						RPD	REC.
Benzene	10.0	9.52		95.2	2.08	30	80 - 120
Naphthalene	10.0	10.2		102	1.50	30	50 - 134

* Indicates values outside of QC limits



LCS / LCS DUPLICATE RECOVERY
EPA 8260D

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>09/24/21 11:05</u>
Batch:	<u>BJI0716</u>	Laboratory ID:	<u>BJI0716-BS1</u>
Preparation:	<u>EPA 5030C (Purge and Trap)</u>	Sequence Name:	<u>LCS</u>
Initial/Final:	<u>10 mL / 10 ml</u>		

COMPOUND	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	Q	LCS % REC. #	QC LIMITS REC.
Benzene	10.0	9.50		95.0	80 - 120
Naphthalene	10.0	9.29		92.9	50 - 134

* Indicates values outside of QC limits

COMPOUND	SPIKE ADDED (ug/L)	LCSD CONCENTRATION (ug/L)	Q	LCSD % REC. #	% RPD #	QC LIMITS	
						RPD	REC.
Benzene	10.0	9.89		98.9	3.98	30	80 - 120
Naphthalene	10.0	9.96		99.6	7.00	30	50 - 134

* Indicates values outside of QC limits



**MASS SPECTROMETER
INSTRUMENT PERFORMANCE CHECK
EPA 8260D**

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Lab File ID: V209022102.D

Injection Date: 09/02/21

Instrument ID: NT2

Injection Time: 06:49

Sequence: SJI0050

Lab Sample ID: SJI0050-TUN1

m/z	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE	
95	50 - 200% of 174	148	PASS
96	5 - 9% of 95	6.44	PASS
173	Less than 2% of 174	0.505	PASS
174	50 - 200% of 95	67.5	PASS
175	5 - 9% of 174	7.42	PASS
176	95 - 105% of 174	95.6	PASS
177	5 - 10% of 176	6.98	PASS

Client Sample ID	Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed
MS Tune	SJI0050-TUN1	V209022102.D	09/02/2021	6:49
Cal Standard	SJI0050-CAL1	V209022103.D	09/02/2021	7:27
Cal Standard	SJI0050-CAL2	V209022104.D	09/02/2021	7:47
Cal Standard	SJI0050-CAL3	V209022105.D	09/02/2021	8:08
Cal Standard	SJI0050-CAL4	V209022106.D	09/02/2021	8:28
Cal Standard	SJI0050-CAL5	V209022107.D	09/02/2021	8:48
Initial Cal Check	SJI0050-ICV1	V209022107ICV.D	09/02/2021	8:48
Cal Standard	SJI0050-CAL6	V209022108.D	09/02/2021	9:09
Cal Standard	SJI0050-CAL7	V209022109.D	09/02/2021	9:29
Cal Standard	SJI0050-CAL8	V209022110.D	09/02/2021	9:50
Initial Cal Blank	SJI0050-ICB1	V209022111.D	09/02/2021	10:10
Secondary Cal Check	SJI0050-SCV1	V209022112.D	09/02/2021	10:31
LCS	BJI0078-BS1	V209022122.D	09/02/2021	13:58
LCS Dup	BJI0078-BSD1	V209022123.D	09/02/2021	14:18
Blank	BJI0078-BLK1	V209022125.D	09/02/2021	14:59
ZZZZZ	21H0351-17	V209022126.D	09/02/2021	15:20
ZZZZZ	21H0351-02	V209022127.D	09/02/2021	15:41
ZZZZZ	21H0351-05	V209022128.D	09/02/2021	16:01
ZZZZZ	21H0351-06	V209022129.D	09/02/2021	16:24
ZZZZZ	21H0351-07	V209022130.D	09/02/2021	16:44
ZZZZZ	21H0351-09	V209022132.D	09/02/2021	17:28
ZZZZZ	21H0351-10	V209022133.D	09/02/2021	17:52
ZZZZZ	21H0351-11	V209022134.D	09/02/2021	18:12
ZZZZZ	21H0351-12	V209022135.D	09/02/2021	18:33
Calibration Check	SJI0050-CCV1	V209022136.D	09/02/2021	18:53



**MASS SPECTROMETER
INSTRUMENT PERFORMANCE CHECK
EPA 8260D**

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Lab File ID: V309082108.D
Instrument ID: NT3
Sequence: SJI0159

SDG: 21I0294
Project: South State Street PRDI
Injection Date: 09/08/21
Injection Time: 12:24
Lab Sample ID: SJI0159-TUN1

m/z	ION ABUNDANCE CRITERIA	% RELATIVE ABUNDANCE	
95	50 - 200% of 174	121	PASS
96	5 - 9% of 95	6.33	PASS
173	Less than 2% of 174	0.588	PASS
174	50 - 200% of 95	82.4	PASS
175	5 - 9% of 174	6.94	PASS
176	95 - 105% of 174	98.7	PASS
177	5 - 10% of 176	6.45	PASS

Client Sample ID	Lab Sample ID	Lab File ID	Date Analyzed	Time Analyzed
MS Tune	SJI0159-TUN1	V309082108.D	09/08/2021	12:24
Cal Standard	SJI0159-CAL1	V309082109.D	09/08/2021	12:49
Cal Standard	SJI0159-CAL2	V309082110.D	09/08/2021	13:15
Cal Standard	SJI0159-CAL3	V309082111.D	09/08/2021	13:40
Cal Standard	SJI0159-CAL4	V309082112.D	09/08/2021	14:05
Cal Standard	SJI0159-CAL5	V309082113.D	09/08/2021	14:30
Initial Cal Check	SJI0159-ICV1	V309082113A.D	09/08/2021	14:30
Cal Standard	SJI0159-CAL6	V309082114.D	09/08/2021	14:55
Cal Standard	SJI0159-CAL7	V309082115.D	09/08/2021	15:21
Cal Standard	SJI0159-CAL8	V309082116.D	09/08/2021	15:46
Initial Cal Blank	SJI0159-ICB1	V309082117.D	09/08/2021	16:11
Secondary Cal Check	SJI0159-SCV1	V309082118.D	09/08/2021	16:36
LCS	BJI0246-BS1	V309082119.D	09/08/2021	17:02
LCS Dup	BJI0246-BSD1	V309082120.D	09/08/2021	17:27
Blank	BJI0246-BLK1	V309082122.D	09/08/2021	18:17
ZZZZZ	21H0389-01	V309082127.D	09/08/2021	20:30
ZZZZZ	21H0389-02	V309082128.D	09/08/2021	20:56
ZZZZZ	21I0068-01	V309082129.D	09/08/2021	21:21
ZZZZZ	21I0068-02	V309082130.D	09/08/2021	21:47
ZZZZZ	21I0068-03	V309082131.D	09/08/2021	22:12
ZZZZZ	21I0068-04	V309082132.D	09/08/2021	22:38
ZZZZZ	21I0068-05	V309082133.D	09/08/2021	23:03
ZZZZZ	21I0068-06	V309082134.D	09/08/2021	23:29
ZZZZZ	21I0085-01	V309082135.D	09/08/2021	23:54
ZZZZZ	21I0085-02	V309082136.D	09/09/2021	0:20
ZZZZZ	21I0085-03	V309082137.D	09/09/2021	0:46



INITIAL CALIBRATION DATA
EPA 8260D

Laboratory:	Analytical Resources, LLC	SDG:	21I0294
Client:	GeoEngineers	Project:	South State Street PRDI
Calibration:	EI00012	Instrument:	NT2
Calibration Date:	09/03/2021	Column (1):	RTX-VMS

Compound	Level 07		Level 08		Level 09		Level 10		Level 11		Level 12	
		RRF		RRF		RRF		RRF		RRF		RRF
Benzene	40	1.198295	80	1.022787								
Naphthalene	40	1.692089	80	1.580629								
1,2-Dichloroethane-d4	5	0.2635331	5	0.2675552								
Toluene-d8	5	1.089567	5	1.103335								
4-Bromofluorobenzene	5	0.3647268	5	0.3779337								
1,2-Dichlorobenzene-d4	5	0.874189	5	0.8643598								



INITIAL CALIBRATION DATA EPA 8260D

Laboratory:	Analytical Resources, LLC	SDG:	21I0294
Client:	GeoEngineers	Project:	South State Street PRDI
Calibration:	EI00012	Instrument:	NT2
Calibration Date:	09/03/2021	Column (1):	RTX-VMS

COMPOUND	Mean RRF	RRF RSD	Linear COD	Quad COD	Limit Type & Limit	Q
Benzene	1.195969	7.0			RSD (15)	
Naphthalene	1.120994	44.7	0.9971		LCOD (0.99)	
1,2-Dichloroethane-d4	0.2575254	2.3			RSD (15)	
Toluene-d8	1.082016	1.0			RSD (15)	
4-Bromofluorobenzene	0.3517071	4.7			RSD (15)	
1,2-Dichlorobenzene-d4	0.8951168	2.2			RSD (15)	



SECOND-SOURCE CALIBRATION VERIFICATION

EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EI00012

Laboratory ID: SJI0050-SCV1

Sequence: SJI0050

Standard ID: J009499

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Benzene	10.000	11.1	11.3	20.00
Naphthalene	10.000	10.4	4.4	20.00
1,2-Dichloroethane-d4	5.0000	6.23	24.6 *	20.00
Toluene-d8	5.0000	5.04	0.8	20.00
4-Bromofluorobenzene	5.0000	5.01	0.3	20.00
1,2-Dichlorobenzene-d4	5.0000	4.95	-1.1	20.00

* Values outside of QC limits



SECOND-SOURCE CALIBRATION VERIFICATION

EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EI00035

Laboratory ID: SJI0159-SCV1

Sequence: SJI0159

Standard ID: J009499

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Benzene	10.000	9.42	-5.8	20.00
Naphthalene	10.000	10.6	5.9	20.00
1,2-Dichloroethane-d4	5.0000	4.77	-4.6	20.00
Toluene-d8	5.0000	4.99	-0.1	20.00
4-Bromofluorobenzene	5.0000	5.06	1.1	20.00
1,2-Dichlorobenzene-d4	5.0000	5.02	0.3	20.00

* Values outside of QC limits



CONTINUING CALIBRATION CHECK
EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: NT2

Calibration: EI00012

Lab File ID: V209022136.D

Calibration Date: 09/03/2021

Sequence: SJI0050

Injection Date: 09/02/21

Lab Sample ID: SJI0050-CCV1

Injection Time: 18:53

Sequence Name: CCV

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR (RRF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Benzene	A	10.000	10.5	1.1959690	1.2503000	0.5	4.5	+/-50
Naphthalene	A	10.000	8.86	1.1209940	1.4121560		-11.4	+/-50
1,2-Dichloroethane-d4	A	5.0000	5.30	0.2575254	0.2728012		5.9	+/-50
Toluene-d8	A	5.0000	5.05	1.0820160	1.0920500		0.9	+/-50
4-Bromofluorobenzene	A	5.0000	5.04	0.3517071	0.3545772		0.8	+/-50
1,2-Dichlorobenzene-d4	A	5.0000	5.08	0.8951168	0.9091048		1.6	+/-50

* Values outside of QC limits

* Values outside of QC limits



**SECOND-SOURCE
CONTINUING CALIBRATION CHECK
EPA 8260D**

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: NT2

Calibration: EI00012

Lab File ID: V209022112.D

Calibration Date: 09/03/2021

Sequence: SJI0050

Injection Date: 09/02/21

Lab Sample ID: SJI0050-SCV1

Injection Time: 10:31

Sequence Name: SCV

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR (RRF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Benzene	A	10.000	11.1	1.1959690	1.3316310	0.5	11.3	+/-20
Naphthalene	A	10.000	10.4	1.1209940	1.6649200		4.4	+/-20
1,2-Dichloroethane-d4	A	5.0000	6.23	0.2575254	0.3207978		24.6	+/-20 *
Toluene-d8	A	5.0000	5.04	1.0820160	1.0902260		0.8	+/-20
4-Bromofluorobenzene	A	5.0000	5.01	0.3517071	0.3527152		0.3	+/-20
1,2-Dichlorobenzene-d4	A	5.0000	4.95	0.8951168	0.8855555		-1.1	+/-20

* Values outside of QC limits



**SECOND-SOURCE
CONTINUING CALIBRATION CHECK
EPA 8260D**

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: NT3

Calibration: EI00035

Lab File ID: V309082118.D

Calibration Date: 09/08/2021

Sequence: SJI0159

Injection Date: 09/08/21

Lab Sample ID: SJI0159-SCV1

Injection Time: 16:36

Sequence Name: SCV

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR (RRF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Benzene	A	10.000	9.42	1.5608550	1.4710300	0.5	-5.8	+/-20
Naphthalene	A	10.000	10.6	2.0329140	2.1532930		5.9	+/-20
1,2-Dichloroethane-d4	A	5.0000	4.77	0.2752774	0.2626291		-4.6	+/-20
Toluene-d8	A	5.0000	4.99	1.1539230	1.1522480		-0.1	+/-20
4-Bromofluorobenzene	A	5.0000	5.06	0.3964982	0.4009671		1.1	+/-20
1,2-Dichlorobenzene-d4	A	5.0000	5.02	0.8716693	0.8746165		0.3	+/-20

* Values outside of QC limits



CONTINUING CALIBRATION CHECK
EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: NT2

Calibration: EI00012

Lab File ID: V209222138.D

Calibration Date: 09/03/2021

Sequence: SJI0363

Injection Date: 09/22/21

Lab Sample ID: SJI0363-CCV1

Injection Time: 20:00

Sequence Name: CCV

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR (RRF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Benzene	A	10.000	11.4	1.1959690	1.3684810	0.5	14.4	+/-50
Naphthalene	A	10.000	12.4	1.1209940	1.9752220		23.9	+/-50
1,2-Dichloroethane-d4	A	5.0000	5.67	0.2575254	0.2922389		13.5	+/-50
Toluene-d8	A	5.0000	5.10	1.0820160	1.1038750		2.0	+/-50
4-Bromofluorobenzene	A	5.0000	5.04	0.3517071	0.3548540		0.9	+/-50
1,2-Dichlorobenzene-d4	A	5.0000	5.02	0.8951168	0.8995611		0.5	+/-50

* Values outside of QC limits



CONTINUING CALIBRATION CHECK
EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: NT3

Calibration: EI00035

Lab File ID: V309232130.D

Calibration Date: 09/08/2021

Sequence: SJI0371

Injection Date: 09/23/21

Lab Sample ID: SJI0371-CCV1

Injection Time: 22:01

Sequence Name: CCV

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR (RRF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Benzene	A	10.000	9.40	1.5608550	1.4665340	0.5	-6.0	+/-50
Naphthalene	A	10.000	8.77	2.0329140	1.7824180		-12.3	+/-50
1,2-Dichloroethane-d4	A	5.0000	4.86	0.2752774	0.2677263		-2.7	+/-50
Toluene-d8	A	5.0000	4.96	1.1539230	1.1448620		-0.8	+/-50
4-Bromofluorobenzene	A	5.0000	4.85	0.3964982	0.3846741		-3.0	+/-50
1,2-Dichlorobenzene-d4	A	5.0000	4.96	0.8716693	0.8639332		-0.9	+/-50

* Values outside of QC limits

* Values outside of QC limits



**LOW-CONCENTRATION
CONTINUING CALIBRATION CHECK
EPA 8260D**

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: NT3

Calibration: EI00035

Lab File ID: V309232108.D

Calibration Date: 09/08/2021

Sequence: SJI0371

Injection Date: 09/23/21

Lab Sample ID: SJI0371-LCV1

Injection Time: 12:40

Sequence Name: VOA 0.2

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR (RRF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Benzene	A	0.20000	0.19	1.5608550	1.4909560	0.5	-4.5	
Naphthalene	A	0.20000	0.44	2.0329140	4.5176470		122	*
1,2-Dichloroethane-d4	A	5.0000	4.45	0.2752774	0.2450819		-11.0	
Toluene-d8	A	5.0000	4.85	1.1539230	1.1197800		-3.0	
4-Bromofluorobenzene	A	5.0000	5.10	0.3964982	0.4045148		2.0	
1,2-Dichlorobenzene-d4	A	5.0000	4.99	0.8716693	0.8705862		-0.1	

* Values outside of QC limits



**LOW-CONCENTRATION
CONTINUING CALIBRATION CHECK
EPA 8260D**

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: NT3

Calibration: EI00035

Lab File ID: V309232109.D

Calibration Date: 09/08/2021

Sequence: SJI0371

Injection Date: 09/23/21

Lab Sample ID: SJI0371-LCV2

Injection Time: 13:06

Sequence Name: VOA 1.0

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR (RRF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Benzene	A	1.0000	0.90	1.5608550	1.4033670	0.5	-10.1	
Naphthalene	A	1.0000	0.88	2.0329140	1.7864540		-12.1	
1,2-Dichloroethane-d4	A	5.0000	4.61	0.2752774	0.2539516		-7.7	
Toluene-d8	A	5.0000	4.93	1.1539230	1.1378890		-1.4	
4-Bromofluorobenzene	A	5.0000	5.07	0.3964982	0.4018497		1.3	
1,2-Dichlorobenzene-d4	A	5.0000	5.05	0.8716693	0.8801621		1.0	

* Values outside of QC limits



**LOW-CONCENTRATION
CONTINUING CALIBRATION CHECK
EPA 8260D**

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: NT3

Calibration: EI00035

Lab File ID: V309242108.D

Calibration Date: 09/08/2021

Sequence: SJI0440

Injection Date: 09/24/21

Lab Sample ID: SJI0440-LCV1

Injection Time: 12:46

Sequence Name: VOA 1.0

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR (RRF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Benzene	A	1.0000	0.88	1.5608550	1.3658150	0.5	-12.5	
Naphthalene	A	1.0000	0.89	2.0329140	1.8190720		-10.5	
1,2-Dichloroethane-d4	A	5.0000	4.67	0.2752774	0.2569657		-6.7	
Toluene-d8	A	5.0000	4.90	1.1539230	1.1314470		-1.9	
4-Bromofluorobenzene	A	5.0000	4.89	0.3964982	0.3876883		-2.2	
1,2-Dichlorobenzene-d4	A	5.0000	4.96	0.8716693	0.8653654		-0.7	

* Values outside of QC limits



INITIAL CALIBRATION CHECK EPA 8260D

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>21I0294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>NT2</u>	Calibration: <u>EI00012</u>
Lab File ID: <u>V209022107ICV.D</u>	Calibration Date: <u>09/03/2021</u>
Sequence: <u>SJI0050</u>	Injection Date: <u>09/02/21</u>
Lab Sample ID: <u>SJI0050-ICV1</u>	Injection Time: <u>08:48</u>
Sequence Name: <u>VOA 10</u>	

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR			% DRIFT/DIFF	
		STD	ICV	ICAL	ICV	MIN	ICV	LIMIT
Benzene	A	10.000	9.75	1.1959690	1.1655190	0.5	-2.6	+/-20
Naphthalene	A	10.000	8.12	1.1209940	1.2945050		-18.8	+/-20
1,2-Dichloroethane-d4	A	5.0000	4.97	0.2575254	0.2559784		-0.6	+/-20
Toluene-d8	A	5.0000	4.94	1.0820160	1.0695150		-1.2	+/-20
4-Bromofluorobenzene	A	5.0000	5.04	0.3517071	0.3546495		0.8	+/-20
1,2-Dichlorobenzene-d4	A	5.0000	5.08	0.8951168	0.9096058		1.6	+/-20
Chlorobenzene-d5	A	10.000	10.0	40978.1000	1.0000			

* Values outside of QC limits



INITIAL CALIBRATION CHECK
EPA 8260D

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Instrument ID:	<u>NT3</u>	Calibration:	<u>EI00035</u>
Lab File ID:	<u>V309082113A.D</u>	Calibration Date:	<u>09/08/2021</u>
Sequence:	<u>SJI0159</u>	Injection Date:	<u>09/08/21</u>
Lab Sample ID:	<u>SJI0159-ICV1</u>	Injection Time:	<u>14:30</u>
Sequence Name:	<u>VOA 10</u>		

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR			% DRIFT/DIFF	
		STD	ICV	ICAL	ICV	MIN	ICV	LIMIT
Benzene	A	10.000	9.46	1.5608550	1.4762390	0.5	-5.4	+/-20
Naphthalene	A	10.000	9.93	2.0329140	2.0189370		-0.7	+/-20
1,2-Dichloroethane-d4	A	5.0000	5.07	0.2752774	0.2791007		1.4	+/-20
Toluene-d8	A	5.0000	4.93	1.1539230	1.1387680		-1.3	+/-20
4-Bromofluorobenzene	A	5.0000	4.96	0.3964982	0.3933258		-0.8	+/-20
1,2-Dichlorobenzene-d4	A	5.0000	5.04	0.8716693	0.8777888		0.7	+/-20

* Values outside of QC limits



INITIAL CALIBRATION CHECK

EPA 8260D

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>2110294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>NT2</u>	Calibration: <u>EI00012</u>
Lab File ID: <u>V209222104.D</u>	Calibration Date: <u>09/03/2021</u>
Sequence: <u>SJI0363</u>	Injection Date: <u>09/22/21</u>
Lab Sample ID: <u>SJI0363-ICV1</u>	Injection Time: <u>08:08</u>
Sequence Name: <u>VOA 10</u>	

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR			% DRIFT/DIFF	
		STD	ICV	ICAL	ICV	MIN	ICV	LIMIT
Benzene	A	10.000	11.2	1.1959690	1.3452860	0.5	12.5	+/-20
Naphthalene	A	10.000	8.20	1.1209940	1.3066560		-18.0	+/-20
1,2-Dichloroethane-d4	A	5.0000	5.67	0.2575254	0.2918448		13.3	+/-20
Toluene-d8	A	5.0000	5.22	1.0820160	1.1299370		4.4	+/-20
4-Bromofluorobenzene	A	5.0000	4.97	0.3517071	0.3492719		-0.7	+/-20
1,2-Dichlorobenzene-d4	A	5.0000	4.93	0.8951168	0.8823029		-1.4	+/-20
Chlorobenzene-d5	A	10.000	10.0	40978.1000	1.0000			

* Values outside of QC limits



INITIAL CALIBRATION CHECK

EPA 8260D

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>21I0294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>NT3</u>	Calibration: <u>EI00035</u>
Lab File ID: <u>V309232106.D</u>	Calibration Date: <u>09/08/2021</u>
Sequence: <u>SJI0371</u>	Injection Date: <u>09/23/21</u>
Lab Sample ID: <u>SJI0371-ICV1</u>	Injection Time: <u>11:48</u>
Sequence Name: <u>VOA 10</u>	

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR			% DRIFT/DIFF	
		STD	ICV	ICAL	ICV	MIN	ICV	LIMIT
Benzene	A	10.000	9.72	1.5608550	1.5175190	0.5	-2.8	+/-20
Naphthalene	A	10.000	10.0	2.0329140	2.0333800		0.02	+/-20
1,2-Dichloroethane-d4	A	5.0000	4.63	0.2752774	0.2547822		-7.4	+/-20
Toluene-d8	A	5.0000	5.05	1.1539230	1.1663770		1.1	+/-20
4-Bromofluorobenzene	A	5.0000	5.11	0.3964982	0.4049938		2.1	+/-20
1,2-Dichlorobenzene-d4	A	5.0000	5.01	0.8716693	0.8740047		0.3	+/-20

* Values outside of QC limits



INITIAL CALIBRATION CHECK EPA 8260D

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>2110294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>NT3</u>	Calibration: <u>EI00035</u>
Lab File ID: <u>V309242104.D</u>	Calibration Date: <u>09/08/2021</u>
Sequence: <u>SJI0440</u>	Injection Date: <u>09/24/21</u>
Lab Sample ID: <u>SJI0440-ICV1</u>	Injection Time: <u>11:05</u>
Sequence Name: <u>VOA 10</u>	

COMPOUND	TYPE	CONC. (ug/L)		RESPONSE FACTOR			% DRIFT/DIFF	
		STD	ICV	ICAL	ICV	MIN	ICV	LIMIT
Benzene	A	10.000	9.51	1.5608550	1.4835670	0.5	-5.0	+/-20
Naphthalene	A	10.000	9.29	2.0329140	1.8883790		-7.1	+/-20
1,2-Dichloroethane-d4	A	5.0000	4.76	0.2752774	0.2622751		-4.7	+/-20
Toluene-d8	A	5.0000	4.88	1.1539230	1.1251730		-2.5	+/-20
4-Bromofluorobenzene	A	5.0000	5.15	0.3964982	0.4080626		2.9	+/-20
1,2-Dichlorobenzene-d4	A	5.0000	4.78	0.8716693	0.8335455		-4.4	+/-20

* Values outside of QC limits



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0050

Instrument: NT2

Calibration: EI00012

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
MS Tune	SJI0050-TUN1	V209022102.D	NA	09/02/21 06:49
8260D 0.2	SJI0050-CAL1	V209022103.D	NA	09/02/21 07:27
8260D 0.5	SJI0050-CAL2	V209022104.D	NA	09/02/21 07:47
8260D 1.0	SJI0050-CAL3	V209022105.D	NA	09/02/21 08:08
8260D 2.0	SJI0050-CAL4	V209022106.D	NA	09/02/21 08:28
8260D 10	SJI0050-CAL5	V209022107.D	NA	09/02/21 08:48
VOA 10	SJI0050-ICV1	V209022107ICV.D	NA	09/02/21 08:48
8260D 20	SJI0050-CAL6	V209022108.D	NA	09/02/21 09:09
8260D 40	SJI0050-CAL7	V209022109.D	NA	09/02/21 09:29
8260D 80	SJI0050-CAL8	V209022110.D	NA	09/02/21 09:50
Initial Cal Blank	SJI0050-ICB1	V209022111.D	NA	09/02/21 10:10
SCV	SJI0050-SCV1	V209022112.D	NA	09/02/21 10:31
ZZZZZ	BJI0078-BS1	V209022122.D	Water	09/02/21 13:58
ZZZZZ	BJI0078-BSD1	V209022123.D	Water	09/02/21 14:18
ZZZZZ	BJI0078-BLK1	V209022125.D	Water	09/02/21 14:59
ZZZZZ	21H0351-17	V209022126.D	Water	09/02/21 15:20
ZZZZZ	21H0351-02	V209022127.D	Water	09/02/21 15:41
ZZZZZ	21H0351-05	V209022128.D	Water	09/02/21 16:01
ZZZZZ	21H0351-06	V209022129.D	Water	09/02/21 16:24
ZZZZZ	21H0351-07	V209022130.D	Water	09/02/21 16:44
ZZZZZ	21H0351-09	V209022132.D	Water	09/02/21 17:28
ZZZZZ	21H0351-10	V209022133.D	Water	09/02/21 17:52
ZZZZZ	21H0351-11	V209022134.D	Water	09/02/21 18:12
ZZZZZ	21H0351-12	V209022135.D	Water	09/02/21 18:33
CCV	SJI0050-CCV1	V209022136.D	NA	09/02/21 18:53



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0159

Instrument: NT3

Calibration: EI00035

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
MS Tune	SJI0159-TUN1	V309082108.D	NA	09/08/21 12:24
8260D 0.2	SJI0159-CAL1	V309082109.D	NA	09/08/21 12:49
8260D 0.5	SJI0159-CAL2	V309082110.D	NA	09/08/21 13:15
8260D 1.0	SJI0159-CAL3	V309082111.D	NA	09/08/21 13:40
8260D 2.0	SJI0159-CAL4	V309082112.D	NA	09/08/21 14:05
8260D 10	SJI0159-CAL5	V309082113.D	NA	09/08/21 14:30
VOA 10	SJI0159-ICV1	V309082113A.D	NA	09/08/21 14:30
8260D 20	SJI0159-CAL6	V309082114.D	NA	09/08/21 14:55
8260D 40	SJI0159-CAL7	V309082115.D	NA	09/08/21 15:21
8260D 80	SJI0159-CAL8	V309082116.D	NA	09/08/21 15:46
Initial Cal Blank	SJI0159-ICB1	V309082117.D	NA	09/08/21 16:11
SCV	SJI0159-SCV1	V309082118.D	NA	09/08/21 16:36
ZZZZZ	BJI0246-BS1	V309082119.D	Water	09/08/21 17:02
ZZZZZ	BJI0246-BSD1	V309082120.D	Water	09/08/21 17:27
ZZZZZ	BJI0246-BLK1	V309082122.D	Water	09/08/21 18:17
ZZZZZ	21H0389-01	V309082127.D	Water	09/08/21 20:30
ZZZZZ	21H0389-02	V309082128.D	Water	09/08/21 20:56
ZZZZZ	21I0068-01	V309082129.D	Water	09/08/21 21:21
ZZZZZ	21I0068-02	V309082130.D	Water	09/08/21 21:47
ZZZZZ	21I0068-03	V309082131.D	Water	09/08/21 22:12
ZZZZZ	21I0068-04	V309082132.D	Water	09/08/21 22:38
ZZZZZ	21I0068-05	V309082133.D	Water	09/08/21 23:03
ZZZZZ	21I0068-06	V309082134.D	Water	09/08/21 23:29
ZZZZZ	21I0085-01	V309082135.D	Water	09/08/21 23:54
ZZZZZ	21I0085-02	V309082136.D	Water	09/09/21 00:20
ZZZZZ	21I0085-03	V309082137.D	Water	09/09/21 00:46



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0363

Instrument: NT2

Calibration: EI00012

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
MS Tune	SJI0363-TUN1	V209222102.D	NA	09/22/21 07:15
VOA 10	SJI0363-ICV1	V209222104.D	NA	09/22/21 08:08
LCS	BJI0605-BS2	V209222104LCS.D	Water	09/22/21 08:08
LCS Dup	BJI0605-BSD2	V209222106.D	Water	09/22/21 08:48
Blank	BJI0605-BLK2	V209222108.D	Water	09/22/21 09:29
TB-1_092021	21I0294-13	V209222109.D	Water	09/22/21 09:50
ZZZZZ	21I0232-01	V209222110.D	Water	09/22/21 10:10
ZZZZZ	21I0232-02	V209222111.D	Water	09/22/21 10:31
ZZZZZ	21I0242-01	V209222112.D	Water	09/22/21 10:52
ZZZZZ	21I0306-03	V209222121.D	Water	09/22/21 13:59
ZZZZZ	21I0242-03	V209222122.D	Water	09/22/21 14:20
ZZZZZ	21I0270-01	V209222123.D	Water	09/22/21 14:41
ZZZZZ	21I0306-01	V209222124.D	Water	09/22/21 15:02
ZZZZZ	21I0306-02	V209222125.D	Water	09/22/21 15:23
ZZZZZ	21I0295-03	V209222128.D	Water	09/22/21 16:26
ZZZZZ	21I0295-04	V209222129.D	Water	09/22/21 16:47
ZZZZZ	21I0295-05	V209222130.D	Water	09/22/21 17:08
ZZZZZ	21I0295-06	V209222131.D	Water	09/22/21 17:29
ZZZZZ	21I0295-08	V209222132.D	Water	09/22/21 17:50
MW-28_092021	21I0294-01	V209222134.D	Water	09/22/21 18:32
MW-24_092021	21I0294-03	V209222135.D	Water	09/22/21 18:55
CCV	SJI0363-CCV1	V209222138.D	NA	09/22/21 20:00



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0371

Instrument: NT3

Calibration: EI00035

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
MS Tune	SJI0371-TUN1	V309232102.D	NA	09/23/21 09:49
VOA 10	SJI0371-ICV1	V309232106.D	NA	09/23/21 11:48
LCS	BJI0674-BS1	V309232106LCS.D	Water	09/23/21 11:48
LCS Dup	BJI0674-BSD1	V309232107.D	Water	09/23/21 12:13
VOA 0.2	SJI0371-LCV1	V309232108.D	NA	09/23/21 12:40
VOA 1.0	SJI0371-LCV2	V309232109.D	NA	09/23/21 13:06
Blank	BJI0674-BLK1	V309232110.D	Water	09/23/21 13:31
ZZZZZ	21I0317-13	V309232111.D	Water	09/23/21 13:56
ZZZZZ	21I0310-02	V309232112.D	Water	09/23/21 14:21
ZZZZZ	21I0232-03	V309232113.D	Water	09/23/21 14:46
ZZZZZ	21I0304-02	V309232114.D	Water	09/23/21 15:11
ZZZZZ	21I0295-07	V309232115.D	Water	09/23/21 15:37
ZZZZZ	21I0311-01	V309232116.D	Water	09/23/21 16:04
MW-24_092021	21I0294-03RE1	V309232117.D	Water	09/23/21 16:29
ZZZZZ	21I0311-01RE1	V309232118.D	Water	09/23/21 16:54
ZZZZZ	21I0295-09	V309232119.D	Water	09/23/21 17:20
ZZZZZ	21I0317-01	V309232120.D	Water	09/23/21 17:45
ZZZZZ	21I0317-03	V309232121.D	Water	09/23/21 18:10
ZZZZZ	21I0317-05	V309232122.D	Water	09/23/21 18:35
ZZZZZ	21I0317-07	V309232123.D	Water	09/23/21 19:01
ZZZZZ	21I0317-09	V309232124.D	Water	09/23/21 19:26
ZZZZZ	21I0317-11	V309232125.D	Water	09/23/21 19:51
ZZZZZ	21I0310-01	V309232126.D	Water	09/23/21 20:18
ZZZZZ	21I0304-01	V309232127.D	Water	09/23/21 20:44
CCV	SJI0371-CCV1	V309232130.D	NA	09/23/21 22:01



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0440

Instrument: NT3

Calibration: EI00035

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
MS Tune	SJI0440-TUN1	V309242102.D	NA	09/24/21 10:00
VOA 10	SJI0440-ICV1	V309242104.D	NA	09/24/21 11:05
LCS	BJI0716-BS1	V309242104LCS.D	Water	09/24/21 11:05
LCS Dup	BJI0716-BSD1	V309242106.D	Water	09/24/21 11:56
VOA 1.0	SJI0440-LCV1	V309242108.D	NA	09/24/21 12:46
Blank	BJI0716-BLK1	V309242109.D	Water	09/24/21 13:12
ZZZZZ	21I0346-09	V309242110.D	Water	09/24/21 13:37
TB-2_092021	21I0294-14	V309242111.D	Water	09/24/21 14:02
ZZZZZ	21I0346-01	V309242112.D	Water	09/24/21 14:27
ZZZZZ	21I0346-02	V309242113.D	Water	09/24/21 14:55
ZZZZZ	21I0346-03	V309242114.D	Water	09/24/21 15:20
ZZZZZ	21I0346-04	V309242115.D	Water	09/24/21 15:48
ZZZZZ	21I0346-05	V309242116.D	Water	09/24/21 16:14
ZZZZZ	21I0346-06	V309242117.D	Water	09/24/21 16:40
ZZZZZ	21I0346-07	V309242118.D	Water	09/24/21 17:08
ZZZZZ	21I0346-08	V309242119.D	Water	09/24/21 17:36
MW-60_092021	21I0294-05	V309242120.D	Water	09/24/21 18:02
MW-55_092021	21I0294-07	V309242121.D	Water	09/24/21 18:28
MW-42_092021	21I0294-09	V309242122.D	Water	09/24/21 18:53
MW-54_092021	21I0294-11	V309242123.D	Water	09/24/21 19:19
ZZZZZ	21I0335-01	V309242124.D	Water	09/24/21 19:45
ZZZZZ	21I0335-03	V309242125.D	Water	09/24/21 20:10
ZZZZZ	21I0335-05	V309242126.D	Water	09/24/21 20:36



SURROGATE RECOVERY SUMMARY

EPA 8260D

Laboratory: Analytical Resources, LLC

SDG/WO: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0050

Instrument: NT2

Calibration: EI00012

Calibration Date: 09/02/2021

Surrogate Compound	Spike Level ug/L	% Recovery	Recovery Limits	Q
SJI0050-ICV1 (Water) Lab File ID: V209022107ICV.D Analyzed: 09/02/21 08:48				
1,2-Dichloroethane-d4	5.0000	99.4	80 - 120	
Toluene-d8	5.0000	98.8	80 - 120	
4-Bromofluorobenzene	5.0000	101	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	102	80 - 120	
SJI0050-ICB1 (Water) Lab File ID: V209022111.D Analyzed: 09/02/21 10:10				
1,2-Dichloroethane-d4			80 - 129	
Toluene-d8			80 - 120	
4-Bromofluorobenzene			80 - 120	
1,2-Dichlorobenzene-d4			80 - 120	
SJI0050-SCV1 (Water) Lab File ID: V209022112.D Analyzed: 09/02/21 10:31				
1,2-Dichloroethane-d4	5.0000	125	80 - 120	*
Toluene-d8	5.0000	101	80 - 120	
4-Bromofluorobenzene	5.0000	100	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	98.9	80 - 120	
SJI0050-CCV1 (Water) Lab File ID: V209022136.D Analyzed: 09/02/21 18:53				
1,2-Dichloroethane-d4	5.0000	106	50 - 150	
Toluene-d8	5.0000	101	50 - 150	
4-Bromofluorobenzene	5.0000	101	50 - 150	
1,2-Dichlorobenzene-d4	5.0000	102	50 - 150	



SURROGATE RECOVERY SUMMARY EPA 8260D

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Sequence: SJI0159
Calibration: EI00035

SDG/WO: 21I0294
Project: South State Street PRDI
Instrument: NT3
Calibration Date: 09/08/2021

Surrogate Compound	Spike Level ug/L	% Recovery	Recovery Limits	Q
SJI0159-ICV1 (Water) Lab File ID: V309082113A.D Analyzed: 09/08/21 14:30				
1,2-Dichloroethane-d4	5.0000	101	80 - 120	
Toluene-d8	5.0000	98.7	80 - 120	
4-Bromofluorobenzene	5.0000	99.2	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	101	80 - 120	
SJI0159-ICB1 (Water) Lab File ID: V309082117.D Analyzed: 09/08/21 16:11				
1,2-Dichloroethane-d4			80 - 129	
Toluene-d8			80 - 120	
4-Bromofluorobenzene			80 - 120	
1,2-Dichlorobenzene-d4			80 - 120	
SJI0159-SCV1 (Water) Lab File ID: V309082118.D Analyzed: 09/08/21 16:36				
1,2-Dichloroethane-d4	5.0000	95.4	80 - 120	
Toluene-d8	5.0000	99.9	80 - 120	
4-Bromofluorobenzene	5.0000	101	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	100	80 - 120	



SURROGATE RECOVERY SUMMARY
EPA 8260D

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Sequence: SJI0363
Calibration: EI00012

SDG/WO: 21I0294
Project: South State Street PRDI
Instrument: NT2
Calibration Date: 09/02/2021

Surrogate Compound	Spike Level ug/L	% Recovery	Recovery Limits	Q
BJI0605-BS2 (Water) Lab File ID: V209222104LCS.D Analyzed: 09/22/21 08:08				
1,2-Dichloroethane-d4	5.0000	113	80 - 129	
Toluene-d8	5.0000	104	80 - 120	
4-Bromofluorobenzene	5.0000	99.3	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	98.6	80 - 120	
SJI0363-ICV1 (Water) Lab File ID: V209222104.D Analyzed: 09/22/21 08:08				
1,2-Dichloroethane-d4	5.0000	113	80 - 120	
Toluene-d8	5.0000	104	80 - 120	
4-Bromofluorobenzene	5.0000	99.3	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	98.6	80 - 120	
BJI0605-BSD2 (Water) Lab File ID: V209222106.D Analyzed: 09/22/21 08:48				
1,2-Dichloroethane-d4	5.0000	113	80 - 129	
Toluene-d8	5.0000	103	80 - 120	
4-Bromofluorobenzene	5.0000	98.4	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	103	80 - 120	
BJI0605-BLK2 (Water) Lab File ID: V209222108.D Analyzed: 09/22/21 09:29				
1,2-Dichloroethane-d4	5.0000	119	80 - 129	
Toluene-d8	5.0000	99.9	80 - 120	
4-Bromofluorobenzene	5.0000	90.4	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	103	80 - 120	
21I0294-13 (Water) Lab File ID: V209222109.D Analyzed: 09/22/21 09:50				
1,2-Dichloroethane-d4	5.0000	120	80 - 129	
Toluene-d8	5.0000	97.8	80 - 120	
4-Bromofluorobenzene	5.0000	88.4	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	103	80 - 120	
21I0294-01 (Water) Lab File ID: V209222134.D Analyzed: 09/22/21 18:32				
1,2-Dichloroethane-d4	5.0000	113	80 - 129	
Toluene-d8	5.0000	100	80 - 120	
4-Bromofluorobenzene	5.0000	95.7	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	104	80 - 120	



SURROGATE RECOVERY SUMMARY

EPA 8260D

Laboratory: Analytical Resources, LLC

SDG/WO: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0363

Instrument: NT2

Calibration: EI00012

Calibration Date: 09/02/2021

Surrogate Compound	Spike Level ug/L	% Recovery	Recovery Limits	Q
21I0294-03 (Water)				
Lab File ID: V209222135.D		Analyzed: 09/22/21 18:55		
1,2-Dichloroethane-d4	5.0000	111	80 - 129	
Toluene-d8	5.0000	99.5	80 - 120	
4-Bromofluorobenzene	5.0000	98.9	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	100	80 - 120	
SJI0363-CCV1 (Water)				
Lab File ID: V209222138.D		Analyzed: 09/22/21 20:00		
1,2-Dichloroethane-d4	5.0000	113	50 - 150	
Toluene-d8	5.0000	102	50 - 150	
4-Bromofluorobenzene	5.0000	101	50 - 150	
1,2-Dichlorobenzene-d4	5.0000	100	50 - 150	



SURROGATE RECOVERY SUMMARY
EPA 8260D

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Sequence: SJI0371
Calibration: EI00035

SDG/WO: 21I0294
Project: South State Street PRDI
Instrument: NT3
Calibration Date: 09/08/2021

Surrogate Compound	Spike Level ug/L	% Recovery	Recovery Limits	Q
BJI0674-BS1 (Water) Lab File ID: V309232106LCS.D Analyzed: 09/23/21 11:48				
1,2-Dichloroethane-d4	5.0000	92.6	80 - 129	
Toluene-d8	5.0000	101	80 - 120	
4-Bromofluorobenzene	5.0000	102	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	100	80 - 120	
SJI0371-ICV1 (Water) Lab File ID: V309232106.D Analyzed: 09/23/21 11:48				
1,2-Dichloroethane-d4	5.0000	92.6	80 - 120	
Toluene-d8	5.0000	101	80 - 120	
4-Bromofluorobenzene	5.0000	102	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	100	80 - 120	
BJI0674-BSD1 (Water) Lab File ID: V309232107.D Analyzed: 09/23/21 12:13				
1,2-Dichloroethane-d4	5.0000	96.6	80 - 129	
Toluene-d8	5.0000	101	80 - 120	
4-Bromofluorobenzene	5.0000	104	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	101	80 - 120	
SJI0371-LCV1 (Water) Lab File ID: V309232108.D Analyzed: 09/23/21 12:40				
1,2-Dichloroethane-d4	5.0000	89.0	0 - 200	
Toluene-d8	5.0000	97.0	0 - 200	
4-Bromofluorobenzene	5.0000	102	0 - 200	
1,2-Dichlorobenzene-d4	5.0000	99.9	0 - 200	
SJI0371-LCV2 (Water) Lab File ID: V309232109.D Analyzed: 09/23/21 13:06				
1,2-Dichloroethane-d4	5.0000	92.3	0 - 200	
Toluene-d8	5.0000	98.6	0 - 200	
4-Bromofluorobenzene	5.0000	101	0 - 200	
1,2-Dichlorobenzene-d4	5.0000	101	0 - 200	
BJI0674-BLK1 (Water) Lab File ID: V309232110.D Analyzed: 09/23/21 13:31				
1,2-Dichloroethane-d4	5.0000	97.7	80 - 129	
Toluene-d8	5.0000	96.7	80 - 120	
4-Bromofluorobenzene	5.0000	101	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	101	80 - 120	



SURROGATE RECOVERY SUMMARY

EPA 8260D

Laboratory: Analytical Resources, LLC

SDG/WO: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0371

Instrument: NT3

Calibration: EI00035

Calibration Date: 09/08/2021

Surrogate Compound	Spike Level ug/L	% Recovery	Recovery Limits	Q
21I0294-03RE1 (Water)				
Lab File ID: V309232117.D		Analyzed: 09/23/21 16:29		
1,2-Dichloroethane-d4	5.0000	91.8	80 - 129	
Toluene-d8	5.0000	99.6	80 - 120	
4-Bromofluorobenzene	5.0000	97.9	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	98.8	80 - 120	
SJI0371-CCV1 (Water)				
Lab File ID: V309232130.D		Analyzed: 09/23/21 22:01		
1,2-Dichloroethane-d4	5.0000	97.3	50 - 150	
Toluene-d8	5.0000	99.2	50 - 150	
4-Bromofluorobenzene	5.0000	97.0	50 - 150	
1,2-Dichlorobenzene-d4	5.0000	99.1	50 - 150	



SURROGATE RECOVERY SUMMARY

EPA 8260D

Laboratory: Analytical Resources, LLC

SDG/WO: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0440

Instrument: NT3

Calibration: EI00035

Calibration Date: 09/08/2021

Surrogate Compound	Spike Level ug/L	% Recovery	Recovery Limits	Q
BJI0716-BS1 (Water) Lab File ID: V309242104LCS.D Analyzed: 09/24/21 11:05				
1,2-Dichloroethane-d4	5.0000	95.3	80 - 129	
Toluene-d8	5.0000	97.5	80 - 120	
4-Bromofluorobenzene	5.0000	103	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	95.6	80 - 120	
SJI0440-ICV1 (Water) Lab File ID: V309242104.D Analyzed: 09/24/21 11:05				
1,2-Dichloroethane-d4	5.0000	95.3	80 - 120	
Toluene-d8	5.0000	97.5	80 - 120	
4-Bromofluorobenzene	5.0000	103	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	95.6	80 - 120	
BJI0716-BSD1 (Water) Lab File ID: V309242106.D Analyzed: 09/24/21 11:56				
1,2-Dichloroethane-d4	5.0000	95.0	80 - 129	
Toluene-d8	5.0000	101	80 - 120	
4-Bromofluorobenzene	5.0000	104	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	98.3	80 - 120	
SJI0440-LCV1 (Water) Lab File ID: V309242108.D Analyzed: 09/24/21 12:46				
1,2-Dichloroethane-d4	5.0000	93.3	0 - 200	
Toluene-d8	5.0000	98.1	0 - 200	
4-Bromofluorobenzene	5.0000	97.8	0 - 200	
1,2-Dichlorobenzene-d4	5.0000	99.3	0 - 200	
BJI0716-BLK1 (Water) Lab File ID: V309242109.D Analyzed: 09/24/21 13:12				
1,2-Dichloroethane-d4	5.0000	97.3	80 - 129	
Toluene-d8	5.0000	97.3	80 - 120	
4-Bromofluorobenzene	5.0000	102	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	101	80 - 120	
21I0294-14 (Water) Lab File ID: V309242111.D Analyzed: 09/24/21 14:02				
1,2-Dichloroethane-d4	5.0000	101	80 - 129	
Toluene-d8	5.0000	99.0	80 - 120	
4-Bromofluorobenzene	5.0000	103	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	94.7	80 - 120	



SURROGATE RECOVERY SUMMARY

EPA 8260D

Laboratory: Analytical Resources, LLC

SDG/WO: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0440

Instrument: NT3

Calibration: EI00035

Calibration Date: 09/08/2021

Surrogate Compound	Spike Level ug/L	% Recovery	Recovery Limits	Q
21I0294-05 (Water) Lab File ID: V309242120.D Analyzed: 09/24/21 18:02				
1,2-Dichloroethane-d4	5.0000	105	80 - 129	
Toluene-d8	5.0000	102	80 - 120	
4-Bromofluorobenzene	5.0000	103	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	103	80 - 120	
21I0294-07 (Water) Lab File ID: V309242121.D Analyzed: 09/24/21 18:28				
1,2-Dichloroethane-d4	5.0000	116	80 - 129	
Toluene-d8	5.0000	94.8	80 - 120	
4-Bromofluorobenzene	5.0000	102	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	98.5	80 - 120	
21I0294-09 (Water) Lab File ID: V309242122.D Analyzed: 09/24/21 18:53				
1,2-Dichloroethane-d4	5.0000	109	80 - 129	
Toluene-d8	5.0000	97.2	80 - 120	
4-Bromofluorobenzene	5.0000	102	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	103	80 - 120	
21I0294-11 (Water) Lab File ID: V309242123.D Analyzed: 09/24/21 19:19				
1,2-Dichloroethane-d4	5.0000	111	80 - 129	
Toluene-d8	5.0000	95.6	80 - 120	
4-Bromofluorobenzene	5.0000	101	80 - 120	
1,2-Dichlorobenzene-d4	5.0000	99.8	80 - 120	



INTERNAL STANDARD AREA AND RT SUMMARY
EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0050

Instrument: NT2

Calibration: EI00012

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
Initial Cal Check (SJI0050-ICV1)		(Water)	Lab File ID: V209022107ICV.D			Analyzed: 09/02/21 08:48			
Pentafluorobenzene	296861	5.278	296861	5.278	100	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	433036	7.729	433036	7.729	100	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	507834	5.667	507834	5.667	100	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	209416	9.419	209416	9.419	100	50 - 200	0.000	+/-0.50	
Initial Cal Blank (SJI0050-ICB1)		(Water)	Lab File ID: V209022111.D			Analyzed: 09/02/21 10:10			
Pentafluorobenzene	278376	5.277	296861	5.278	94	50 - 200	-0.001	+/-0.50	
Chlorobenzene-d5	405193	7.734	433036	7.729	94	50 - 200	0.005	+/-0.50	
1,4-Difluorobenzene	469900	5.666	507834	5.667	93	50 - 200	-0.001	+/-0.50	
1,4-Dichlorobenzene-d4	185228	9.418	209416	9.419	88	50 - 200	-0.001	+/-0.50	
Secondary Cal Check (SJI0050-SCV1)		(Water)	Lab File ID: V209022112.D			Analyzed: 09/02/21 10:31			
Pentafluorobenzene	271361	5.277	296861	5.278	91	50 - 200	-0.001	+/-0.50	
Chlorobenzene-d5	396626	7.733	433036	7.729	92	50 - 200	0.004	+/-0.50	
1,4-Difluorobenzene	457837	5.666	507834	5.667	90	50 - 200	-0.001	+/-0.50	
1,4-Dichlorobenzene-d4	194461	9.418	209416	9.419	93	50 - 200	-0.001	+/-0.50	



INTERNAL STANDARD AREA AND RT SUMMARY

EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0159

Instrument: NT3

Calibration: EI00035

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
Initial Cal Check (SJI0159-ICV1)		(Water)	Lab File ID: V309082113A.D			Analyzed: 09/08/21 14:30			
Pentafluorobenzene	290225	5.133	290225	5.133	100	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	428937	7.573	428937	7.573	100	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	456307	5.521	456307	5.521	100	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	241860	9.258	241860	9.258	100	50 - 200	0.000	+/-0.50	
Initial Cal Blank (SJI0159-ICB1)		(Water)	Lab File ID: V309082117.D			Analyzed: 09/08/21 16:11			
Pentafluorobenzene	289275	5.132	290225	5.133	100	50 - 200	-0.001	+/-0.50	
Chlorobenzene-d5	411279	7.578	428937	7.573	96	50 - 200	0.005	+/-0.50	
1,4-Difluorobenzene	467534	5.52	456307	5.521	102	50 - 200	-0.001	+/-0.50	
1,4-Dichlorobenzene-d4	238318	9.257	241860	9.258	99	50 - 200	-0.001	+/-0.50	
Secondary Cal Check (SJI0159-SCV1)		(Water)	Lab File ID: V309082118.D			Analyzed: 09/08/21 16:36			
Pentafluorobenzene	308732	5.133	290225	5.133	106	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	442555	7.573	428937	7.573	103	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	486194	5.521	456307	5.521	107	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	255863	9.258	241860	9.258	106	50 - 200	0.000	+/-0.50	



INTERNAL STANDARD AREA AND RT SUMMARY EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0363

Instrument: NT2

Calibration: EI00012

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
LCS (BJI0605-BS2)		(Water)	Lab File ID: V209222104LCS.D			Analyzed: 09/22/21 08:08			
Pentafluorobenzene	259919	5.277	259919	5.277	100	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	410431	7.727	410431	7.727	100	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	453473	5.666	453473	5.666	100	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	202044	9.418	202044	9.418	100	50 - 200	0.000	+/-0.50	
Initial Cal Check (SJI0363-ICV1)		(Water)	Lab File ID: V209222104.D			Analyzed: 09/22/21 08:08			
Pentafluorobenzene	259919	5.277	259919	5.277	100	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	410431	7.727	410431	7.727	100	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	453473	5.666	453473	5.666	100	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	202044	9.418	202044	9.418	100	50 - 200	0.000	+/-0.50	
LCS Dup (BJI0605-BSD2)		(Water)	Lab File ID: V209222106.D			Analyzed: 09/22/21 08:48			
Pentafluorobenzene	252458	5.277	259919	5.277	97	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	404983	7.727	410431	7.727	99	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	446436	5.666	453473	5.666	98	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	195916	9.418	202044	9.418	97	50 - 200	0.000	+/-0.50	
Blank (BJI0605-BLK2)		(Water)	Lab File ID: V209222108.D			Analyzed: 09/22/21 09:29			
Pentafluorobenzene	232848	5.278	259919	5.277	90	50 - 200	0.001	+/-0.50	
Chlorobenzene-d5	377515	7.729	410431	7.727	92	50 - 200	0.002	+/-0.50	
1,4-Difluorobenzene	421704	5.667	453473	5.666	93	50 - 200	0.001	+/-0.50	
1,4-Dichlorobenzene-d4	171472	9.419	202044	9.418	85	50 - 200	0.001	+/-0.50	
TB-1_092021 (2110294-13)		(Water)	Lab File ID: V209222109.D			Analyzed: 09/22/21 09:50			
Pentafluorobenzene	224976	5.276	259919	5.277	87	50 - 200	-0.001	+/-0.50	
Chlorobenzene-d5	372218	7.733	410431	7.727	91	50 - 200	0.006	+/-0.50	
1,4-Difluorobenzene	409946	5.666	453473	5.666	90	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	163052	9.424	202044	9.418	81	50 - 200	0.006	+/-0.50	
MW-28_092021 (2110294-01)		(Water)	Lab File ID: V209222134.D			Analyzed: 09/22/21 18:32			
Pentafluorobenzene	258120	5.272	259919	5.277	99	50 - 200	-0.005	+/-0.50	
Chlorobenzene-d5	405739	7.729	410431	7.727	99	50 - 200	0.002	+/-0.50	
1,4-Difluorobenzene	450259	5.667	453473	5.666	99	50 - 200	0.001	+/-0.50	
1,4-Dichlorobenzene-d4	194878	9.419	202044	9.418	96	50 - 200	0.001	+/-0.50	



INTERNAL STANDARD AREA AND RT SUMMARY EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0363

Instrument: NT2

Calibration: EI00012

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
MW-24_092021 (2110294-03)		(Water)	Lab File ID: V209222135.D			Analyzed: 09/22/21 18:55			
Pentafluorobenzene	246515	5.272	259919	5.277	95	50 - 200	-0.005	+/-0.50	
Chlorobenzene-d5	393776	7.729	410431	7.727	96	50 - 200	0.002	+/-0.50	
1,4-Difluorobenzene	429970	5.667	453473	5.666	95	50 - 200	0.001	+/-0.50	
1,4-Dichlorobenzene-d4	200601	9.419	202044	9.418	99	50 - 200	0.001	+/-0.50	



INTERNAL STANDARD AREA AND RT SUMMARY EPA 8260D

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Sequence: SJI0371

SDG: 2110294
Project: South State Street PRDI
Instrument: NT3
Calibration: EI00035

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
LCS (BJI0674-BS1)		(Water)	Lab File ID: V309232106LCS.D			Analyzed: 09/23/21 11:48			
Pentafluorobenzene	303624	5.139	303624	5.139	100	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	433735	7.573	433735	7.573	100	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	464174	5.521	464174	5.521	100	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	256827	9.258	256827	9.258	100	50 - 200	0.000	+/-0.50	
Initial Cal Check (SJI0371-ICV1)		(Water)	Lab File ID: V309232106.D			Analyzed: 09/23/21 11:48			
Pentafluorobenzene	303624	5.139	303624	5.139	100	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	433735	7.573	433735	7.573	100	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	464174	5.521	464174	5.521	100	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	256827	9.258	256827	9.258	100	50 - 200	0.000	+/-0.50	
LCS Dup (BJI0674-BSD1)		(Water)	Lab File ID: V309232107.D			Analyzed: 09/23/21 12:13			
Pentafluorobenzene	295850	5.139	303624	5.139	97	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	450099	7.574	433735	7.573	104	50 - 200	0.001	+/-0.50	
1,4-Difluorobenzene	465074	5.522	464174	5.521	100	50 - 200	0.001	+/-0.50	
1,4-Dichlorobenzene-d4	260398	9.259	256827	9.258	101	50 - 200	0.001	+/-0.50	
Low Cal Check (SJI0371-LCV1)		(Water)	Lab File ID: V309232108.D			Analyzed: 09/23/21 12:40			
Pentafluorobenzene	326348	5.138	303624	5.139	107	50 - 200	-0.001	+/-0.50	
Chlorobenzene-d5	450080	7.572	433735	7.573	104	50 - 200	-0.001	+/-0.50	
1,4-Difluorobenzene	492570	5.526	464174	5.521	106	50 - 200	0.005	+/-0.50	
1,4-Dichlorobenzene-d4	257291	9.257	256827	9.258	100	50 - 200	-0.001	+/-0.50	
Low Cal Check (SJI0371-LCV2)		(Water)	Lab File ID: V309232109.D			Analyzed: 09/23/21 13:06			
Pentafluorobenzene	293300	5.139	303624	5.139	97	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	433580	7.573	433735	7.573	100	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	450253	5.527	464174	5.521	97	50 - 200	0.006	+/-0.50	
1,4-Dichlorobenzene-d4	249220	9.258	256827	9.258	97	50 - 200	0.000	+/-0.50	
Blank (BJI0674-BLK1)		(Water)	Lab File ID: V309232110.D			Analyzed: 09/23/21 13:31			
Pentafluorobenzene	291379	5.139	303624	5.139	96	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	426580	7.579	433735	7.573	98	50 - 200	0.006	+/-0.50	
1,4-Difluorobenzene	452749	5.521	464174	5.521	98	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	241075	9.258	256827	9.258	94	50 - 200	0.000	+/-0.50	



INTERNAL STANDARD AREA AND RT SUMMARY
EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0371

Instrument: NT3

Calibration: EI00035

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
MW-24_092021 (2110294-03RE1)		(Water)	Lab File ID: V309232117.D		Analyzed: 09/23/21 16:29				
Pentafluorobenzene	379086	5.138	303624	5.139	125	50 - 200	-0.001	+/-0.50	
Chlorobenzene-d5	559452	7.573	433735	7.573	129	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	592327	5.527	464174	5.521	128	50 - 200	0.006	+/-0.50	
1,4-Dichlorobenzene-d4	311589	9.258	256827	9.258	121	50 - 200	0.000	+/-0.50	



INTERNAL STANDARD AREA AND RT SUMMARY EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0440

Instrument: NT3

Calibration: EI00035

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
LCS (BJI0716-BS1)		(Water)	Lab File ID: V309242104LCS.D			Analyzed: 09/24/21 11:05			
Pentafluorobenzene	275924	5.139	275924	5.139	100	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	406271	7.573	406271	7.573	100	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	431802	5.522	431802	5.522	100	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	236479	9.258	236479	9.258	100	50 - 200	0.000	+/-0.50	
Initial Cal Check (SJI0440-ICV1)		(Water)	Lab File ID: V309242104.D			Analyzed: 09/24/21 11:05			
Pentafluorobenzene	275924	5.139	275924	5.139	100	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	406271	7.573	406271	7.573	100	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	431802	5.522	431802	5.522	100	50 - 200	0.000	+/-0.50	
1,4-Dichlorobenzene-d4	236479	9.258	236479	9.258	100	50 - 200	0.000	+/-0.50	
LCS Dup (BJI0716-BS1)		(Water)	Lab File ID: V309242106.D			Analyzed: 09/24/21 11:56			
Pentafluorobenzene	262900	5.138	275924	5.139	95	50 - 200	-0.001	+/-0.50	
Chlorobenzene-d5	377795	7.573	406271	7.573	93	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	406388	5.521	431802	5.522	94	50 - 200	-0.001	+/-0.50	
1,4-Dichlorobenzene-d4	219260	9.258	236479	9.258	93	50 - 200	0.000	+/-0.50	
Low Cal Check (SJI0440-LCV1)		(Water)	Lab File ID: V309242108.D			Analyzed: 09/24/21 12:46			
Pentafluorobenzene	284248	5.138	275924	5.139	103	50 - 200	-0.001	+/-0.50	
Chlorobenzene-d5	403778	7.573	406271	7.573	99	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	433192	5.521	431802	5.522	100	50 - 200	-0.001	+/-0.50	
1,4-Dichlorobenzene-d4	236945	9.258	236479	9.258	100	50 - 200	0.000	+/-0.50	
Blank (BJI0716-BLK1)		(Water)	Lab File ID: V309242109.D			Analyzed: 09/24/21 13:12			
Pentafluorobenzene	290513	5.138	275924	5.139	105	50 - 200	-0.001	+/-0.50	
Chlorobenzene-d5	412304	7.573	406271	7.573	101	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	447324	5.521	431802	5.522	104	50 - 200	-0.001	+/-0.50	
1,4-Dichlorobenzene-d4	232053	9.258	236479	9.258	98	50 - 200	0.000	+/-0.50	
TB-2_092021 (2110294-14)		(Water)	Lab File ID: V309242111.D			Analyzed: 09/24/21 14:02			
Pentafluorobenzene	258264	5.138	275924	5.139	94	50 - 200	-0.001	+/-0.50	
Chlorobenzene-d5	390745	7.573	406271	7.573	96	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	407012	5.521	431802	5.522	94	50 - 200	-0.001	+/-0.50	
1,4-Dichlorobenzene-d4	232030	9.258	236479	9.258	98	50 - 200	0.000	+/-0.50	



INTERNAL STANDARD AREA AND RT SUMMARY EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0440

Instrument: NT3

Calibration: EI00035

Internal Standard	Response	RT	Reference Response	Reference RT	Area %	Area % Limits	RT Diff	RT Diff Limit	Q
MW-60_092021 (2110294-05)		(Water)	Lab File ID: V309242120.D		Analyzed: 09/24/21 18:02				
Pentafluorobenzene	213426	5.139	275924	5.139	77	50 - 200	0.000	+/-0.50	
Chlorobenzene-d5	321122	7.573	406271	7.573	79	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	330200	5.521	431802	5.522	76	50 - 200	-0.001	+/-0.50	
1,4-Dichlorobenzene-d4	187581	9.258	236479	9.258	79	50 - 200	0.000	+/-0.50	
MW-55_092021 (2110294-07)		(Water)	Lab File ID: V309242121.D		Analyzed: 09/24/21 18:28				
Pentafluorobenzene	273264	5.133	275924	5.139	99	50 - 200	-0.006	+/-0.50	
Chlorobenzene-d5	404059	7.573	406271	7.573	99	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	446153	5.521	431802	5.522	103	50 - 200	-0.001	+/-0.50	
1,4-Dichlorobenzene-d4	238734	9.258	236479	9.258	101	50 - 200	0.000	+/-0.50	
MW-42_092021 (2110294-09)		(Water)	Lab File ID: V309242122.D		Analyzed: 09/24/21 18:53				
Pentafluorobenzene	282241	5.129	275924	5.139	102	50 - 200	-0.010	+/-0.50	
Chlorobenzene-d5	415562	7.574	406271	7.573	102	50 - 200	0.001	+/-0.50	
1,4-Difluorobenzene	445175	5.517	431802	5.522	103	50 - 200	-0.005	+/-0.50	
1,4-Dichlorobenzene-d4	238783	9.259	236479	9.258	101	50 - 200	0.001	+/-0.50	
MW-54_092021 (2110294-11)		(Water)	Lab File ID: V309242123.D		Analyzed: 09/24/21 19:19				
Pentafluorobenzene	244793	5.138	275924	5.139	89	50 - 200	-0.001	+/-0.50	
Chlorobenzene-d5	367239	7.573	406271	7.573	90	50 - 200	0.000	+/-0.50	
1,4-Difluorobenzene	395524	5.521	431802	5.522	92	50 - 200	-0.001	+/-0.50	
1,4-Dichlorobenzene-d4	218119	9.258	236479	9.258	92	50 - 200	0.000	+/-0.50	



HOLDING TIME SUMMARY

Analysis: EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sample Name	Date Collected	Date Received	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
MW-28_092021 21I0294-01	09/20/21 10:10	09/21/21 15:38	09/22/21 08:41	1	14	09/22/21 18:32	2	14	
MW-24_092021 21I0294-03	09/20/21 11:11	09/21/21 15:38	09/22/21 08:41	1	14	09/22/21 18:55	2	14	
MW-24_092021 21I0294-03RE1	09/20/21 11:11	09/21/21 15:38	09/23/21 10:15	2	14	09/23/21 16:29	3	14	
MW-60_092021 21I0294-05	09/20/21 11:30	09/21/21 15:38	09/24/21 12:54	4	14	09/24/21 18:02	4	14	
MW-55_092021 21I0294-07	09/20/21 12:29	09/21/21 15:38	09/24/21 12:54	4	14	09/24/21 18:28	4	14	
MW-42_092021 21I0294-09	09/20/21 12:35	09/21/21 15:38	09/24/21 12:54	4	14	09/24/21 18:53	4	14	
MW-54_092021 21I0294-11	09/20/21 13:54	09/21/21 15:38	09/24/21 12:54	3	14	09/24/21 19:19	4	14	
TB-1_092021 21I0294-13	09/20/21 10:10	09/21/21 15:38	09/22/21 08:41	1	14	09/22/21 09:50	2	14	
TB-2_092021 21I0294-14	09/20/21 10:10	09/21/21 15:38	09/24/21 12:54	4	14	09/24/21 14:02	4	14	

* Indicates hold time exceedance.



Analytical Resources, Incorporated
Analytical Chemists and Consultants

**METHOD DETECTION
AND REPORTING LIMITS
EPA 8260D**

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Instrument: NT2

Analyte	MDL	RL	Units
Benzene	0.05	0.20	ug/L
Naphthalene	0.27	0.50	ug/L



**METHOD DETECTION
AND REPORTING LIMITS**

EPA 8260D

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Instrument: NT3

Analyte	MDL	RL	Units
Benzene	0.05	0.20	ug/L
Naphthalene	0.27	0.50	ug/L



7290B Investment Drive North Charleston, South Carolina 29417
Phone: 866.272.0932 Fax: 866.509.5146 www.o2si.com



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Date Received: _____

Certificate of Analysis

Rev 0

Page 1 of 1

Catalog No.: 021111-01	Lot No.: 366047	Storage: ≤ -10 °C	Solvent: P/T Methanol	Exp. Date: 13-Jan-2022	Description: Bromoethane Solution, 2,000 mg/L, 1 ml
-------------------------------	------------------------	--------------------------	------------------------------	-------------------------------	--

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
bromoethane	74-96-4	99.8	1111.1.1P	2014 ± 20.63 mg/L

H003272

Bromoethane Solution
Expires 1/13/2022
Prepared By Paul Campbell 4/1/2019

Certified By: _____

Kara Catron

Manufacture Date 9-Jan-2019

Follow all storage requirements, keep tightly closed when not in use, and use good laboratory practices when handling. This Reference Material was manufactured, produced, and/or certified under a quality management system that is accredited to ISO 17034 and ISO/IEC 17025.

All weights are traceable through N. I. S. T. Test No. 822/264157-00. Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.

The stated uncertainty is the expanded uncertainty with a coverage factor of two to give a 95% confidence level.



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Catalog No.: 020620-02	Lot No.: 377123	Storage: ≤ -10 °C	Solvent: P/T Methanol	Exp. Date: 15-May-2024	Description: n-Hexane Solution, 1,000 mg/L, 1 mL
-------------------------------	------------------------	--------------------------	------------------------------	-------------------------------	---

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
n-hexane (C6)	110-54-3	98	620.24.1P	1000 ± 14.42 mg/L

H009538

n-Hexane (C6)

Expires 5/15/2024

Prepared By Lani Hertzog 10/2/2019

Certified By: _____

Auquilla Samuel

Manufacture Date 17-May-2019

Follow all storage requirements, keep tightly closed when not in use, and use good laboratory practices when handling. This Reference Material was manufactured, produced, and/or certified under a quality management system that is accredited to ISO 17034 and ISO/IEC 17025.

All weights are traceable through N. I. S. T. Test No. 822/264157-00. Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.

The stated uncertainty is the expanded uncertainty with a coverage factor of two to give a 95% confidence level.



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 Phone: 866.272.0932 Fax: 866.509.5146 www.o2si.com



ISO 17025 Accredited Chemical Testing Lab
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Date Received: _____

Certificate of Analysis

Rev 1

Page 1 of 1

Catalog No.: 122318-01 **Lot No.:** 329610 **Storage:** ≤ -10 °C **Solvent:** P/T Methanol **Exp. Date:** 28-Nov-2021 **Description:** MtBE & Freon 113 Solution, 1000 mg/L, 1 ml

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
methyl t-butyl ether	1634-04-4	99.96	208.24.2P	1003 ± 10.42 mg/L
1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	99.9	270.158.1P	1012 ± 14.59 mg/L

H009539

MtBE&Freon 113 Solution
 Expires 11/28/2021

Prepared By Lani Hertzog 10/2/2019

Certified By: _____

Susan Mathews

Manufacture Date 28-Nov-2017

Follow all storage requirements, keep tightly closed when not in use, and use good laboratory practices when handling.
 This Reference Material was manufactured, produced, and/or certified under a quality management system that is accredited to ISO 17034 and ISO/IEC 17025.

All weights are traceable through N. I. S. T. Test No. 822/264157-00. Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.

The stated uncertainty is the expanded uncertainty with a coverage factor of two to give a 95% confidence level.



CERTIFIED REFERENCE MATERIAL

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800)356-1688
Fax: (814)353-1309

www.restek.com

Certificate of Analysis



FOR LABORATORY USE ONLY-READ SDS PRIOR TO USE.

This Reference Material is intended for Laboratory Use Only as a standard for the qualitative and/or quantitative determination of the analyte(s) listed.

Catalog No. : ! "#\$ **Lot No.:** %!&\$!(&

Description :) *+, -./0+1,23451,2/0+/.2607587.8
) *+, -./0+1,23451,2/0+/.2607587.82"9!!!; <=>92?@A2B/0+75-,9
&=><7=CD,

Container Size : "2=> **Pkg Amt:** G2&2=>

Expiration Date : HD5/2 !92"! " **Storage:** !E*2-.2F-,8/.

CERTIFIED VALUES

Elution Order	Compound	Grav. Conc. (weight/volume)	Expanded Uncertainty (95% C.L.; K=2)
1	2-Chloroethyl vinyl ether CAS # 110-75-8 (Lot MKBS6526V) Purity 99%	2,000.6 µg/mL	+/- 11.6317 µg/mL Gravimetric +/- 42.8331 µg/mL Unstressed +/- 44.0783 µg/mL Stressed

Solvent: P&T Methanol
CAS # 67-56-1
Purity 99%

H012546

2CEVE SS
Expires 6/30/2024
Prepared By Paul Campbell 12/30/2019

Tech Tips:

I/;.78704-52-J20/0.7F+,-./0+1,/5/20-2C/507F+,-./0+75/2=712-FFD.24J2K-,D04-5K2F-5074545;2")F+,-./0+1,23451,2/0+/.27./2F-=L45/82 M40+2K-,D04-5K20+702F-5074520/0.7F+,-./0+1,/5/N

Column:

!"#\$%&'()*+,-./:;<=>?@A

Carrier Gas:

3456789:;.<=>?@A

Temp. Program:

?!@A\$-37B5\$, \$#>:~\$,\$!@A
C\$D@AE#>:&\$-37B5\$"\$#>:&2

Inj. Temp:

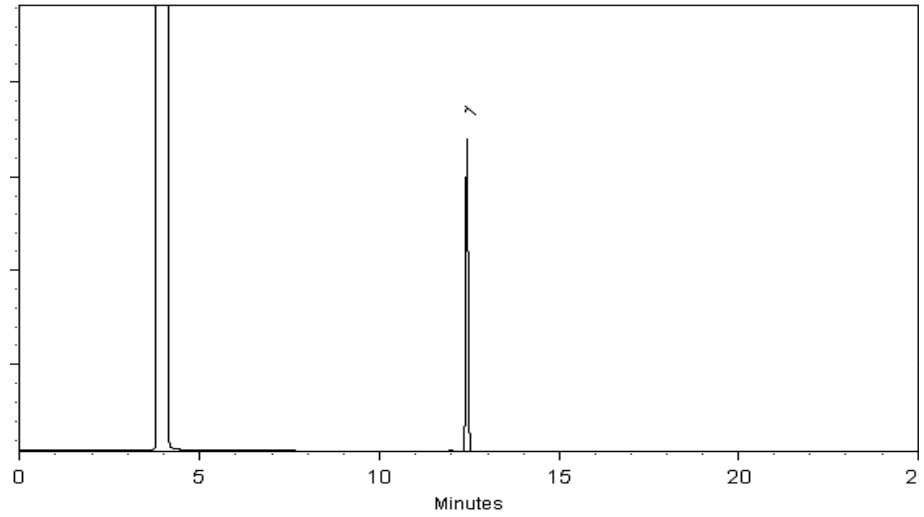
,!!@A

Det. Temp:

,"!@A

Det. Type:

FGH



A+4K2F+.-=70-;7=2./C./K/50K272;/5/.7,2K/02-J20/K045;2F-58404-5K2F+-K/52J-.2C.-8DF02
 7FF/C075F/N22O-.2-C04=7,2./KD,0K24521-D.2,7L92F-58404-5K2K+-D,82L/278PDK0/82J-.21-D.2
 KC/F4J4F245K0.D=/5092=/0+-89275827CC,4F704-5N

Walker Workman
 Walker Workman - Operations Technician I

Date Mixed: 27-Jun-2019 **Balance:** B707717271

Jennifer J Pollino
 Jennifer Pollino - Operations Tech-ARM QC

Date Passed: 01-Jul-2019

**Manufactured under Restek's ISO 9001:2015
 Registered Quality System
 Certificate #FM 80397**

General Certified Reference Material Notes

Expiration Notes:

- XYC4.704-52870/237,482J-.2D5-C/5/827=CD,2K0-./82452F=-C,475F/2M40+20+/2./F-==/58/82F-58404-5KN
- Z5F/.07450192F-5F/50.704-5927582/YC4.704-52-J20+/2*SB27./2L7K/82-520+/2D5-C/5/82C-.8DF02L/45;2K0-./827FF-.845;20-20+/2./F-==/58/82F-58404-52J-D5824520+/2K0-.7;/2J4/,8N

Purity Notes:

- ?D.4012758<-.2F+/=4F7,248/5040127./28/0/.=45/82L12-5/2-.2=-./2-J20+/2J-.,-M45;20/F+54[D/K2]*<O^I92_?>*92*<:X*I92]*<B692>*<B692S^92758<-.2=/,045;2C-450N
- *-C-D58K2M40+272,4K0/82CD.4012-J2./KK20+752`a2+73/2L//52M/4;+02F-./F0/820-2F=-C/5K70/2J-.24=CD.404/K2758<-.2K7,0KN22 F-./F04-52J7F0-.24K2DK/820-2F7,FD,70/20+/27=-D502-J2F=-C-D5825/F/KK7.120-27F+4/3/20+/28/K4./82F-5F/50.704-52-J20+/2 C7./502F=-C-D582452K-,D04-5N22
- ?D.4012-J24K=-/4F2F=-C-D58K24K2./C-.0/827K20+/2KD=2-J20+/24K=-/KN22
- ?D.401237,D/K27./2.-D58/820-20+/25/7./K02M+,-/25D=L/.N

Certified Uncertainty Value Notes:

- A+/2D5F/.074504/K27./28/0/.=45/824527FF-.875F/2M40+2^6b2&W! '27582JD48/2 \$N2A+/2F/.04J4/82F=-L45/82K0./KK/82 D5F/.074501237,D/2R245F,D8/K2;.734=/0.4F2D5F/.07450192+--;/5/4012L/0M//5)7=CD,2D5F/.07450192K0-.7;/2K07L4,401 D5F/.07450127582K+4CC45;2K07L4,4012D5F/.07450127582M/.2F=-L45/82DK45;20+/2J-.,-M45;2J-.=D,7)

$$U_{combined\ stressed} = k \sqrt{U_{gravimetric}^2 + U_{homogeneity}^2 + U_{storage\ stability}^2 + U_{shipping\ stability}^2}$$

- k 4K272F-3/.7;/2J7F0-.2-J2^92M+4F+2;43/K272./3/,2-J2F-5J48/5F/2-J27CC.-Y4=70/,12`\$aN
- ^024K24=C-.075020-25-0/20+7020+/2K+4CC45;2K07L4,4012D5F/.0745012M7K2-L0745/82D58/.20/=C/.70D./2/Y0./=K2J-.2KC/F4J4F204 450/.37,Kc20+./J-./920+/2F/.04J4/82F=-L45/82K0./KK/82D5F/.074501237,D/2K+-D,82-5,12L/27CC,4/820-20+/2C-.8DF024J2402M7K2 K0-./827025-5)K07587.820/=C/.70D./2F-58404-5K2DC20-2758245F,D845;25027025N20/2NF+54F7,26/.34F/2702 [MMMN./K0/dNF=-<*507F0>K](#).2DK/2./F-==/58704-5K24J21-D.2K+4C=/502M7K245)0.75K402J-.2=-./20+752W2871K270225-5) K07587.820/=C/.70D./2F-58404-5KN
- %CC,120+/2F/.04J4/82F=-L45/82D5K0./KK/82D5F/.074501237,D/24J20+/2C-.8DF02M7K2./F/43/82D58/.2K07587.82K+4CC45;2 F-58404-5KN222%CC,120+/2F/.04J4/82F=-L45/82K0./KK/82D5F/.074501237,D/24J20+/2C-.8DF02M7K2./F/43/82D58/./25-5)K07587.82 F-58404-5K27K2KC/F4J4/82L/,-MN2

Label Conditions	Standard Conditions	Non-Standard Conditions
"\$E*2Q=-457,22R=- 2N=C/.70D./ T	e2#!E*2	V2#!E*2DC20-2W2871K
&!E*2-.2F-,8/.2RS/J.4;/./70/T	e2!E*2	V2!E*2DC20-2W2871K
IE*2-.2F-,8/.2RO./U/.T	e2"\$E*2	V2"\$E*2DC20-2W2871K

- 6/C7.70/2R5-02F=-L45/8T2D5F/.074501237,D/K2J-.2;.734=/0.4F2D5F/.07450127./27,K-284KC,71/82-520+/2F/.04J4F70/924J25//8/8922 K/C7.70/2+--;/5/4012L/0M//5)7=CD,2D5F/.07450192K0-.7;/2K07L4,4012D5F/.07450127582K+4CC45;2K07L4,4012D5F/.074501237,D/K2 7./27374,7L,/2L12F-507F045;2S/K2NF+54F7,26/.34F/2702 [MMMN./K0/dNF=-<*507F0>K](#)
- A+/2C7Fd7;/827=-D5024K20+/2=454=D=2K7=C,/2K4U/2J-.2M+4F+2D5F/.07450124K237,48N22A+/27=CD,/K27./2-3/.)J4,./820-2/5KD./2 0+7020+/2=454=D=2C7Fd7;/827=-D502F752L/2KD/50,120.75KJ/.M8

Manufacturing Notes:

- *-5F/50.704-524K2L7K/82DC-52;.734=/0.4F2C./C7.704-52DK45;2/40+/.272L7,75F/2M+-K/2F7,4L.704-52+7K2L//523/.4J4/82874,12 DK45;2Q/520.7F/7L,/2M/4;+082758<284,D04-5K2M40+272K,7KKM7.N

Handling Notes:

- 607L4,4012-J20+/2D5-C/5/82C-.8DF092M+/52K0-./82452F=-C,475F/2M40+20+/2./F-==/58/82F-58404-5K924K2;D7.750//820+.-D;+2 0+/2/YC4.704-5284KC,71/82-520+/2C-.8DF02,7L/,27582F/.04J4F70/N2*-507F02S/K0/d2J-.2788404-57,2-C/5/82C-.8DF02K07L4,4012 45J-./704-592M40+20+/2d5-M,/8;/<D58/.K075845;20+702-C/52C-.8DF02K07L4,40124K2KDLP/F020-20+/2KC/F4J4F2+758,45;27582 /534-.5=/507,2F-58404-5K20-2M+4F+20+/2C-.8DF024K2/YC-K/8N2O-.21-D.2F-53/54/5F/2S/K0/d2KDCC,4/K28/7F04370/82347,K2M40+2 =-K02K07587.8K2C7Fd/824527=CD,/KN2>7.;/23-,D=/28/7F04370/82347,K27./27374,7L,/20+.-D;+2S/K0/d27K272FDK0=-2 -.8/./8240/=N2%88404-57,,192S/K0/d2K/,,K2IBI*62J-.20+/2CD.C-K/2-J2;,7KKM7./28/7F043704-527K2F707,-;25D=L/.2 &(#&92 M+4F+245F,D8/K2F=-C,/0/245K0.DF04-5KN
- ^J27512D584KK-,3/82=70/.47,24K234K4L,/245K48/20+/27=CD,92K-54F70/20+/2D5-C/5/827=CD,2D504,20+/2=70/.47,24K2F=-C,/0/,12 84KK-,3/8N

Certificate of Analysis

Product Name: 2-Chloroethylvinyl Ether Standard
Product Number: EPA-1016-1 **Lot Issue Date:** 23-Jul-2020
Lot Number: 0006546244 **Expiration Date:** 31-Aug-2023

Description:

This analytical reference material (RM) was manufactured and verified in accordance with an ISO 9001 registered quality system, and analyte concentrations were verified by an ISO 17025 accredited laboratory. The concentration and uncertainty value at the 95% confidence level for each analyte, determined gravimetrically, is listed below.

Analyte	CAS#	Analyte Lot	Concentration ± Uncertainty
2-chloroethylvinyl ether	000110-75-8	RM06940	5020 ± 25 µg/mL

Matrix: methanol (methyl alcohol)

Storage Conditions: Store Frozen (-25° to -10°C).

Traceability:

The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCCL Z540.3, ISO 9001, ISO 17025, and ISO 17034. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 1088.

Homogeneity:

This RM was unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

Intended Use:

This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods, and continuing calibration verification.

Instructions for Use:

Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening the container and should be processed without delay for the certified values to be valid within the stated uncertainties.

Hazards:

Refer to the Safety Data Sheet on www.agilent.com for information regarding this RM.

Expiration of Certification:

The certification of this RM is valid until the expiration date specified above, provided the RM is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the RM is damaged, contaminated, or otherwise modified.

Maintenance of Certification:

If substantive changes are noted that affect the certification before the expiration of this certificate, Agilent will notify the purchaser.

I009147

2CEVE

Expires 8/31/2023

Prepared By Paul Campbell 10/5/2020

Sample lot approver:


Monica Bourgeois
QMS Representative



ISO 17034 Cert No.
AR-1936

RM was produced in accordance with TUV USA Inc registered ISO 9001 Quality Management System. Cert # 56 100 18560026

Page: 1 of 1

www.agilent.com/quality/



ISO 17025 Cert
No. AT-1937



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ISO 17025 Accredited Chemical Testing Lab
 Cert. No. 3031.01

I009654

8260B Calibration Super Mix

Expires 10/29/2024

Prepared By Paul Campbell 10/14/2020

Date Received: _____

Certificate of Analysis

Rev 0

Page 1 of 3

Catalog No.:	Lot No.:	Storage:	Solvent:	Exp. Date:	Description:
122150-01	425321	≤ -10 °C	P/T Methanol	29-Oct-2024	8260B Calibration Super Mix, 76-1, 2,000 mg/L, 1 ml (Ampule A) One of Two

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
2-nitropropane	79-46-9	99.4	219.8.1P	1997 ± 40.75 mg/L
acetonitrile	75-05-8	99.9	204.1.2P	2000 ± 35.59 mg/L
acrylonitrile	107-13-1	99	210.1.6P	2002 ± 36.99 mg/L
allyl chloride	107-05-1	98.6	227.1.1P	2013 ± 41.08 mg/L
benzene	71-43-2	99.99	146.1.9P	2001 ± 35.59 mg/L
bromobenzene	108-86-1	99.9	147.8.1.1P	2013 ± 41.08 mg/L
bromochloromethane	74-97-5	99.7	148.1.3P	2005 ± 35.72 mg/L
bromodichloromethane	75-27-4	99.5	149.1.9P	2001 ± 35.65 mg/L
bromoform	75-25-2	99.3	150.7.2P	2002 ± 35.67 mg/L
n-butylbenzene	104-51-8	99.2	151.7.3.2P	2003 ± 35.69 mg/L
sec-butylbenzene	135-98-8	99.5	152.1.2.1P	2011 ± 35.83 mg/L
tert-butylbenzene	98-06-6	99.9	153.29.1P	2010 ± 35.81 mg/L
carbon disulfide	75-15-0	99.99	200.18.2P	2001 ± 35.65 mg/L
carbon tetrachloride	56-23-5	100	154.9.1P	2003 ± 35.69 mg/L
chlorobenzene	108-90-7	99.9	155.29.1P	2001 ± 35.65 mg/L
2-chloroethanol	107-07-3	98.5	217.1.2.1P	2010 ± 41.02 mg/L

Auquilla Samuel

Certified By: _____

Auquilla Samuel

Manufacture Date 31-Oct-2019

Follow all storage requirements, keep tightly closed when not in use, and use good laboratory practices when handling. This Reference Material was manufactured, produced, and/or certified under a quality management system that is accredited to ISO 17034 and ISO/IEC 17025.

All weights are traceable through N. I. S. T. Test No. 822/264157-00. Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically. The stated uncertainty is the expanded uncertainty with a coverage factor of two to give a 95% confidence level.

Certificate of Analysis

Catalog No.: 122150-01

Lot No.: 425321

Expiration Date: 29-Oct-2024

<u>Compound</u>	<u>CAS No.</u>	<u>Purity (%)</u>	<u>Neat Material Lot No.</u>	<u>Concentration</u>	
chloroform	67-66-3	99.8	156.7.1P	2004 ± 35.7	mg/L
chloroprene	126-99-8	99	315.282.8P	2000 ± 35.58	mg/L
2-chlorotoluene	95-49-8	99.5	157.7.1P	2010 ± 35.81	mg/L
4-chlorotoluene	106-43-4	99.9	158.9.3P	2006 ± 35.74	mg/L
cis-1,2-dichloroethylene	156-59-2	99.7	166.286.1P	2004 ± 40.89	mg/L
dibromochloromethane	124-48-1	97.5	159.29.2P	2009 ± 35.74	mg/L
1,2-dibromo-3-chloropropane	96-12-8	98.4	160.7.2.1P	2001 ± 35.65	mg/L
1,2-dibromoethane	106-93-4	99.9	161.9.1P	2001 ± 35.65	mg/L
dibromomethane	74-95-3	99.8	162.1.2P	2001 ± 40.83	mg/L
1,2-dichlorobenzene	95-50-1	99.8	43.7.1P	2000 ± 35.63	mg/L
1,3-dichlorobenzene	541-73-1	99.9	44.7.1P	2011 ± 35.83	mg/L
1,4-dichlorobenzene	106-46-7	99.9	45.29.2P	2001 ± 35.65	mg/L
cis-1,4-dichloro-2-butene	1476-11-5	96.2	209.1.4.1P	2013 ± 35.87	mg/L
trans-1,4-dichloro-2-butene	110-57-6	98	201.1.17P	2002 ± 35.67	mg/L
1,1-dichloroethane	75-34-3	98.27	163.247.1P	2009 ± 35.74	mg/L
1,2-dichloroethane	107-06-2	99.9	164.158.1P	2001 ± 35.65	mg/L
1,1-dichloroethylene	75-35-4	99	165.1.1.1.1P	2002 ± 36.99	mg/L
trans-1,2-dichloroethylene	156-60-5	99.8	167.9.2P	2006 ± 35.74	mg/L
1,2-dichloropropane	78-87-5	99.7	168.8.1.1P	2001 ± 40.83	mg/L
1,3-dichloropropane	142-28-9	99.8	169.7.2.1P	2001 ± 35.65	mg/L
2,2-dichloropropane	594-20-7	99.1	170.7.2P	2000 ± 35.63	mg/L
1,1-dichloropropylene	563-58-6	99	171.158.1P	2000 ± 40.81	mg/L
cis-1,3-dichloropropylene	10061-01-5	99.6	172.7.4.1P	2007 ± 35.76	mg/L
trans-1,3-dichloropropylene	10061-02-6	99	173.7.4.5P	2000 ± 35.63	mg/L

Aquilla Samuel

Certified By:

Aquilla Samuel
 Manufacture Date 31-Oct-2019

Follow all storage requirements, keep tightly closed when not in use, and use good laboratory practices when handling. This Reference Material was manufactured, produced, and/or certified under a quality management system that is accredited to ISO 17034 and ISO/IEC 17025.

All weights are traceable through N. I. S. T. Test No. 822/264157-00. Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.

The stated uncertainty is the expanded uncertainty with a coverage factor of two to give a 95% confidence level.

Certificate of Analysis

Catalog No.: 122150-01

Lot No.: 425321

Expiration Date: 29-Oct-2024

<u>Compound</u>	<u>CAS No.</u>	<u>Purity (%)</u>	<u>Neat Material Lot No.</u>	<u>Concentration</u>
1,4-dioxane	123-91-1	100	223.1.3P	2003 ± 40.87 mg/L
ethyl ether	60-29-7	99.9	226.1.3P	2002 ± 35.61 mg/L
ethyl methacrylate	97-63-2	99.1	216.1.1P	2007 ± 40.96 mg/L
ethylbenzene	100-41-4	99.9	174.8.2P	2001 ± 40.83 mg/L
hexachlorobutadiene	87-68-3	98	47.158.1.2P	2009 ± 41 mg/L
iodomethane	74-88-4	99.9	203.1.3.1P	2003 ± 40.87 mg/L
isobutyl alcohol	78-83-1	100	220.7.2P	2001 ± 35.65 mg/L
isopropylbenzene	98-82-8	98.9	176.9.1P	2004 ± 40.89 mg/L
4-isopropyltoluene	99-87-6	99.7	177.9.2P	2003 ± 40.87 mg/L
methyl acrylonitrile	126-98-7	99.5	212.3.1P	2000 ± 36.96 mg/L
methyl methacrylate	80-62-6	98.5	231.8.1.1P	2012 ± 41.06 mg/L
methyl acrylate	96-33-3	99.9	349.1.1P	2004 ± 40.9 mg/L
methylene chloride	75-09-2	99.99	178.271.1P	2002 ± 35.61 mg/L
naphthalene	91-20-3	99.8	26.9.1P	2001 ± 35.65 mg/L
nitrobenzene	98-95-3	99.9	94.29.2P	2003 ± 35.63 mg/L
pentachloroethane	76-01-7	98.8	52.3.5P	2004 ± 37.03 mg/L
propionitrile	107-12-0	99.9	218.7.1P	2001 ± 35.65 mg/L
n-propylbenzene	103-65-1	99.7	179.7.2P	2005 ± 35.72 mg/L
styrene	100-42-5	99.5	180.286.1P	2010 ± 41.02 mg/L
1,1,1,2-tetrachloroethane	630-20-6	99.8	181.7.2.7P	2004 ± 35.7 mg/L
1,1,2,2-tetrachloroethane	79-34-5	99.4	182.8.2P	2001 ± 40.83 mg/L
tetrachloroethylene	127-18-4	100	183.1.2P	2006 ± 35.68 mg/L
tetrahydrofuran (THF)	109-99-9	99.9	299.18.1P	2003 ± 40.87 mg/L
toluene	108-88-3	100	184.48.1P	2001 ± 35.65 mg/L

Aquilla Samuel

Certified By:

Aquilla Samuel
 Manufacture Date 31-Oct-2019

Follow all storage requirements, keep tightly closed when not in use, and use good laboratory practices when handling.

This Reference Material was manufactured, produced, and/or certified under a quality management system that is accredited to ISO 17034 and ISO/IEC 17025.

All weights are traceable through N. I. S. T. Test No. 822/264157-00. Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.

The stated uncertainty is the expanded uncertainty with a coverage factor of two to give a 95% confidence level.

Certificate of Analysis

Catalog No.: 122150-01

Lot No.: 425321

Expiration Date: 29-Oct-2024

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
1,2,3-trichlorobenzene	87-61-6	99	185.1.1.6P	2016 ± 37.25 mg/L
1,2,4-trichlorobenzene	120-82-1	99.6	54.29.1P	2005 ± 35.72 mg/L
1,1,1-trichloroethane	71-55-6	99	187.1.1P	2004 ± 40.89 mg/L
1,1,2-trichloroethane	79-00-5	99.6	195.7.1.6P	2004 ± 35.7 mg/L
trichloroethylene	79-01-6	100	188.1.1P	2015 ± 41.12 mg/L
1,2,3-trichloropropane	96-18-4	99.5	189.1.3P	2005 ± 35.72 mg/L
1,1,2-trichloro-1,2,2-trifluoroethane (Freon 113)	76-13-1	99	270.158.2P	2003 ± 40.88 mg/L
1,2,4-trimethylbenzene	95-63-6	99.1	190.1.3P	2008 ± 40.98 mg/L
1,3,5-trimethylbenzene	108-67-8	99.7	191.9.2.1P	2002 ± 40.85 mg/L
m-xylene	108-38-3	99.7	193.7.1.2P	2001 ± 35.65 mg/L
o-xylene	95-47-6	99.2	192.29.2P	2003 ± 35.69 mg/L
p-xylene	106-42-3	99.9	194.7.1P	2003 ± 35.69 mg/L

Auquilla Samuel

Certified By: _____

Auquilla Samuel

Manufacture Date 31-Oct-2019

Follow all storage requirements, keep tightly closed when not in use, and use good laboratory practices when handling.

This Reference Material was manufactured, produced, and/or certified under a quality management system that is accredited to ISO 17034 and ISO/IEC 17025.

All weights are traceable through N. I. S. T. Test No. 822/264157-00. Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.

The stated uncertainty is the expanded uncertainty with a coverage factor of two to give a 95% confidence level.

Report of Certification

Catalog Number: S-2986 **Lot No.** EN191002016
Description: 2-Pentanone **Ship Date:**
Matrix: Methanol (Purge & Trap Grade) **Expiration Date:**

This Certified Reference Material (CRM) has been prepared and certified under an ISO 9001 (certified by DQS) and ISO 17025 (accredited by A2LA), and ISO 17034 (accredited by A2LA) quality system consistent with the following standards:

- ISO 9001: Quality management systems - Requirements
- ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories
- ISO 17034: General requirements for the competence of reference material producers
- ISO Guide 30: Reference Materials - Selected terms and definitions
- ISO Guide 31: Reference Materials - Contents of certificates and labels
- ISO Guide 35: Reference Materials - General and Statistical principals for certification
- Guide to the Expression of Uncertainty in Measurement, 2008
- EURACHEM/CITAC Guide: Qualifying Uncertainty in Analytical Measurement - Third Edition
- NIST Technical Note 1297

Storage Requirements:

To ensure the stability of the product once it arrives in your laboratory, please store this product in ambient conditions (18°C to 27°C). Note: Shipping conditions may differ from storage conditions. The EXPIRATION DATE is calculated from the SHIPPED DATE using our stability data and is applicable only if the product is stored under the laboratory specified conditions.

Instructions for Use:

Let material come to room temperature before use. Check for precipitate and if necessary sonicate for one minute. If compounds do not dissolve after one minute then sonicate further until the product is dissolved. A clear appearance is acceptable. The minimum recommended amount that should be removed from this vial is 5µL with a 25µL gas tight syringe. All solutions should be thoroughly mixed, by shaking, prior to use. All surfaces that come in contact with the solution must be thoroughly cleaned prior to use. Dilutions should be performed only with Class A volumetric glassware.

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For assistance, please contact sales support at crmsales@spexcsp.com.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, and analytical instrumentation have been qualified prior to use. The highest purity solvents and Class A / calibrated volumetrics have been used in all preparations.

Homogeneity:

The homogeneity of this CRM has been confirmed by procedures consistent with ISO 17025, ISO 17034, and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed to prove homogeneity in accordance with our internal procedure 4300-HOMOGEN-1A. This is consistent with the intended use of this CRM. The Degree of Homogeneity, as expressed as maximum between-bottle variation, is 1.2%

Statistical Estimator and Confidence Limits:

The Certified value 'X' as listed on the reverse of this document is at the 95% level of confidence and can be expressed as:

- $X = x \pm U$ where X=certified value, U=expanded uncertainty, x=property value
- $U = k u_c$ where k=2 is the coverage factor at the 95% confidence level
- $u_c =$ combined standard uncertainty obtained by combining the individual compound standard uncertainty components u_i where $u_c = \sqrt{\sum u_i^2}$

Legal Notice:

SPEX CertiPrep Certified Reference Materials are not for any cosmetic, drug, or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this Reference Material shall be greater than the purchase price. In no event shall SPEX CertiPrep be liable for any loss of profits or any incidental, special, or consequential damages.

SPEX CertiPrep 

Your Science is Our Passion.®

203 Norcross Ave. Metuchen, NJ 08840
www.spexcertiprep.com • E-mail: crmsales@spexcsp.com
Phone: 1-732-549-7144 • Fax 1-732-603-9647



Certificate of Analysis

Product Name: Custom Standard

Product Number: CUS-1756

Lot Issue Date: 30-Dec-2020

Lot Number: 0006580093

Expiration Date: 31-Jan-2023

Description:

This analytical reference material (RM) was manufactured and verified in accordance with an ISO 9001 registered quality system and analyte concentrations were verified by an ISO 17025 accredited laboratory. The concentration and uncertainty value at the 95% confidence level for each analyte, determined gravimetrically, is listed below.

Analyte	CAS#	Analyte Lot	Concentration ± Uncertainty
acrylonitrile	000107-13-1	RM16463	5020 ± 25 µg/mL
bromoethane	000074-96-4	RM00936	5023 ± 25 µg/mL
carbon disulfide	000075-15-0	RM08158	5019 ± 25 µg/mL
iodomethane	000074-88-4	RM14171	5023 ± 25 µg/mL
1,1,2-trichlorotrifluoroethane	000076-13-1	RM04848	5025 ± 25 µg/mL
trans-1,4-dichloro-2-butene	000110-57-6	RM13971	5019 ± 25 µg/mL

Matrix: methanol (methyl alcohol)

Storage Conditions: Store Frozen (-25° to -10°C).

Traceability:

The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCCL Z540.3, ISO 9001, ISO 17025, and ISO 17034. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 1088.

Homogeneity:

This RM was unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

Intended Use:

This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods, and continuing calibration verification.

Instructions for Use:

Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening the container and should be processed without delay for the certified values to be valid within the stated uncertainties.

Hazards:

Refer to the Safety Data Sheet on www.agilent.com for information regarding this RM.

J000092

Custom Mix

Expires 1/31/2023

Prepared By Paul Campbell 1/5/2021



ISO 17034 Cert
No. AR-1936

RM was produced in accordance with TUV USA Inc registered ISO 9001 Quality Management System. Cert # 56 100 18560026

Page: 1 of 2

www.agilent.com/quality/
CSD-QA-015.1



ISO 17025 Cert
No. AT-1937

Certificate of Analysis

Product Number: CUS-1756

Lot Number: 0006580093

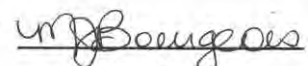
Expiration of Certification:

The certification of this RM is valid until the expiration date specified above, provided the RM is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the RM is damaged, contaminated, or otherwise modified.

Maintenance of Certification:

If substantive changes are noted that affect the certification before the expiration of this certificate, Agilent will notify the purchaser.

Sample lot approver:



Monica Bourgeois
QMS Representative



ISO 17034 Cert
No. AR-1936

RM was produced in accordance with TUV USA Inc registered ISO 9001 Quality Management System. Cert # 56 100 18560026

Page: 2 of 2

www.agilent.com/quality/
CSD-QA-015.1



ISO 17025 Cert
No. AT-1937

Certificate of Analysis

Product Name: VOC Standard

Product Number: DWM-588-1

Lot Issue Date: 09-Mar-2020

Lot Number: 0006518400

Expiration Date: 30-Apr-2023

Description:

This analytical reference material (RM) was manufactured and verified in accordance with an ISO 9001 registered quality system, and analyte concentrations were verified by an ISO 17025 accredited laboratory. The concentration and uncertainty value at the 95% confidence level for each analyte, determined gravimetrically, is listed below.

Analyte	CAS#	Analyte Lot	Concentration ± Uncertainty
bromochloromethane	000074-97-5	RM00009	2006 ± 10 µg/mL
bromodichloromethane	000075-27-4	RM14215	2010 ± 10 µg/mL
bromoform	000075-25-2	RM07516	2006 ± 10 µg/mL
carbon tetrachloride	000056-23-5	RM07576	2009 ± 10 µg/mL
chloroform	000067-66-3	RM13988	2007 ± 10 µg/mL
dibromochloromethane	000124-48-1	RM14843	2005 ± 10 µg/mL
dibromomethane	000074-95-3	RM12878	2007 ± 10 µg/mL
methylene chloride	000075-09-2	RM09575	2008 ± 10 µg/mL
trichlorofluoromethane	000075-69-4	RM00017	2010 ± 10 µg/mL
1,2-dibromoethane	000106-93-4	RM00018	2007 ± 10 µg/mL
1,1-dichloroethane	000075-34-3	RM15556	2005 ± 10 µg/mL
1,2-dichloroethane	000107-06-2	RM04655	2010 ± 10 µg/mL
1,1-dichloroethene	000075-35-4	RM14486	2009 ± 10 µg/mL
cis-1,2-dichloroethene	000156-59-2	RM15008	2009 ± 10 µg/mL
trans-1,2-dichloroethene	000156-60-5	RM07565	2006 ± 10 µg/mL
1,1,1,2-tetrachloroethane	000630-20-6	RM12632	2009 ± 10 µg/mL
1,1,2,2-tetrachloroethane	000079-34-5	NT00390	2008 ± 10 µg/mL

J000093

VOC mixture

Expires 4/30/2023

Prepared By Paul Campbell 1/5/2021



ISO 17034 Cert No.
AR-1936

RM was produced in accordance with TUV USA Inc registered ISO 9001 Quality Management System. Cert # 56 100 18560026

Page: 1 of 4

www.agilent.com/quality/
CSD-QA-015.1



ISO 17025 Cert
No. AT-1937

Certificate of Analysis

Product Number:	DWM-588-1	Lot Number:	0006518400
tetrachloroethene	000127-18-4	RM06491	2008 ± 10 µg/mL
1,1,1-trichloroethane	000071-55-6	RM15035	2010 ± 10 µg/mL
1,1,2-trichloroethane	000079-00-5	RM01175	2007 ± 10 µg/mL
trichloroethene	000079-01-6	RM00029	2010 ± 10 µg/mL
1,2-dibromo-3-chloropropane	000096-12-8	RM13666	2009 ± 10 µg/mL
1,2-dichloropropane	000078-87-5	RM12821	2008 ± 10 µg/mL
1,3-dichloropropane	000142-28-9	RM02080	2008 ± 10 µg/mL
2,2-dichloropropane	000594-20-7	RM12927	2005 ± 10 µg/mL
1,1-dichloropropene	000563-58-6	RM16247	2010 ± 10 µg/mL
cis-1,3-dichloropropene	010061-01-5	RM12891	2007 ± 10 µg/mL
trans-1,3-dichloropropene	010061-02-6	RM12254	2006 ± 10 µg/mL
hexachlorobutadiene	000087-68-3	RM09157	2005 ± 10 µg/mL
1,2,3-trichloropropane	000096-18-4	RM13082	2004 ± 10 µg/mL
naphthalene	000091-20-3	NT00970	2006 ± 10 µg/mL
benzene	000071-43-2	RM12931	2009 ± 10 µg/mL
n-butylbenzene	000104-51-8	RM03651	2008 ± 10 µg/mL
sec-butylbenzene	000135-98-8	RM10905	2005 ± 10 µg/mL
tert-butylbenzene	000098-06-6	RM14040	2007 ± 10 µg/mL
ethylbenzene	000100-41-4	RM12195	2006 ± 10 µg/mL
isopropylbenzene	000098-82-8	RM00835	2009 ± 10 µg/mL
4-isopropyltoluene	000099-87-6	RM09747	2009 ± 10 µg/mL
n-propylbenzene	000103-65-1	RM12785	2010 ± 10 µg/mL



ISO 17034 Cert No.
AR-1936

RM was produced in accordance with TUV USA Inc registered ISO 9001 Quality Management System. Cert # 56 100 18560026

Page: 2 of 4

www.agilent.com/quality/
CSD-QA-015.1



ISO 17025 Cert
No. AT-1937

Certificate of Analysis

Product Number: DWM-588-1

Lot Number: 0006518400

styrene	000100-42-5	RM13393	2010 ± 10 µg/mL
toluene	000108-88-3	RM06650	2008 ± 10 µg/mL
1,2,4-trimethylbenzene	000095-63-6	RM06731	2002 ± 10 µg/mL
1,3,5-trimethylbenzene	000108-67-8	RM12905	2009 ± 10 µg/mL
o-xylene	000095-47-6	RM15639	2005 ± 10 µg/mL
m-xylene	000108-38-3	RM15919	2006 ± 10 µg/mL
p-xylene	000106-42-3	RM02647	2009 ± 10 µg/mL
1,4-dichlorobenzene	000106-46-7	RM12826	2009 ± 10 µg/mL
bromobenzene	000108-86-1	RM10227	2008 ± 10 µg/mL
chlorobenzene	000108-90-7	RM01874	2008 ± 10 µg/mL
2-chlorotoluene	000095-49-8	RM13774	2007 ± 10 µg/mL
4-chlorotoluene	000106-43-4	RM11750	2009 ± 10 µg/mL
1,2-dichlorobenzene	000095-50-1	RM13636	2005 ± 10 µg/mL
1,3-dichlorobenzene	000541-73-1	NT00356	2009 ± 10 µg/mL
1,2,3-trichlorobenzene	000087-61-6	RM10193	2007 ± 10 µg/mL
1,2,4-trichlorobenzene	000120-82-1	RM09454	2009 ± 10 µg/mL
bromomethane	000074-83-9	RM00064	2002 ± 10 µg/mL
chloroethane	000075-00-3	RM00065	2010 ± 10 µg/mL
chloromethane	000074-87-3	RM12571	2010 ± 10 µg/mL
dichlorodifluoromethane	000075-71-8	RM05289	2010 ± 10 µg/mL
vinyl chloride	000075-01-4	RM05458	2010 ± 10 µg/mL

Matrix: methanol (methyl alcohol)

 ISO 17034 Cert No.
AR-1936

RM was produced in accordance with TUV USA Inc registered ISO 9001 Quality Management System. Cert # 56 100 18560026

Page: 3 of 4

www.agilent.com/quality/
CSD-QA-015.1

 ISO 17025 Cert
No. AT-1937

Certificate of Analysis

Product Number: DWM-588-1

Lot Number: 0006518400

Storage Conditions: Store Frozen (-25° to -10°C).

Traceability:

The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z540.3, ISO 9001, ISO 17025, and ISO 17034. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 1088.

Homogeneity:

This RM was unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

Intended Use:

This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods, and continuing calibration verification.

Instructions for Use:

Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening the container and should be processed without delay for the certified values to be valid within the stated uncertainties.

Hazards:

Refer to the Safety Data Sheet on www.agilent.com for information regarding this RM.

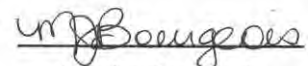
Expiration of Certification:

The certification of this RM is valid until the expiration date specified above, provided the RM is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the RM is damaged, contaminated, or otherwise modified.

Maintenance of Certification:

If substantive changes are noted that affect the certification before the expiration of this certificate, Agilent will notify the purchaser.

Sample lot approver:


Monica Bourgeois
QMS Representative

ISO 17034 Cert No.
AR-1936

RM was produced in accordance with TUV USA Inc registered ISO 9001 Quality Management System. Cert # 56 100 18560026

Page: 4 of 4

www.agilent.com/quality/
CSD-QA-015.1



ISO 17025 Cert
No. AT-1937

Certificate of Analysis

Product Name: Methyl tert-Butyl Ether Standard

Product Number: STS-440-1

Lot Issue Date: 19-Aug-2020

Lot Number: 0006555762

Expiration Date: 31-Aug-2022

Description:

This analytical reference material (RM) was manufactured and verified in accordance with an ISO 9001 registered quality system, and analyte concentrations were verified by an ISO 17025 accredited laboratory. The concentration and uncertainty value at the 95% confidence level for each analyte, determined gravimetrically, is listed below.

Analyte	CAS#	Analyte Lot	Concentration ± Uncertainty
tert-butylmethyl ether	001634-04-4	RM06568	2006 ± 10 µg/mL

Matrix: methanol (methyl alcohol)

Storage Conditions: Store Frozen (-25° to -10°C).

Traceability:

The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z540.3, ISO 9001, ISO 17025, and ISO 17034. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 1088.

Homogeneity:

This RM was unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

Intended Use:

This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods, and continuing calibration verification.

Instructions for Use:

Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening the container and should be processed without delay for the certified values to be valid within the stated uncertainties.

Hazards:

Refer to the Safety Data Sheet on www.agilent.com for information regarding this RM.

Expiration of Certification:

The certification of this RM is valid until the expiration date specified above, provided the RM is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the RM is damaged, contaminated, or otherwise modified.

Maintenance of Certification:

If substantive changes are noted that affect the certification before the expiration of this certificate, Agilent will notify the purchaser.

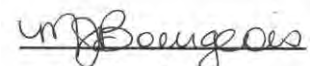
J000094

MTBE Solution

Expires 8/31/2022

Prepared By Paul Campbell 1/5/2021

Sample lot approver:



Monica Bourgeois

QMS Representative



ISO 17034 Cert
No. AR-1936

RM was produced in accordance with TUV USA Inc registered ISO 9001 Quality Management System. Cert # 56 100 18560026

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www.agilent.com/quality/
CSD-QA-015.1



ISO 17025 Cert
No. AT-1937



Reference Materials Producer
Cert #2495.01

SPEX[®]ertificate

Certificate of Reference Material



Chemical Testing
Cert #2495.02

Catalog Number: S-3800 **Lot No.** CP201130003

Description: Vinyl acetate

Matrix: Methanol (Purge & Trap Grade)

Ship Date: January 14, 2021

Expiration Date: January 14, 2022

This SPEXOrganics[®] Certified Reference Material, CRM, is intended primarily for use as a calibration standard or quality control standard for organic chromatography instrumentation such as GC, GC-MS, LC, and LC-MS. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Compounds:

<u>Compound</u>	<u>CAS #</u>	<u>Labeled</u>	<u>Purity</u>	<u>Certified†</u>	<u>Uncertainty</u>
Vinyl acetate	108-05-4	1000 µg/mL	99%	988 µg/mL	± 35 µg/mL

J000707

Vinyl Acetate 1000

Expires 1/14/2022

Prepared By Paul Campbell 1/20/2021

* - Isomer ratios (when applicable) are an uncertified parameter.

Final Solution Verification:

Final solution integrity verified by Gas Chromatography/Mass Spectrometry. The mass spectrum of each compound was confirmed against the NIST mass spectral database.

† Certified concentration based on gravimetric weights and corrected for the purity of the compound(s) used to prepare the standard. Analytical balance calibration is verified daily with C1 weight set #23-190006 which is registered with Atlantic Scale, and traceable to NIST and NJ Division of Weights and Measures.

This CRM is guaranteed stable and accurate to within the uncertainty listed for the certified value. This includes uncertainty components due to preparation, homogeneity, short term and long term stability. During the stated period of validity, the purchaser will be notified if this product is recalled due to any significant changes in the stability of the solution. For further information, contact the Sales Support Department at crmsales@spexcsp.com.

Date of Certification: October 20, 2021

Certifying Officer: *Shannon Macieira*
Shannon Macieira, Operations Manager

Report of Certification

Catalog Number: S-3800

Lot No. CP201130003

Description: Vinyl acetate

Matrix: Methanol (Purge & Trap Grade)

Ship Date: October 20, 2021

Expiration Date: October 20, 2022

This Certified Reference Material (CRM) has been prepared and certified under an ISO 9001 (certified by DQS) and ISO 17025 (accredited by A2LA), and ISO 17034 (accredited by A2LA) quality system consistent with the following standards:

- ISO 9001: Quality management systems - Requirements
- ISO/IEC 17025: General requirements for the competence of testing and calibration laboratories
- ISO 17034: General requirements for the competence of reference material producers
- ISO Guide 30: Reference Materials - Selected terms and definitions
- ISO Guide 31: Reference Materials - Contents of certificates and labels
- ISO Guide 35: Reference Materials - General and Statistical principals for certification
- Guide to the Expression of Uncertainty in Measurement, 2008
- EURACHEM/CITAC Guide: Qualifying Uncertainty in Analytical Measurement - Third Edition
- NIST Technical Note 1297

Storage Requirements:

To ensure the stability of the product once it arrives in your laboratory, please store this product in a freezer (-35°C to -10°C). Note: Shipping conditions may differ from storage conditions. The EXPIRATION DATE is calculated from the SHIPPED DATE using our stability data and is applicable only if the product is stored under the laboratory specified conditions.

Instructions for Use:

Let material come to room temperature before use. Check for precipitate and if necessary sonicate for one minute. If compounds do not dissolve after one minute then sonicate further until the product is dissolved. A clear appearance is acceptable. The minimum recommended amount that should be removed from this vial is 5µL with a 25µL gas tight syringe. All solutions should be thoroughly mixed, by shaking, prior to use. All surfaces that come in contact with the solution must be thoroughly cleaned prior to use. Dilutions should be performed only with Class A volumetric glassware.

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For assistance, please contact sales support at crmsales@spexcsp.com.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, and analytical instrumentation have been qualified prior to use. The highest purity solvents and Class A / calibrated volumetrics have been used in all preparations.

Homogeneity:

The homogeneity of this CRM has been confirmed by procedures consistent with ISO 17025, ISO 17034, and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed to prove homogeneity in accordance with our internal procedure 4300-HOMOGEN-1A. This is consistent with the intended use of this CRM. The Degree of Homogeneity, as expressed as maximum between-bottle variation, is 1.2%

Statistical Estimator and Confidence Limits:

The Certified value 'X' as listed on the reverse of this document is at the 95% level of confidence and can be expressed as:

- $X = x \pm U$ where X=certified value, U=expanded uncertainty, x=property value
- $U = k u_c$ where k=2 is the coverage factor at the 95% confidence level
- u_c = combined standard uncertainty obtained by combining the individual compound standard uncertainty components u_i , where $u_c = \sqrt{\sum u_i^2}$

Legal Notice:

SPEX CertiPrep Certified Reference Materials are not for any cosmetic, drug, or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this Reference Material shall be greater than the purchase price. In no event shall SPEX CertiPrep be liable for any loss of profits or any incidental, special, or consequential damages.

SPEX CertiPrep 

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Rev: 0

Final Report 2110294 10/21/2021 Page 167 of 797



CERTIFIED WEIGHT REPORT

Part Number: 19267
Lot Number: 030918
Description: p-Bromofluorobenzene
EPA Method 502/524 Surrogate Standard #2
Expiration Date: 030923
Recommended Storage: Refrigerate (4 °C)
Nominal Concentration (µg/mL): 2000
NIST Test ID#: 2506734D
Weight(s) shown below were combined and diluted to (mL): 100.0

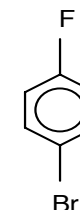
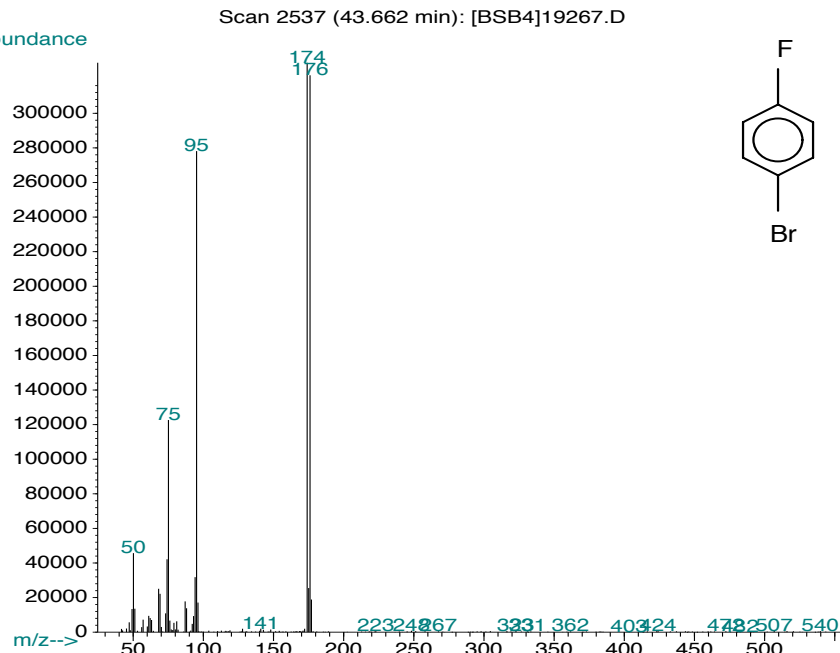
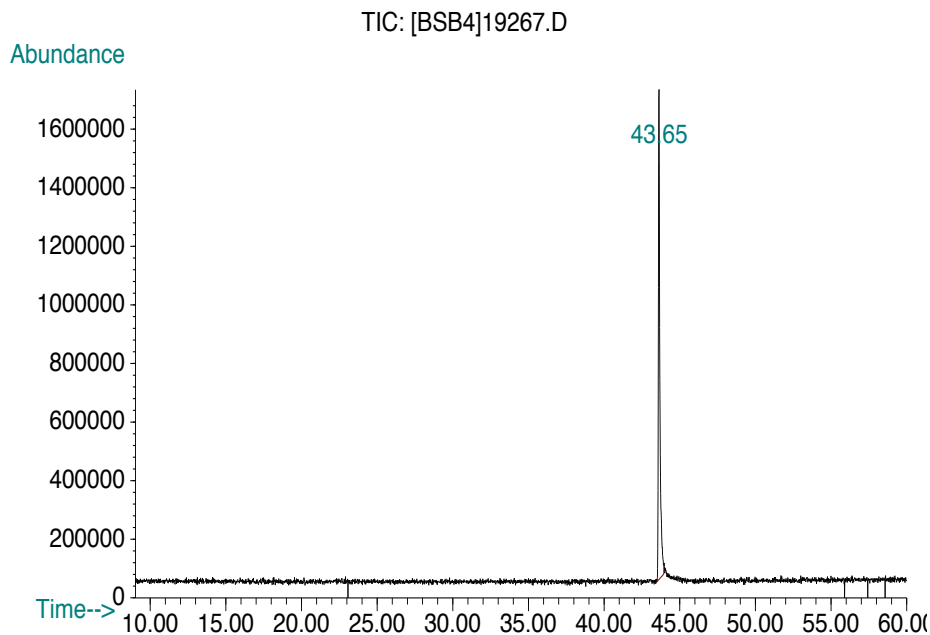
Solvent(s): Methanol
Lot#: DS435

5E-05 Balance Uncertainty
0.001 Flask Uncertainty

		030918
Formulated By:	Jason Criscio	DATE
		030918
Reviewed By:	Pedro L. Rentas	DATE

Compound	RM#	Lot Number	Nominal Conc (µg/mL)	Purity (%)	Uncertainty Purity	Target Weight(g)	Actual Weight(g)	Actual Conc (µg/mL)	Expanded Uncertainty (+/-) (µg/mL)	SDS Information (Solvent Safety Info. On Attached pg.)		
										CAS#	OSHA PEL (TWA)	LD50
1. p-Bromofluorobenzene	48	01127COV	2000	99	0.2	0.20204	0.20234	2002.9	8.2	460-00-4	N/A	orl-rat 2700mg/kg

Method: GC6MSD-1; **Detector:** Mass Selective Detector; **Column:** Vocol (60m X 0.25mm ID X 1.5µm film thickness); **Oven Profile:** Temp. 1 = 35°C (Time1=10min.), Temp. 2 = 200°C (Time2=8.75 min.), Rate = 4°C/min., **Injector Temp. = 200°C, Detector Temp. = 220°C. Analyst:** Candice Warren.



- The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- All Standards, after opening ampule, should be stored with caps tight and under appropriate laboratory conditions.
- Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, DC, (1994).

J001274
BFB stock
Expires 3/9/2023
Prepared By Paul Campbell 2/4/2021

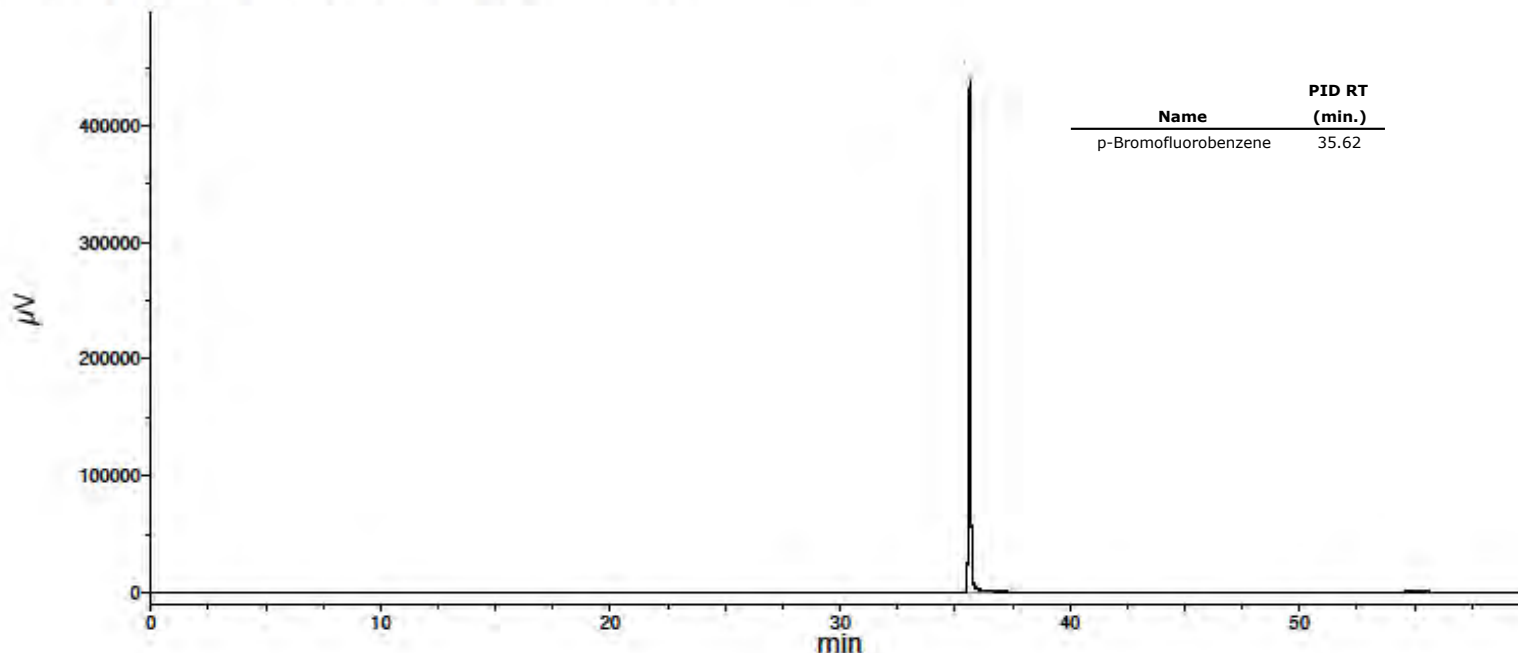


Run 37, "P19267 L030918 [2000µg/mL in MeOH]"

Run Length: 60.00 min, 36000 points at 10 points/second.
Created: Mon, Mar 12, 2018 at 10:30:10 AM.
Sampled: Sequence "030818-GC1", Method "GC1-M7".
Analyzed using Method "GC1-M7".

Comments

GC1-M7 Analysis by Candice Warren
Column ID SPB-Vocol 105 meter X 0.53mm X 3.0µm film thickness
Flow rates: Total flow=150mL/min., Helium (carrier)=10mL/min.,
Helium(make-up)=40mL/min., Hydrogen(make-up)=100mL/min.
Oven Profile: Temp. 1=35°C (Time 1=10 min.), Temp 2=200°C (Time 2=8.75 min.),
Rate = 4°C/min., Total run time=60 min. Injector temp.=200°C, FID Temp.=200°C.
ELCD Signal = Edaq Channel 1 PID Signal = Edaq Channel 2
Standard injection = 0.5µL, Range=4 Purge Valve = 8 min.





7290B Investment Drive North Charleston, South Carolina 29417
 Phone: 866.272.0932 Fax: 866.509.5146 www.o2si.com



ISO 17025 Accredited Chemical Testing Lab
 Cert. No. 3031.01

Date Received: _____

Certificate of Analysis

Rev 0

Page 1 of 1

Catalog No.: 120016-01 **Lot No.:** 434093 **Storage:** ≤ -10 °C **Solvent:** P/T Methanol **Exp. Date:** 9-Feb-2026 **Description:** Method 8260 Gases, 2,000 mg/L, 1 mL

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
bromomethane	74-83-9	99.5	139.158.1.1P	2009 ± 4.5 mg/L
chloroethane	75-00-3	99.94	141.2.2P	2005 ± 4.03 mg/L
chloromethane	74-87-3	99	140.158.2.2P	1997 ± 20.36 mg/L
dichlorodifluoromethane	75-71-8	99	142.158.5P	1993 ± 20.32 mg/L
trichlorofluoromethane	75-69-4	99	144.1.3P	2000 ± 12.17 mg/L
vinyl chloride	75-01-4	99	143.158.5.1P	1987 ± 20.26 mg/L

J002342
 CLP VOA Gases Stock
 Expires 2/9/2026
 Prepared By Paul Campbell 3/2/2021

Certified By: _____

Erica Lawson

Manufacture Date 10-Feb-2021

Follow all storage requirements, keep tightly closed when not in use, and use good laboratory practices when handling. This Reference Material was manufactured, produced, and/or certified under a quality management system that is accredited to ISO 17034 and ISO/IEC 17025.

All weights are traceable through N. I. S. T. Test No. 822/264157-00. Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.

The stated uncertainty is the expanded uncertainty with a coverage factor of two to give a 95% confidence level.



CERTIFIED REFERENCE MATERIAL

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800)356-1688
Fax: (814)353-1309



Certificate of Analysis



www.restek.com

FOR LABORATORY USE ONLY-READ SDS PRIOR TO USE.

This Reference Material is intended for Laboratory Use Only as a standard for the qualitative and/or quantitative determination of the analyte(s) listed.

Catalog No. : ! "#\$ **Lot No.:** %!#&!''

Description : ()*+,%. /010/-201*3143
()*+,%. /010/-201*3143-''!!-56789:-;<= ->/0?1*@,-#89718AB,

Container Size : "-89 **Pkg Amt:** F-#-89

Expiration Date : J.0@K/4- #-:!'"" **Storage:** C"!DE-@4-.@,3/4

Handling: =?)G-A4@3B.0-)G-A?@0@G/*G)0)H/I **Ship:** J*-L./

CERTIFIED VALUES

Elution Order	Compound	Grav. Conc. (weight/volume)	Expanded Uncertainty (95% C.L.; K=2)
1	Vinyl acetate CAS # 108-05-4 Purity 99%	2,006.0 µg/mL	+/- 11.7723 µg/mL Gravimetric +/- 121.0414 µg/mL Unstressed +/- 121.3288 µg/mL Stressed

Solvent: P&T Methanol
CAS # 67-56-1
Purity 99%

J005912
Vinyl Acetate
Expires 10/31/2022
Prepared By Paul Campbell 6/4/2021

Tech Tips:

()*+,-1./010/-)G-1-H@,10),/-@461*)-/G0/4-)*.,B3/3-)*-0?/-0146/0-,)G0G-@M-G/H/*1,*B2@?/4-8/0?@3G*3/4-1.)3)-.@*3)0)*G:-/G0/4G-4/1.0-P)0?-1.,@?@,G-0@-M@48-*/P-/G0/4G-Q041*G/G0/4)M).10)*RI->/0?1*@,CK1G/3-8)S/G-.*01)*6-?1,@6/*10/3-.@8A@B*3G-14/G,)6?0,+-.1.)3):-G@-0-)G-)8A@401*0-0@-8)*8)T/-/SA@GB4/-@M-H)*+,-1./010/-0@-8)S/G-@M-?1,@6/*10/3-.@8A@B*3G-)*-8/0?1*@,-I-U@4-0?)4/1G@*P/-@M/4-H)*+,-1./010/-)*-3)H)3B1,-G@,B0)*@GB66/G0-0?10-)0-K/-)*04@3B./3-)*0@-0?/-P@4V)*6-,/H/,-.1,)K410)*-G@,B0)*-)88/3)10/,+K/M@4/-BG/I=?)G-P),,-8)*8)T/-A4@K,/8G-1*3-/*GB4/-8@4/-.*G)G0/*0-4/GB,0GI

Column:
!"#\$%&'()*+,-./:;<=>?@A

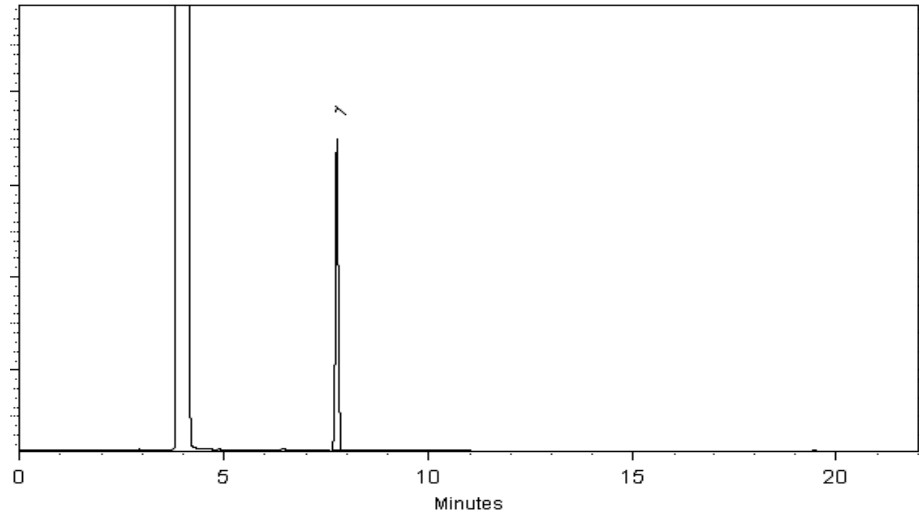
Carrier Gas:
3456789:;.<=>?@A

Temp. Program:
?!@A\$-37B5,\$#>?@A
C\$D@AE#>.&\$-37B5"\$#>.&2

Inj. Temp:
,!@A

Det. Temp:
,"!@A

Det. Type:
FGH



=?)G-.?4@810@6418-4/A4/G/*0G-1-6/*41,-G/0-@M-0/G0)*6-.@*3)0)*G-.?@G/*-M@4-A4@3B.0-1./A01*/I--U@4-@A0)81,-4/GB,0G-)*+@B4-,1K:-.@*3)0)*G-G?@B,3-K/-13WBG0/3-M@4-+@B4-GA/.)M)-)*G04B8/*0:-8/0?@3:-1*3-1AA,.)10)*I

Russ Bookhamer
Russ Bookhamer - Operations Technician I

Date Mixed: 05-Apr-2021 Balance: 1128342314

Alexis Shelow
Alexis Shelow - Operations Tech I

Date Passed: 09-Apr-2021

Manufactured under Restek's ISO 9001:2015
Registered Quality System
Certificate #FM 80397

General Certified Reference Material Notes

Expiration Notes:

- OSA)410)@*-310/-H1,)3-M@4-B* @A*/3-18AB,-G0@4/3-)*-.@8A,)1*./-P)0?-0?/-4/ .@88/*3/3-.@*3)0)@*GI
- N*/.401)*0+-.@*/.*0410)@*-1*3-(SA)410)@*-@M-0?/-EZ>-14/-K1G/3-@*-0?/-B* @A*/3-A4@3B.0-K/)*6-G0@4/3-1..@43)*6-0@-0?/-4/ .@88/*3/3-.@*3)0)@*-M@B*3-)*-0?/-G0@416/-M/),3I

Purity Notes:

- ;B4)0+1*37@4-.?/8).1,-)/3*0)0+-14/-3/0/48)*3-K+-@*/-@4-8@4/-@M-0?/-M@,,@P)*6-0/.*?)]B/G^_E7UL`:-a;9E:-_E75OE`:-_E7>2:-9E7>2:-ZL:-1*37@4-8/0)*6-A@)*0I
- E@8A@B*3G-P)0?-1-,)G0/3-AB4)0+-@M-,/GG-0?1*-"b-?1H/-K/!/*-P/6?0-.@44/0/3-0@-.@8A/*G10/-M@4-)8AB4)0)/G-%37@4-G1,0GI-.@44/0)@*-M1.0@4-)G-BG/3-0@-.1.,B,10/0?/-18@B*0-@M-.@8A@B*3-*/./GG14+-0@-1.?)H/0?/-3/G)4/3-.@*/.*0410)@*-@M-0?/-A14/*0-.@8A@B*3-)*-G@,B0)@*I--
- ;B4)0+-@M-)G@8/4)-. @8A@B*3G-)G-4/A@40/3-1G-0?/-GB8-@M-0?/-)G@8/4GI--
- ;B4)0+-H1,B/G-14/-4@B*3/3-0@-0?/-*/14/G0-P?@,/*B8K/4I

Certified Uncertainty Value Notes:

- =?/-B*./401)*0)/G-14/-3/0/48)*3-)*-1..@431*./-P)0?-L2J-#&! \-1*3-_B)3/-Xl-=?/-./40)M)/3-.@8K)*3-G04/GG/3-B*./401)*0+-H1,B/-Q-)*.B3/G-641H)8/04).-B*./401)*0+:-?@8@6/*)0+-K/0P/*C18AB,-B*./401)*0+-G0@416/-G01K),)0+B*./401)*0+-1*3-G?)AA)*6-G01K),)0+-B*./401)*0+-1*3-P/4-.@8K)*3-BG)*6-0?/-M@,,@P)*6-M@48B,1^

$$U_{combined\ stressed} = k \sqrt{U_{gravimetric}^2 + U_{homogeneity}^2 + U_{storage\ stability}^2 + U_{shipping\ stability}^2}$$

- k)G-1-.@H/416/-M1.0@4-@M-":-P?).?-6)H/G-1-,/H/,-@M-.@*M)3*/.-@M-1AA4@S)810/,+Xbl
- L0-)G-)8A@401*0-0@-@0/-0?10-0?/-G?)AA)*6-G01K),)0+-B*./401)*0+-P1G-@K01)*3-B*3/4-0/8A/410B4/-/S04/8/G-M@4-GA/.)M)-0)8/-)0/4H1,Gc-0?/4/M@4/:-0?/-./40)M)/3-.@8K)*3-G04/GG/3-B*./401)*0+-H1,B/-G?@B,3-@*,+K-1AA,)/3-0@-0?/-A4@3B.0-)M-)0-P1G-G0@4/3-10-*@CG01*3143-0/8A/410B4/-.*3)0)@*G-BA-0@-1*3-)*.B3)6@-01-CZ/G0A/?.*).1,-2/4H)/-10-PPPI4/G0/VI.@87E@*01.0CNG@4-BG/-4/ .@88/*310)@*G-)M-+@B4-G?)A8/*0-P1G-)*C041*G)0-M@4-8@4/0?1*-&-31+G-10--@*CG01*3143-0/8A/410B4/-.*3)0)@*GI
- %AA,+0?/-./40)M)/3-.@8K)*3-B*G04/GG/3-B*./401)*0+-H1,B/-)M-0?/-A4@3B.0-P1G-4/./)H/3-B*3/4-G01*3143-G?)AA)*6-.@*3)0)@*GI---%AA,+0?/-./40)M)/3-.@8K)*3-G04/GG/3-B*./401)*0+-H1,B/-)M-0?/-A4@3B.0-P1G-4/./)H/3-B*3/4-*@CG01*3143-.@*3)0)@*G-1G-GA/.)M)/3-K/,@PI-

Label Conditions	Standard Conditions	Non-Standard Conditions
"XDE-Y@8)*1,-Z@ @8/8A/410B4/ R	d-\$!DE-	[-\$!DE-BA-0@-&-31+G
#!DE-@4-.@,3/4-QZ/M4)6/410/R	d-!DE-	[-!DE-BA-0@-&-31+G
!DE-@4-.@,3/4-QU4//T/4R C"!DE-@4-.@,3/4-Q//A-U4//T/4R	d-"XDE-	[-"XDE--BA-0@-&-31+G

- 2/A1410/-Q* @0-.@8K)*3R-B*./401)*0+-H1,B/G-M@4-641H)8/04).-B*./401)*0+-14/-1,G@-3)GA,1+3-@*-0?/-./40)M).10/:-)M-*/3/3:--G/A1410/-?@8@6/*)0+-K/0P/*C18AB,-B*./401)*0+-G0@416/-G01K),)0+-B*./401)*0+-1*3-G?)AA)*6-G01K),)0+-B*./401)*0+-H1,B/G-14/-1H1),1K,/-K+-.@*01.0)*6-Z/G0A/?.*).1,-2/4H)/-10-PPPI4/G0/VI.@87E@*01.0CNG
- =?/-A1.V16/3-18@B*0-)G-0?/-8)*8B8-G18A,/G)T/-M@4-P?).?-B*./401)*0+-)G-H1,)3I---?/-18AB,/G-14/-@H/4CM),,)/3-0@-/*GB4/-0?10-0?/-8)*8B8-A1.V16/3-18@B*0-.1*-K/-GBM),)*0,+041*GM/44/3

Manufacturing Notes:

- E@*./0410)@*-)G-K1G/3-BA@*-641H)8/04).-A4/A1410)@*-BG)*6-/)0?/4-1-K1,1*./-P?@G/-1,)K410)@*-?1G-K/*-H/4)M)/3-31),+BG)*6-YL2-041./1K,/-P/)/6?0G-1*37@4-3),B0)@*G-P)0?-P/46G GP14/

Handling Notes:

- 201K),)0+-@M-0?/-B* @A*/3-A4@3B.0:-P?/*-G0@4/3-)*-.@8A,)1*./-P)0?-0?/-4/ .@88/*3/3-.@*3)0)@*G-)G-6B141*0//3-0?4@B6?-0?/-SA)410)@*-3)GA,1+3-@*-0?/-A4@3B.0-,1K,/-1*3-./40)M).10/I-E@*01.0-Z/G0/V-M@4-133)0)@*1,-@A*/3-A4@3B.0-G01K),)0+-)*M@4810)@*-P)0?-0?/-V* @P,/36/7B*3/4G01*3)*6-0?10-@A*/-A4@3B.0-G01K),)0+-)G-GBKW/.0-0@-0?/-GA/.)M)-?1*3,)*6-1*3-/*H)4@*8*01,-.*3)0)@*G-0@-P?).?-0?/-A4@3B.0-)G-/SA@G/3I-U@4-+@B4-.@*H/*)*/-Z/G0/V-GBAA,)/G-3/1.0)H10/3-H)1,G-P)0?-8@G0-G01*3143G-A1.V/3-8-18AB,/GI-9146/4-H@,B8/-3/1.0)H10/3-H)1,G-14/-1H1),1K,/-0?4@B6?-Z/G0/V-1G-1-.BG0@8-@43/4/3-)0/8I-%33)0)@*1,,+:-Z/G0/V-G/,G- >'E2-M@4-0?/-AB4A@G/-@M-6,1GGP14/-3/1.0)H10)@*-1G-.101,@6-*B8K/4- #e\$#:-P?).?-)*.B3/G-.@8A,/0-)*G04B.0)@*GI

Certificate of Analysis

Product Name: 1,2-Dichlorobenzene-d4 Standard

Product Number: STS-210-1

Lot Issue Date: 11-Aug-2020

Lot Number: 0006552847

Expiration Date: 30-Sep-2024

Description:

This analytical reference material (RM) was manufactured and verified in accordance with an ISO 9001 registered quality system, and analyte concentrations were verified by an ISO 17025 accredited laboratory. The concentration and uncertainty value at the 95% confidence level for each analyte, determined gravimetrically, is listed below.

Analyte	CAS#	Analyte Lot	Concentration ± Uncertainty
1,2-dichlorobenzene-d4	002199-69-1	RM11038	2002 ± 10 µg/mL

Matrix: methanol (methyl alcohol)

Storage Conditions: Store Frozen (-25° to -10°C).

Traceability:

The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCCL Z540.3, ISO 9001, ISO 17025, and ISO 17034. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 1088.

Homogeneity:

This RM was unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

Intended Use:

This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods, and continuing calibration verification.

Instructions for Use:

Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening the container and should be processed without delay for the certified values to be valid within the stated uncertainties.

Hazards:

Refer to the Safety Data Sheet on www.agilent.com for information regarding this RM.

Expiration of Certification:

The certification of this RM is valid until the expiration date specified above, provided the RM is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the RM is damaged, contaminated, or otherwise modified.

Maintenance of Certification:

If substantive changes are noted that affect the certification before the expiration of this certificate, Agilent will notify the purchaser.

J007623

d4 1,2 Dichlorobenzene Stock
Expires 9/30/2024
Prepared By Paul Campbell 7/23/2021

Sample lot approver:


Monica Bourgeois
QMS Representative



ISO 17034 Cert
No. AR-1936

RM was produced in accordance with TUV USA Inc registered ISO 9001 Quality Management System. Cert # 56 100 18560026

Page: 1 of 1

www.agilent.com/quality/



ISO 17025 Cert
No. AT-1937

Date Received: _____

Certificate of Analysis

Rev 0

Page 1 of 1

Catalog No.: 120002-01 **Lot No.:** 456477 **Storage:** -18°C +/- 4°C
 -5PAK **Solvent:** P/T Methanol **Exp. Date:** 22-Jul-2026 **Description:** 8260B Surrogate Solution, 2,000 mg/L, 5 x 1 ml

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
4-bromofluorobenzene (BFB)	460-00-4	99.5	135.7.1P	1982 ± 25.4 mg/L
dibromofluoromethane	1868-53-7	99	136.290.3P	2008 ± 28.96 mg/L
1,2-dichloroethane-d4	17060-07-0	99.8	138.120.2P	1992 ± 25.6 mg/L
toluene-d ₈	2037-26-5	100	137.12.4P	2003 ± 25.74 mg/L

J008077

8260B Surrogate Solution
 Expires 7/22/2026
 Prepared By Paul Campbell 8/5/2021



Certified By: _____

Jared Ball

Manufacture Date 23-Jul-2021

Follow all storage requirements, keep tightly closed when not in use, and use good laboratory practices when handling. This Reference Material was manufactured, produced, and/or certified under a quality management system that is accredited to ISO 17034 and ISO/IEC 17025.

All weights are traceable through N. I. S. T. Test No. 822/264157-00. Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.

The stated uncertainty is the expanded uncertainty with a coverage factor of two to give a 95% confidence level.

Date Received: _____

Certificate of Analysis

Rev 0

Page 1 of 1

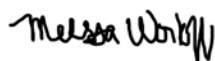
Catalog No.:	Lot No.:	Storage:	Solvent:	Exp. Date:	Description:
121020-02	425069	≤ 6 °C	P/T Methanol	1-Oct-2025	Ketones Solution, 5000 mg/L, 1 mL

Compound	CAS No.	Purity (%)	Neat Material Lot No.	Concentration
acetone	67-64-1	99.6	196.271.4P	5024 ± 52.27 mg/L
2-butanone (MEK)	78-93-3	99.9	197.18.1P	5018 ± 72.37 mg/L
2-hexanone	591-78-6	99.7	199.7.2.1P	5002 ± 52.22 mg/L
4-methyl-2-pentanone (MIBK)	108-10-1	99.6	198.1.3P	5015 ± 72.32 mg/L

J008079

Ketones SS Stock
 Expires 10/1/2025

Prepared By Paul Campbell 8/5/2021



Certified By: _____

Melissa Workoff
 Manufacture Date 2-Oct-2020

Follow all storage requirements, keep tightly closed when not in use, and use good laboratory practices when handling. This Reference Material was manufactured, produced, and/or certified under a quality management system that is accredited to ISO 17034 and ISO/IEC 17025.

All weights are traceable through N. I. S. T. Test No. 822/264157-00. Concentration (correct for purity) and uncertainty (95% confidence) values listed are determined gravimetrically.

The stated uncertainty is the expanded uncertainty with a coverage factor of two to give a 95% confidence level.



CERTIFIED WEIGHT REPORT

Part Number: 92579
Lot Number: 052319
Description: 2-Pentanone

Solvent(s): Methanol (90%), Water (10%)
Lot#: DU230-US (90%), 011619 (10%)

Expiration Date: 052324
Recommended Storage: Refrigerate (4 °C)
Nominal Concentration (µg/mL): 2000
NIST Test ID#: 6UTB

Weight(s) shown below were combined and diluted to (mL): 25.0

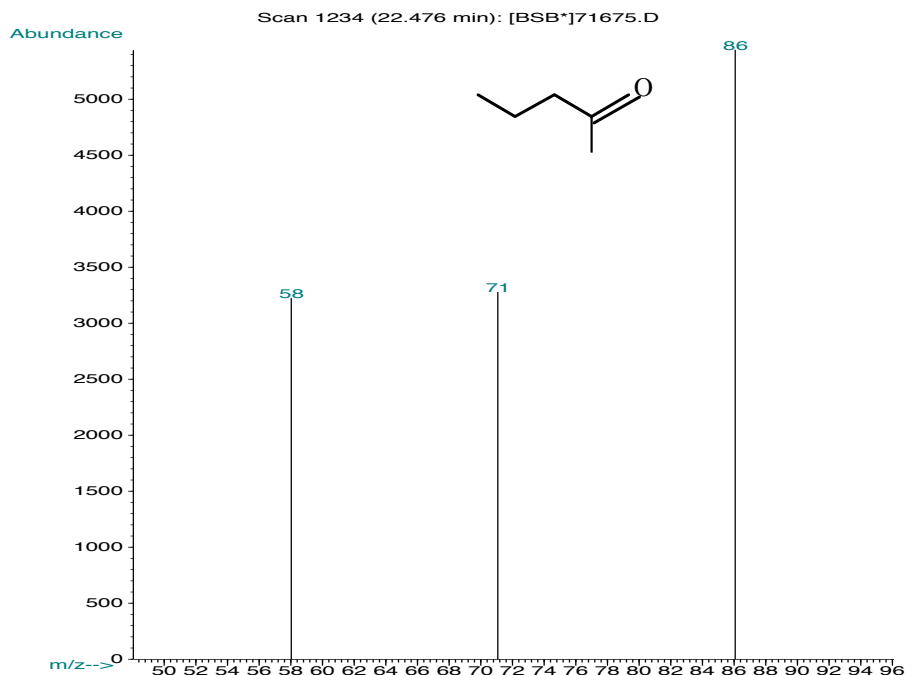
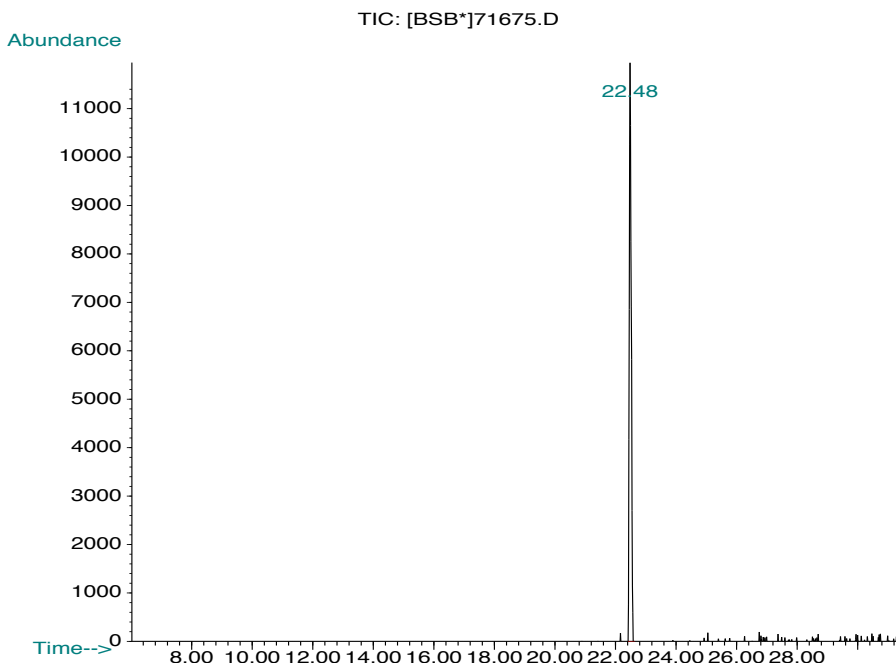
5E-05 Balance Uncertainty
0.002 Flask Uncertainty

<i>Elu Mega</i>		052319
Formulated		DATE
<i>Pedro L. Rentas</i>		052319
Reviewed By:	Pedro L. Rentas	DATE

Expanded SDS Information
(Solvent Safety Info. On Attached pg.)

Compound	Lot RM#	Lot Number	Nominal Conc (µg/mL)	Purity (%)	Uncertainty Purity	Target Weight(g)	Actual Weight(g)	Actual Conc (µg/mL)	Expanded Uncertainty (+/-) µg/mL	CAS#	OSHA PEL (TWA)	LD50
1. 2-Pentanone	1675	ER 07040KN	2000	99	0.2	0.05051	0.05060	2003.5	9.0	107-87-9	N/A	N/A

Method GC6MSD-1: Column: Vocol (60m X 0.25mm ID X 1.5µm film thickness). Temp. 1 = 35°C (10min.), Temp. 2 = 200°C (8.75 min.), Rate = 4°C/min., Injector Temp. = 200°C, Detector Temp. = 220°C. Solvent Delay: 7 minutes. Analysis performed by Candice Warren.



- The certified value is the concentration calculated from gravimetric and volumetric measurements unless otherwise stated.
- Standards are prepared gravimetrically using balances that are calibrated with weights traceable to NIST (see above).
- Standards are certified (+/-) 0.5% of the stated value, unless otherwise stated.
- All Standards, after opening ampule, should be stored with caps tight and under appropriate laboratory conditions.
- Uncertainty Reference: Taylor, B.N. and Kuyat, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Result," NIST Technical Note 1297, U.S. Government Printing Office, Washington, DC, (1994).

J008176

2-Pentanone 2000
Expires 5/23/2024
Prepared By Paul Campbell 8/9/2021

**Run 119, "P92579 L052319 [2000µg/mL in M:W(9:1)]"**

Run Length: 60.00 min, 36000 points at 10 points/second.

Created: Mon, May 27, 2019 at 8:24:48 PM.

Sampled: Sequence "052119-GC1", Method "GC1-M7".

Analyzed using Method "GC1-M7".

Comments

GC1-M7 Analysis by Candice Warren

Column ID SPB-Vocol 105 meter X 0.53mm X 3.0µm film thickness

Flow rates: Total flow=150mL/min., Helium (carrier)=10mL/min.,

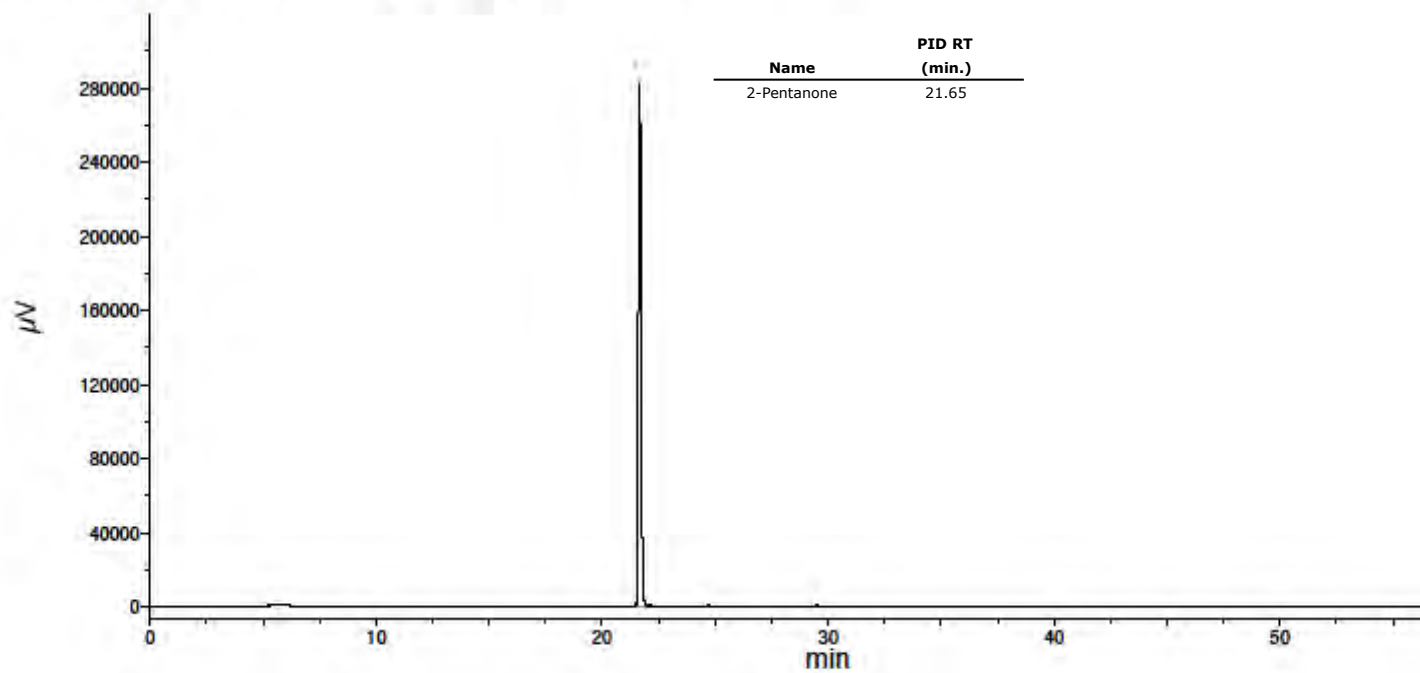
Helium(make-up)=40mL/min., Hydrogen(make-up)=100mL/min.

Oven Profile: Temp. 1=35°C (Time 1=10 min.), Temp 2=200°C (Time 2=8.75 min.),

Rate = 4°C/min., Total run time=60 min. Injector temp.=200°C, FID Temp.=200°C.

ELCD Signal = Edaq Channel 1 PID Signal = Edaq Channel 2

Standard injection = 1.0µL, Range=4 Purge Valve = 8 min.





CERTIFIED REFERENCE MATERIAL

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800)356-1688
Fax: (814)353-1309

www.restek.com

Certificate of Analysis



FOR LABORATORY USE ONLY-READ SDS PRIOR TO USE.

This Reference Material is intended for Laboratory Use Only as a standard for the qualitative and/or quantitative determination of the analyte(s) listed.

Catalog No. : !!!" **Lot No.:** #!\$"%&"

Description : '(#)*+,-./+0-12)3-4)5\$
'(#)*+,-./+0-12)3-4)5\$)67!!!89;.<7)=> ?)3@0A+21B +0@WD!E\$!F7)
\$;<:+;GH,

Container Size : L);< **Pkg Amt:** M)\$);<

Expiration Date : N@J@;.@/) \$7)L!L **Storage:** !!*)1/)J1,K@/

Ship: #,-@20

CERTIFIED VALUES

Elution Order	Compound	Grav. Conc. (weight/volume)	Expanded Uncertainty (95% C.L.; K=2)			
1	Acetone	5,002.8 µg/mL	+/-	29.0869	µg/mL	Gravimetric
	CAS # 67-64-1 (Lot SHBL7812)		+/-	301.8431	µg/mL	Unstressed
	Purity 99%		+/-	302.5597	µg/mL	Stressed
2	2-Butanone (MEK)	5,015.7 µg/mL	+/-	29.1615	µg/mL	Gravimetric
	CAS # 78-93-3 (Lot SHBL6194)		+/-	302.6174	µg/mL	Unstressed
	Purity 99%		+/-	303.3359	µg/mL	Stressed
3	4-Methyl-2-pentanone (MIBK)	5,008.7 µg/mL	+/-	29.1208	µg/mL	Gravimetric
	CAS # 108-10-1 (Lot SHBL5515)		+/-	302.1951	µg/mL	Unstressed
	Purity 99%		+/-	302.9125	µg/mL	Stressed
4	2-Hexanone	5,004.2 µg/mL	+/-	29.0947	µg/mL	Gravimetric
	CAS # 591-78-6 (Lot MKCL1599)		+/-	301.9236	µg/mL	Unstressed
	Purity 99%		+/-	302.6404	µg/mL	Stressed

Solvent: P&T Methanol/Water (90:10)
CAS # 67-56-1/7732-18-5
Purity 99%

J008268

Ketones Stock

Expires 12/31/2023

Prepared By Paul Campbell 8/11/2021

Column:
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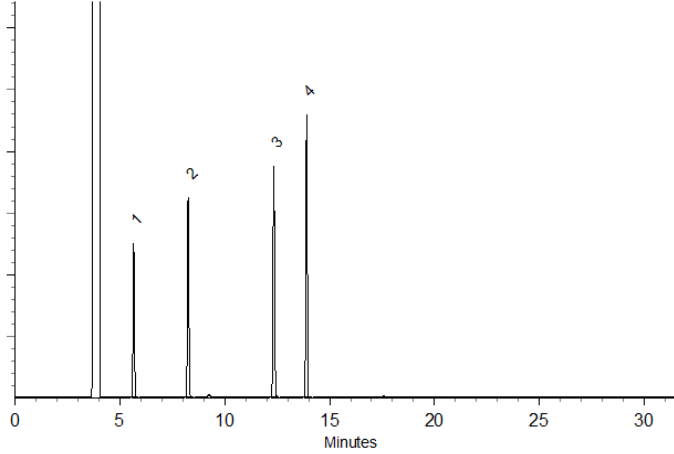
Carrier Gas:
3456789:;.<*/:*\$@;= &!\$;>&

Temp. Program:
?!@A\$-37B5\$, \$#>:~\$,\$!@A
C\$D@AE#>:&\$-37B5"\$#>:&2

Inj. Temp:
,!!@A

Det. Temp:
,!!@A

Det. Type:
FGH



?A-S)JA/1;+019/+;)/@G/@S@20S)+)9@2@/+,)S@0)1R)0@S0-29)J12K-0-12S)JA1S@2)R1/)G/1KHJ0
 +JJ@G0+2J@Q))T1/)1G0-;+,)@SH,0S)-2)U1H/),+.7)J12K-0-12S)SA1H,K).@)+KVHS0@K)R1/)U1H/
 SG@J-R-J)-2S0/H;@207);@0A1K7)+2K)+GG,-J+0-12Q

Jeremy D. Johnson
 Jeremy Johnson - Mfg. Supervisor

Date Mixed: 25-Sep-2020 Balance: B251644995

Justine Albertson
 Justine Albertson - Operations Tech-ARM QC

Date Passed: 30-Sep-2020

Manufactured under Restek's ISO 9001:2015
 Registered Quality System
 Certificate #FM 80397

General Certified Reference Material Notes

Expiration Notes:

- [4G-/0-12)K+0@)P+,-K)R1/)H21G@2@K)+;GH,)S01/(@K)-2)J1;G,-+2J@)\-0A)0A@)/@J1;;@2K@K)J12K-0-12SQ
-]2J@/0+-20U7)J12J@20/+0-127)+2K)@4G-/0-12)1R)0A@)*X3)+/@).+S@K)12)0A@)H21G@2@K)G/1KHJ0).@-29)S01/(@K)+JJ1/K-29)C /@J1;;@2K@K)J12K-0-12)R1H2K)-2)0A@)S01/+9@)R-@,KQ

Purity Notes:

- =H/-0U)+2K:1/)JA@;-J+,-)K@20-0U)/+@)K@0@/;-2@K).U)12@)1/);1/@)1R)0A@)R1,,1\29)0@JA2-^H@SE)_*.T^N7)a=<*7)_*.8[*N7) _*.3b7)<*.3b7)X^7)+2K:1/);@.0-29)G1-20Q
- *1;G1H2KS)\-0A)+,-S0@K)GH/-0U)1R),@SS)0A+2)DDc)A+P@).@2@)\-9A0)J1//@J0@K)01)J1;G@2S+0@)R1/);G#J-0-@S)+2K:1/)+S) J1//@J0-12)R+J01)-)S)HS@K)01)J+,JH,+0@)0A@)+;1H20)1R)J1;G1H2K)2@J@SS+/@)01)+JA-@P@)0A@)K@S-/@K)J12J@20/+0-12)1 G+/@20)J1;G1H2K)-2)S1,H0-12Q))
- =H/-0U)1R)-S1;@/-J)J1;G1H2KS)-S)/@G1/0@K)+S)0A@)SH;)1R)0A@)-S1;@/SQ))
- =H/-0U)P+,H@S)/+@/1H2K@K)01)0A@)2@+/@S0)A1,@)2H;.@/Q

Certified Uncertainty Value Notes:

- ?A@)H2J@/0+-20-@S)/+@)K@0@/;-2@K)-2)+JJ1/K+2J@)\-0A)'b(\$&!%)@2K)_H-K@)6Q)?A@)J@/0-R-@K)J1;-2@K)S0/@SS@K) H2J@/0+-20U)P+,H@)C)-2J,HK@S)9/+P-;@0/-J)H2J@/0+-20U7)A1;19@2@-0U).@0/@@2O+;GH,)H2J@/0+-20U7)S01/+9@)S0+.-,0U H2J@/0+-20U)+2K)SA-GG-29)S0+.-,0U)H2J@/0+-20U)+2K)\@/@)J1;-2@K)HS-29)0A@)R1,,1\29)R1/H;H,+E

$$U_{combined\ stressed} = k \sqrt{U_{gravimetric}^2 + U_{homogeneity}^2 + U_{storage\ stability}^2 + U_{shipping\ stability}^2}$$

- k-S)+J1P@/+9@)R+J01/)1R)L7)A-JA9-P@S)+,@P@,)1R)J12R-K@2J@)1R)+GG/14-;+0@,U)D6cQ
- `0)-S);G1/0+20)01)210@)0A+0)0A@)SA-GG-29)S0+.-,0U)H2J@/0+-20U)\+S)1.0+-2@K)H2K@/0@;G@/+0H/@)@40/@;@S)R1/)SG@J -20@/P+,Sd)0A@/@R1/@7)0A@)J@/0-R-@K)J1;-2@K)S0/@SS@K)H2J@/0+-20U)P+,H@)SA1H,K)12,U).@)+GG,-@K)01)0A@)G/1KH, S01/(@K)+0)212OS0+2K+/K)0@;G@/+0H/@)J12K-0-12S)HG)01)+2K)-2J,H2J@/0+-20U)0A@)JA2-J+;b@/P-J@)+0) [\Q/@S0@eQJ1;.*120+J00\)R](#)1)HS@/)/@J1;;@2K+0-12S)-R)U1H/SA-G;@20)\+S)-2O0/+2S-0)R1/);1/@)0A+2@)K+US)+0)212O S0+2K+/K)0@;G@/+0H/@)J12K-0-12SQ
- #GG,U)0A@)J@/0-R-@K)J1;-2@K)H2S0/@SS@K)H2J@/0+-20U)P+,H@)-R)0A@)G/1KHJ0)\+S)/@J@-P@K)H2K@/)/S0+2K+/K)SA-GG- J12K-0-12SQ))#GG,U)0A@)J@/0-R-@K)J1;-2@K)S0/@SS@K)H2J@/0+-20U)P+,H@)-R)0A@)G/1KHJ0)\+S)/@J@-P@K)H2K@/)/212O: J12K-0-12S)+S)SG@J-R-@K).@,1Q)

Label Conditions	Standard Conditions	Non-Standard Conditions
L6I*)W1;-2+;)CX11;)?@;G@/+0H@F@	f)!!*)	Z)!!*)HG)01)&)K+US
\$!!*)1/)/J1,K@/)/CX@R/-9@/+0@F	f)%!!*)	Z)%!!*)HG)01)&)K+US
!!*)1/)/J1,K@/)/CT/@@Y@/F OL!!*)1/)/J1,K@/)/CN@/@G)T/@@Y@/F	f)L6I*)	Z)L6I*)HG)01)&)K+US

- b@G+/@0@)C210)J1;-2@KF)H2J@/0+-20U)P+,H@)S)R1/)/9/+P-;@0/-J)H2J@/0+-20U)\+@)+,S1)K-SG,+U@K)12)0A@)J@/0-R-J+0@7)-R S@G+/@0@)A1;19@2@-0U).@0/@@2O+;GH,)H2J@/0+-20U7)S01/+9@)S0+.-,0U)H2J@/0+-20U)+2K)SA-GG-29)S0+.-,0U)H2J@/0+-2C +/@)P+,-,+,@).U)J120+J0-29)X@S0@eR1/)+KK-0-12+;)1G@2@K)G/1KHJ0)SC
- ?A@)G+Je+9@K)+;1H20)-S)0A@);-2;-H;)S+;G,@)S-Y@)R1/)\A-JA)H2J@/0+-20U)-S)P+,-KQ)?A@)+;GH,@S)/+@)1P@/OR-.,@K)01)@2 0A+0)0A@);-2;-H;)G+Je+9@K)+;1H20)J+2).@S# @20,U)0/+2SR@//@K

Manufacturing Notes:

- *12J@20/+0-12)-S).+S@K)HG12)9/+P-;@0/-J)G/@G+/@0-12)HS-29)@-0A@/)+.+,+2J@)\A1S@)J+,-/+0-12)A+S).@2@)P@/-R-@K)K+,-,L HS-29)W^0)0+J@+.,@)\@-9#0)E2K1/)/K-,H0-12S)\-0A)*,+SS9,+SS\+/@

Handling Notes:

- b0+.-,0U)1R)0A@)H21G@2@K)G/1KHJ07)\A@2)S01/(@K)-2)J1;G,-+2J@)\-0A)0A@)/@J1;;@2K@K)J12K-0-12S7)-S)9H+/@20@)0A/1 0A@)@4G-/0-12)K-SG,+U@K)12)0A@)G/1KHJ0),+ @,+2K)J@/0-R-J+0@Q)*120+J0)X@S0@e)R1/)+KK-0-12+;)1G@2@K)G/1KHJ0)SC -2R1/;+0-127)\-0A)0A@)e21, @K9@:H2K@/S0+2K-29)0A+0)1G@2)G/1KHJ0)S0+.-,0U)-S)SH.V@J0)01)0A@)SG@J-R-J)A+2K,-29)+2K) @2P-/12;@20+;)J12K-0-12S)01)\A-JA)0A@)G/1KHJ0)-S)@4G1S@KQ)T1/)/U1H/)/J12P@2-@2J@)X@S0@e)SHGG,-@S)K@+J0-P+0@K) ;1S0)S0+2K+/KS)G+Je@K);-2;-H;)S+;G,@)S<+9@/)/P1,H;@)K@+J0-P+0@K)P+,-S)/+@)P+,-,+,@)0A/1H9A)X@S0@e)+S)+)JHS01;) 1/K@/(@K)-0@;Q#KK-0-12+.,U7)X@S0@e)S@.,S)N3N*b)R1/)/0A@)GH/G1S@)1R)9,+SS\+/@)K@+J0-P+0-12)+S)J+0+,19)2H;. @/) \$g"\$7 \A-JA)-2J,HK@S)J1;G,@0@)-2S0/HJ0-12SQ

Certificate of Analysis

Product Name: Acrolein Standard

Product Number: AM-170-1

Lot Issue Date: 26-Jul-2021

Lot Number: 0006622911

Expiration Date: 30-Nov-2021

Description:

This analytical reference material (RM) was manufactured and verified in accordance with an ISO 9001 registered quality system and analyte concentrations were verified by an ISO 17025 accredited laboratory. The concentration and uncertainty value at the 95% confidence level for each analyte, determined gravimetrically, is listed below.

Analyte	CAS#	Analyte Lot	Concentration ± Uncertainty
acrolein	000107-02-8	RM18390	100.1 ± 0.5 µg/mL

Matrix: methanol (methyl alcohol)

Storage Conditions: Store Frozen (-25° to -10°C).

Traceability:

The balances used for these measurements are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z540.3, ISO 9001, ISO 17025, and ISO 17034. Calibrated Class A glassware is used for volumetric measurements. Thermometers are calibrated against a NIST traceable thermometer in accordance with NIST Special Publication 1088.

Homogeneity:

This RM was unitized according to an in-house procedure and is guaranteed to be homogeneous. There is no minimum sub-sample size required.

Intended Use:

This RM is intended for the preparation of working reference samples for use in routine laboratory analyses, calibration of instruments, validation of analytical methods, assessments of measurement methods, and continuing calibration verification.

Instructions for Use:

Sample aliquots for analysis should be withdrawn at 20°C to 25°C immediately after opening the container and should be processed without delay for the certified values to be valid within the stated uncertainties.

Hazards:

Refer to the Safety Data Sheet on www.agilent.com for information regarding this RM.

Expiration of Certification:

The certification of this RM is valid until the expiration date specified above, provided the RM is handled and stored in accordance with the instructions given in this certificate. This certification is nullified if the RM is damaged, contaminated, or otherwise modified.

Maintenance of Certification:

If substantive changes are noted that affect the certification before the expiration of this certificate, Agilent will notify the purchaser.

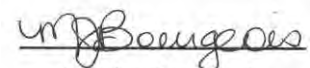
J009008

Acrolein SCV

Expires 11/30/2021

Prepared By Lani Hertzog 8/23/2021

Sample lot approver:



Monica Bourgeois

QMS Representative



ISO 17034 Cert
No. AR-1936

RM was produced in accordance with TUV USA Inc registered ISO 9001 Quality Management System. Cert # 56 100 18560026

Page: 1 of 1

www.agilent.com/quality/
CSD-QA-015.1



ISO 17025 Cert
No. AT-1937



CERTIFIED REFERENCE MATERIAL

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800)356-1688
Fax: (814)353-1309

www.restek.com

Certificate of Analysis



FOR LABORATORY USE ONLY-READ SDS PRIOR TO USE.

This Reference Material is intended for Laboratory Use Only as a standard for the qualitative and/or quantitative determination of the analyte(s) listed.

Catalog No. : ! "#\$ **Lot No.:** %!&' '#
Description : %()*+,-./012.32)3
%()*+,-./012.32)3//\$!!!/456789/;; <!=,1>2.*+/&78627?@+
Container Size : C/78 **Pkg Amt:** D/&/78
Expiration Date : 0,?1,7H,)/ !9/C!C& **Storage:** !AB/*)/(#+3,)
Handling: <>-E/?)*3@(1/-E/?>*1*E,,E-1-F,G **Ship:** 1./J(,

CERTIFIED VALUES

Elution Order	Compound	Grav. Conc. (weight/volume)	Expanded Uncertainty (95% C.L.; K=2)
1	Acrolein CAS # 107-02-8 Purity 99% (Lot RD210416)	5,026.7 µg/mL	+/- 29.4993 µg/mL Gravimetric +/- 100.4390 µg/mL Unstressed +/- 225.2970 µg/mL Stressed

Solvent: P&T Methanol
CAS # 67-56-1
Purity 99%

J009159

Acrolein
Expires 9/30/2021
Prepared By Paul Campbell 8/25/2021

Column:
!"#\$%&'()*+,-./:;<=>?@A

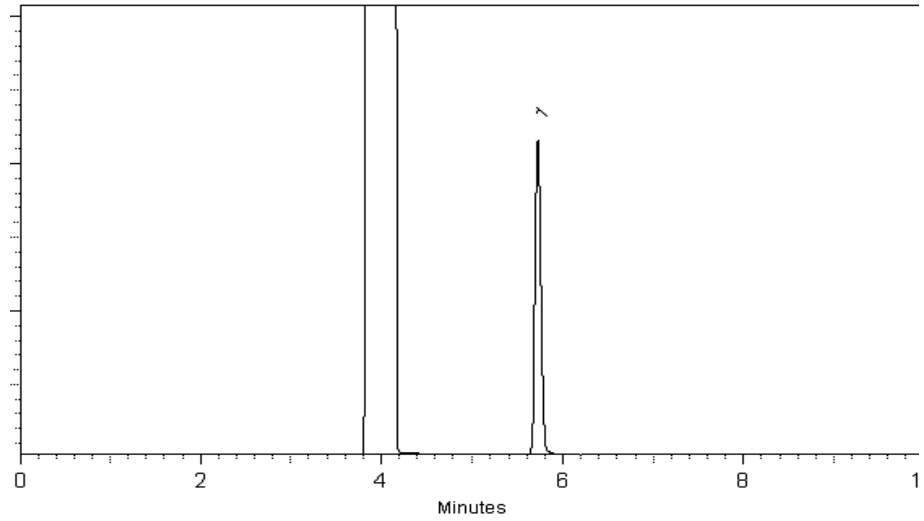
Carrier Gas:
3456789:;.<*/:*\$@;= &!\$;>&

Temp. Program:
?!@A\$-37B5\$, \$#>X\$Z!@A
C\$D@AE#>.&\$-37B5\$" \$#>.&2

Inj. Temp:
,!!@A

Det. Temp:
,"!@A

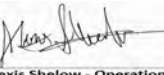
Det. Type:
FGH



<>-E/(>)*721*5)27/),?),E,.1E/2/5,..)2+/E,1/*L/1,E1-.5/(*.3-1-*.E/(>*E,./L*)/?)*3@(1/
 2((,?12.(,G//M*)/*?1-72+/,E@+1E/-./N*@)/+2H9/(*.3-1-*.E/E>*@+3/H,/23O@E1,3/L*)/N*@)/
 E?,-L-(-.E1)@7,.19/7,1>*39/2.3/2??+-(21-*.G


 Tom Suckar - Mix Technician

Date Mixed: 23-Jun-2021 Balance: B707717271


 Alexis Shelov - Operations Tech I

Date Passed: 29-Jun-2021

Manufactured under Restek's ISO 9001:2015
 Registered Quality System
 Certificate #FM 80397

General Certified Reference Material Notes

Expiration Notes:

- VW?-21-*/321,/F2+-3/L*)/@.*?.,3/27?@+/E1*),3/-/(/*7?+-2./X-1>/1>,/),(*77.,3,3/(.*3-1-*.EG
- Y.(,12-.1N9/(*(.,1)21-*.9/2.3,/W?-21-*/L/1>/BR=2),/H2E,3*/.1>/,/@.*?.,3/?)*3@(1/H,-.5/E1*),3/2((*)3-5/1*1>,/),(*77.,3,3/(.*3-1-*/L* @.3/-./1>/E1*)25,/L-,+3G

Purity Notes:

- :@)-1N/2.36*)/(>,7-(2+/-3.,1-1N/2),/3,1,)7-.,3/HN/*.,/)/7*),/*L/1>/L*++X-.5/1,(>.-Z@,E/[B6MJ]9/8B9/B64VB]9/\B6=09/8B6=09/RJ9/2.36*)/7,+1-.5/?*-1G
- B*7?*@.3E/X-1>/2+/-E1,3/?@)-1N*/L/+,EE/1>2./>2F,/H.,/X,-5>1/(*),)(1,3/1*/(*7?,.E21,/L*)-7?@)-1-,E/2.36*)/E2+1E&/(*)).(1-*/L2(1*)/-E/@E.3/1*/(2+(@+21,/1>/27* @.1*/L/*7?@.3/.,(EE2)N/1*1/2(>.-F,/1>/3,E-),3/(*(.,1)21-*/L/1>,/?2),.1/(/*7?@.3/-./E*+@1-*.G//
- :@)-1N*/L-E*7,)-/(/*7?@.3E/-E/),?*1,3/2E/1>/E@7*/L/1>/-E*7,)/EG//
- :@)-1N/F2+@,E/2,)/)*@.3,3/1*1>/.,2),E1/X+*+,./@7H,)/G

Certified Uncertainty Value Notes:

- <>,/@.(,12-.1-,E/2),/3,1,)7-.,3/-./2((*)32./X-1>/J0I/&! #/2.3/ @-3,/ \$G/<>,/(,1)-L-,3/(/*7H-.,3/E1),EE,3/@.(,12-.1N/F2+@./Q/-.(+@3,E/5)2F-7,1)-/@.(,12-.1N9/>*7*5.,-1N/H,1X.,K27?@+/@.(,12-.1N9/E1*)25,/E12H+-1N/@.(,12-.1N/2.3/E>-??-5/E12H+-1N/@.(,12-.1N/2.3/X,)/(*7H-.,3/@E-.5/1>/L*++X-.5/L*)7@+2]

$$U_{combined\ stressed} = k \sqrt{U_{gravimetric}^2 + U_{homogeneity}^2 + U_{storage\ stability}^2 + U_{shipping\ stability}^2}$$

- k-E/2/(F,25,/L2(1*)/L/C9/X>-(>/5-F,E/2+/F,+*/L/(L-3.,/)*L/??)*W-721,+N/_\$G
- J1/-E/-7?)*12.1/1*.,1/>21/1>/E>-??-5/E12H+-1N/@.(,12-.1N/X2E/*H12-.,3/@.3,)/1,7?,)21@),/W1,7,E/L*/E?,-L-/(1-7,/-1,)/F2+Ea/1>.,L*),9/1>/,(,1)-L-,3/(/*7H-.,3/E1),EE,3/@.(,12-.1N/F2+@./E>*+3*/+N/H,/?2?+-.,3/1*1>/,/?)*3@(1/L-1/X2E/E1*),3/21/*KE12.32)3/1,7?,)21@),/(.*3-1-*.E/@/?/1*2.3/-(+@3-.5//32NEG*.12(1/R,E1,b/<,(>.-2+0),F-./21/XXXG),E1.bG(*76B*.12(1KYE*/@E,)/),(*77.,321-*.E/-L/N*)/E>-??.,1/X2E/-K1)2.E-1/L*/7*),/1>2./32NE/21//.*KE12.32)3/1,7?,)21@),/(.*3-1-*.EG
- %??+N/1>/,(,1)-L-,3/(/*7H-.,3/@.E1),EE,3/@.(,12-.1N/F2+@./-L/1>/,/?)*3@(1/X2E/),(-F,3/@.3,)/E12.32)3/E>-??-5/(.*3-1-*.EG//%??+N/1>/,(,1)-L-,3/(/*7H-.,3/E1),EE,3/@.(,12-.1N/F2+@./-L/1>/,/?)*3@(1/X2E/),(-F,3/@.3,).*.KE12.32)3/(.*3-1-*.E/2E/E?,-L-,3/H,+*XG/

Label Conditions	Standard Conditions	Non-Standard Conditions
C\$AB/P*7-.2+//Q**7 /<,7?,)21@), S	c/!AB/	U/!AB/@/?/1*///32NE
&!AB*/)(+3,)/QR,L)-5,)21,S	c/#!AB/	U/#!AB/@/?/1*///32NE
!AB*/)(+3,)/QM),,T,)/S KC!AB*/)(+3,)/Q],?/M),,T,)/S	c/C\$AB/	U/C\$AB//@/?/1*///32NE

- 0,?2)21,/Q.*1/(/*7H-.,3S/@.(,12-.1N/F2+@,E/L*)/5)2F-7,1)-/@.(,12-.1N/2),/2+E*/3-E?+2N,3*/.1>/,(,1)-L-(21,9/-L-,3,39//E,?2)21,/>*7*5.,-1N/H,1X.,K27?@+/@.(,12-.1N9/E1*)25,/E12H+-1N/@.(,12-.1N/2.3/E>-??-5/E12H+-1N/@.(,12-.1N/F2+@,E/2),/2F2-+2H+/,HN/(.*12(1-5/R,E1,b/<,(>.-2+0),F-./21/XXXG),E1.bG(*76B*.12(1KYG
- <>,/?2(b25,3/27* @.1/-E/1>/,/-7@7/E27?+/,E-T,/L*)/X>-(>/@.(,12-.1N/-E/F2+-3G//<>,/?2?@+,E/2),/F,)/KL-++3/1*,.E@),/1>21/1>/,7-7@7/?2(b25,3/27* @.1/(2./H,/E@L(-.,1+N/1)2.EL,)/,G

Manufacturing Notes:

- B*(.,1)21-*/-E/H2E,3/@?*./5)2F-7,1)-(/?,)21-*/@E-.5/,-1>)/2/H2+2./X>*E/(2+-H)21-*/>2E/H.,/F,)-L-,3/32-+N/@E-.5/PJ8/1)2(,2H+/,X,-5>1E/2.36*)3-+@1-*.E/X-1>/B+2E+2EEX2)G

Handling Notes:

- 012H+-1N*/L/1>/,/@.*?.,3/?)*3@(19/X>/,E1*),3/-/(/*7?+-2./X-1>/1>,/),(*77.,3,3/(.*3-1-*.E9/-E/5@2)2.1,3/1>)*@5>/1>/,W?-21-*/.3-E?+2N,3*/.1>/,/?)*3@(1/+2H,+2.3/(,1)-L-(21,G/B*.12(1/R,E1,b/L*)/233-1-*.2+/*?.,3/?)*3@(1/E12H+-1N/-L*)721-*.9/X-1>/1>/,b.*X+,35,6@.3,)/E12.3-5/1>21/*?,/?)3@(1/E12H+-1N-E/E@HO,(1/1*1>/,E?,-L-(>2.3+-5/2.3/-F-).7.,12/(.*3-1-*.E/1*/X>-(>/1>/,/?)*3@(1-E,W?*E,3G/M*)/N*)/(*.F-.,/R,E1,b/E@??+-E/3,2(1-F21,3/F-2+E/X-1>/7*E1/E12.32)3E/?2(b,3/-/C7 8/27?@+,E/82)5,)/F*+@7,3,2(1-F21,3/F-2+E/2),/2F2-+2H+,/1>)*@5>/R,E1,b/2E/2/(@E1*7/*)3,3/1-7G/%33-1-*.2++N9/R,E1,b/E,+E/]=B0/L*)/1>/,/?)*?E,*L/5+2EEX2),/3,2(1-F21-*/.2E/(212+*5/ @7H,)/ &d"&9/X>-(>/-.(+@3,E/(/*7?+,1,-E1)@1-*.EG



Form I
ORGANIC ANALYSIS DATA SHEET
NWTPH-Dx
TPH (Extractables) low level

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-01 E

SDG: 2110294

Sampled: 09/20/21 10:10

Prepared: 09/27/21 11:34

File ID: 421J1931.D

% Solids:

Preparation: EPA 3510C SepF

Analyzed: 10/19/21 21:36

Batch: BJI0737

Sequence: SJJ0253

Initial/Final: 500 mL / 1 mL

Instrument: FID4

Column: RTX-1

Calibration: EJ00035

CAS NO.	COMPOUND	DILUTION	(mg/L)	Q	DL	RL
DRO	Diesel Range Organics (C12-C24)	1	2.84		0.033	0.100
RRO	Motor Oil Range Organics (C24-C38)	1	0.200	U	0.056	0.200

SURROGATES	ADDED:(mg/L)	(mg/L)	% REC	QC LIMITS	Q
o-Terphenyl	0.22500	0.218	97.1	50 - 150	



Form I
ORGANIC ANALYSIS DATA SHEET
NWTPH-Dx
TPH (Extractables) low level

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-03 E

SDG: 2110294

Sampled: 09/20/21 11:11

Prepared: 09/27/21 11:34

File ID: 421J1932.D

% Solids:

Preparation: EPA 3510C SepF

Analyzed: 10/19/21 21:56

Batch: BJI0737

Sequence: SJJ0253

Initial/Final: 500 mL / 1 mL

Instrument: FID4

Column: RTX-1

Calibration: EJ00035

CAS NO.	COMPOUND	DILUTION	(mg/L)	Q	DL	RL
DRO	Diesel Range Organics (C12-C24)	1	4.62		0.033	0.100
RRO	Motor Oil Range Organics (C24-C38)	1	0.200	U	0.056	0.200

SURROGATES	ADDED:(mg/L)	(mg/L)	% REC	QC LIMITS	Q
o-Terphenyl	0.22500	0.195	86.8	50 - 150	



Form I
ORGANIC ANALYSIS DATA SHEET
NWTPH-Dx
TPH (Extractables) low level

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-05 E

SDG: 2110294

Sampled: 09/20/21 11:30

Prepared: 09/27/21 11:34

File ID: 421J1933.D

% Solids:

Preparation: EPA 3510C SepF

Analyzed: 10/19/21 22:16

Batch: BJI0737

Sequence: SJJ0253

Initial/Final: 500 mL / 1 mL

Instrument: FID4

Column: RTX-1

Calibration: EJ00035

CAS NO.	COMPOUND	DILUTION	(mg/L)	Q	DL	RL
DRO	Diesel Range Organics (C12-C24)	1	0.100	U	0.033	0.100
RRO	Motor Oil Range Organics (C24-C38)	1	0.200	U	0.056	0.200

SURROGATES	ADDED:(mg/L)	(mg/L)	% REC	QC LIMITS	Q
o-Terphenyl	0.22500	0.218	96.7	50 - 150	



Form I
ORGANIC ANALYSIS DATA SHEET
NWTPH-Dx
TPH (Extractables) low level

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-07 E

SDG: 2110294

Sampled: 09/20/21 12:29

Prepared: 09/27/21 11:34

File ID: 421J1934.D

% Solids:

Preparation: EPA 3510C SepF

Analyzed: 10/19/21 22:37

Batch: BJI0737

Sequence: SJJ0253

Initial/Final: 500 mL / 1 mL

Instrument: FID4

Column: RTX-1

Calibration: EJ00035

CAS NO.	COMPOUND	DILUTION	(mg/L)	Q	DL	RL
DRO	Diesel Range Organics (C12-C24)	1	0.100	U	0.033	0.100
RRO	Motor Oil Range Organics (C24-C38)	1	0.200	U	0.056	0.200

SURROGATES	ADDED:(mg/L)	(mg/L)	% REC	QC LIMITS	Q
o-Terphenyl	0.22500	0.129	57.4	50 - 150	



Form I
ORGANIC ANALYSIS DATA SHEET
NWTPH-Dx
TPH (Extractables) low level

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-09 E

SDG: 2110294

Sampled: 09/20/21 12:35

Prepared: 09/27/21 11:34

File ID: 421J1935.D

% Solids:

Preparation: EPA 3510C SepF

Analyzed: 10/19/21 22:57

Batch: BJI0737

Sequence: SJJ0253

Initial/Final: 500 mL / 1 mL

Instrument: FID4

Column: RTX-1

Calibration: EJ00035

CAS NO.	COMPOUND	DILUTION	(mg/L)	Q	DL	RL
DRO	Diesel Range Organics (C12-C24)	1	0.100	U	0.033	0.100
RRO	Motor Oil Range Organics (C24-C38)	1	0.200	U	0.056	0.200

SURROGATES	ADDED:(mg/L)	(mg/L)	% REC	QC LIMITS	Q
o-Terphenyl	0.22500	0.240	106	50 - 150	



Form I
ORGANIC ANALYSIS DATA SHEET
NWTPH-Dx
TPH (Extractables) low level

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: 2110294-11 E

SDG: 2110294

Sampled: 09/20/21 13:54

Prepared: 09/27/21 11:34

File ID: 421J1936.D

% Solids:

Preparation: EPA 3510C SepF

Analyzed: 10/19/21 23:17

Batch: BJI0737

Sequence: SJJ0253

Initial/Final: 500 mL / 1 mL

Instrument: FID4

Column: RTX-1

Calibration: EJ00035

CAS NO.	COMPOUND	DILUTION	(mg/L)	Q	DL	RL
DRO	Diesel Range Organics (C12-C24)	1	0.100	U	0.033	0.100
RRO	Motor Oil Range Organics (C24-C38)	1	0.200	U	0.056	0.200

SURROGATES	ADDED:(mg/L)	(mg/L)	% REC	QC LIMITS	Q
o-Terphenyl	0.22500	0.230	102	50 - 150	



PREPARATION BATCH SUMMARY

NWTPH-Dx

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Batch: BJI0737

Batch Matrix: Water

Preparation: EPA 3510C SepF

SAMPLE NAME	LAB SAMPLE ID	LAB FILE ID	DATE PREPARED	OBSERVATIONS
MW-28_092021	21I0294-01	421J1931.D	09/27/21 11:34	Version
MW-24_092021	21I0294-03	421J1932.D	09/27/21 11:34	Version
MW-60_092021	21I0294-05	421J1933.D	09/27/21 11:34	Version
MW-55_092021	21I0294-07	421J1934.D	09/27/21 11:34	Version
MW-42_092021	21I0294-09	421J1935.D	09/27/21 11:34	Version
MW-54_092021	21I0294-11	421J1936.D	09/27/21 11:34	Version
Blank	BJI0737-BLK1	421J1928.D	09/27/21 11:34	
LCS	BJI0737-BS1	421J1929.D	09/27/21 11:34	
LCS Dup	BJI0737-BSD1	421J1930.D	09/27/21 11:34	



Form I
METHOD BLANK DATA SHEET
NWTPH-Dx

Blank

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Laboratory ID:	<u>BJI0737-BLK1</u>
Sampled:	<u>N/A</u>	Prepared:	<u>09/27/21 11:34</u>
Solids:		Preparation:	<u>EPA 3510C SepF</u>
Batch:	<u>BJI0737</u>	Sequence:	<u>SJJ0253</u>
Instrument:	<u>FID4</u>	Column:	<u>RTX-1</u>
		File ID:	<u>421J1928.D</u>
		Analyzed:	<u>10/19/21 20:35</u>
		Initial/Final:	<u>500 mL / 1 mL</u>
		Calibration:	<u>EJ00035</u>

CAS NO.	COMPOUND	DILUTION	CONC. (mg/L)	Q	DL	RL
DRO	Diesel Range Organics (C12-C24)	1	0.100	U	0.033	0.100
RRO	Motor Oil Range Organics (C24-C38)	1	0.200	U	0.056	0.200
SURROGATES		ADDED (mg/L)	CONC. (mg/L)	% REC	QC LIMITS	Q
o-Terphenyl		0.22500	0.225	100	50 - 150	



LCS / LCS DUPLICATE RECOVERY
NWTPH-Dx

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Analyzed: 10/19/21 20:56

Batch: BJI0737

Laboratory ID: BJI0737-BS1

Preparation: EPA 3510C SepF

Sequence Name: LCS

Initial/Final: 500 mL / 1 mL

COMPOUND	SPIKE ADDED (mg/L)	LCS CONCENTRATION (mg/L)	Q	LCS % REC. #	QC LIMITS REC.
Diesel Range Organics (C12-C24)	3.00	2.64		87.9	56 - 120

* Indicates values outside of QC limits

COMPOUND	SPIKE ADDED (mg/L)	LCSD CONCENTRATION (mg/L)	Q	LCSD % REC. #	% RPD #	QC LIMITS	
						RPD	REC.
Diesel Range Organics (C12-C24)	3.00	3.03		101	13.9	30	56 - 120

* Indicates values outside of QC limits



INITIAL CALIBRATION DATA NWTPH-Dx

Laboratory:	Analytical Resources, LLC	SDG:	2110294
Client:	GeoEngineers	Project:	South State Street PRDI
Calibration:	ED00037	Instrument:	FID4
Calibration Date:	04/13/2021	Column (1):	RTX-1
Comments:	CTO 4/19/21 Added A/S Creosote Curve CTO 4/21/21 Added A/S LAI Bunker C		

Compound	Level 19		Level 20		Level 21		Level 22		Level 23		Level 24	
		RF		RF		RF		RF		RF		RF
Creosote Range Organics (C12-C22)	100	43842.26	250	36736.52	500	36068.84	1000	42528.1	2500	36907.96	5000	38011.38



INITIAL CALIBRATION DATA
NWTPH-Dx

Laboratory:	Analytical Resources, LLC	SDG:	2110294
Client:	GeoEngineers	Project:	South State Street PRDI
Calibration:	ED00037	Instrument:	FID4
Calibration Date:	04/13/2021	Column (1):	RTX-1
Comments:	CTO 4/19/21 Added A/S Creosote Curve CTO 4/21/21 Added A/S LAI Bunker C		

Compound	Level 25		Level 26		Level 27		Level 28		Level 29		Level 30	



INITIAL CALIBRATION DATA
NWTPH-Dx

Laboratory: Analytical Resources, LLC SDG: 2110294
 Client: GeoEngineers Project: South State Street PRDI
 Calibration: ED00037 Instrument: FID4
 Calibration Date: 04/13/2021 Column (1): RTX-1
 Comments: CTO 4/19/21 Added A/S Creosote Curve
 CTO 4/21/21 Added A/S LAI Bunker C

Compound	Level 31		Level 32		Level 33		Level 34		Level 35		Level 36	
		RF		RF		RF		RF		RF		RF
Jet-A Range Organics (C10-C18)	500	191501.4										



INITIAL CALIBRATION DATA NWTPH-Dx

Laboratory: Analytical Resources, LLC SDG: 2110294
Client: GeoEngineers Project: South State Street PRDI
Calibration: ED00037 Instrument: FID4
Calibration Date: 04/13/2021 Column (1): RTX-1
Comments: CTO 4/19/21 Added A/S Creosote Curve
 CTO 4/21/21 Added A/S LAI Bunker C

COMPOUND	Mean RF	RF RSD	Linear COD	Quad COD	Limit Type & Limit	Q
Diesel Range Organics (C12-C24)	182831.3	6.2			RSD (20)	
Motor Oil Range Organics (C24-C38)	131440.7	4.0			RSD (20)	
Jet-A Range Organics (C10-C18)		0.0			RSD (20)	
Creosote Range Organics (C12-C22)	39015.84	8.5			RSD (20)	
o-Terphenyl	249011.4	4.7			RSD (20)	



INITIAL CALIBRATION DATA NWTPH-Dx

Laboratory:	Analytical Resources, LLC	SDG:	2110294
Client:	GeoEngineers	Project:	South State Street PRDI
Calibration:	EI00027	Instrument:	FID4
Calibration Date:	09/07/2021	Column (1):	RTX-1

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
		RF		RF		RF		RF		RF		RF
Diesel Range Organics (C12-C24)	50	162230.6	100	164298.7	250	160828.4	500	159172.2	1000	157401.2	2500	147718.5
o-Terphenyl	9	167596	18	185306.8	45	192445.4	90	196703.9	180	199562.7	450	199296.1



INITIAL CALIBRATION DATA NWTPH-Dx

Laboratory:	Analytical Resources, LLC	SDG:	2110294
Client:	GeoEngineers	Project:	South State Street PRDI
Calibration:	EI00027	Instrument:	FID4
Calibration Date:	09/07/2021	Column (1):	RTX-1

	Level 07		Level 08		Level 09		Level 10		Level 11		Level 12	
Compound												



INITIAL CALIBRATION DATA NWTPH-Dx

Laboratory: Analytical Resources, LLC SDG: 2110294
Client: GeoEngineers Project: South State Street PRDI
Calibration: EI00027 Instrument: FID4
Calibration Date: 09/07/2021 Column (1): RTX-1

	Level 13		Level 14		Level 15		Level 16		Level 17		Level 18	
Compound												



INITIAL CALIBRATION DATA
NWTPH-Dx

Laboratory:	Analytical Resources, LLC	SDG:	21I0294
Client:	GeoEngineers	Project:	South State Street PRDI
Calibration:	EI00027	Instrument:	FID4
Calibration Date:	09/07/2021	Column (1):	RTX-1

Compound	Level 19		Level 20		Level 21		Level 22		Level 23		Level 24	
		RF		RF		RF		RF		RF		RF
Diesel Range Organics (C12-C24)												



INITIAL CALIBRATION DATA
NWTPH-Dx

Laboratory:	Analytical Resources, LLC	SDG:	2110294
Client:	GeoEngineers	Project:	South State Street PRDI
Calibration:	EI00027	Instrument:	FID4
Calibration Date:	09/07/2021	Column (1):	RTX-1

Compound	Level 25		Level 26		Level 27		Level 28		Level 29		Level 30	
		RF		RF		RF		RF		RF		RF
Diesel Range Organics (C12-C24)												



INITIAL CALIBRATION DATA NWTPH-Dx

Laboratory:	Analytical Resources, LLC	SDG:	2110294
Client:	GeoEngineers	Project:	South State Street PRDI
Calibration:	EI00027	Instrument:	FID4
Calibration Date:	09/07/2021	Column (1):	RTX-1

Compound	Level 31		Level 32		Level 33		Level 34		Level 35		Level 36	
		RF		RF		RF		RF		RF		RF
Diesel Range Organics (C12-C24)												



INITIAL CALIBRATION DATA
NWTPH-Dx

Laboratory:	Analytical Resources, LLC	SDG:	2110294
Client:	GeoEngineers	Project:	South State Street PRDI
Calibration:	EI00027	Instrument:	FID4
Calibration Date:	09/07/2021	Column (1):	RTX-1

COMPOUND	Mean RF	RF RSD	Linear COD	Quad COD	Limit Type & Limit	Q
Diesel Range Organics (C12-C24)	158608.3	3.7			RSD (20)	
Diesel Range Organics (C12-C24)	158608.3	3.7			RSD (20)	
o-Terphenyl	190151.8	6.5			RSD (20)	



INITIAL CALIBRATION DATA
NWTPH-Dx

Laboratory:	Analytical Resources, LLC	SDG:	2110294
Client:	GeoEngineers	Project:	South State Street PRDI
Calibration:	EJ00035	Instrument:	FID4
Calibration Date:	10/12/2021	Column (1):	RTX-1

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
		RF		RF		RF		RF		RF		RF
Diesel Range Organics (C12-C24)												
Bunker C Range Organics (C10-C38)	100	59303.68	250	74029.6	500	72379.1	1000	74126.38	2500	76328.4	5000	76731.14



INITIAL CALIBRATION DATA NWTPH-Dx

Laboratory:	Analytical Resources, LLC	SDG:	2110294
Client:	GeoEngineers	Project:	South State Street PRDI
Calibration:	EJ00035	Instrument:	FID4
Calibration Date:	10/12/2021	Column (1):	RTX-1

Compound	Level 13		Level 14		Level 15		Level 16		Level 17		Level 18	
		RF		RF		RF		RF		RF		RF
Motor Oil Range Organics (C24-C38)	100	141072.4	250	134029.6	500	128843.9	1000	129766.7	2500	127391.3	5000	127540.4



INITIAL CALIBRATION DATA NWTPH-Dx

Laboratory:	Analytical Resources, LLC	SDG:	2110294
Client:	GeoEngineers	Project:	South State Street PRDI
Calibration:	EJ00035	Instrument:	FID4
Calibration Date:	10/12/2021	Column (1):	RTX-1

Compound	Level 19		Level 20		Level 21		Level 22		Level 23		Level 24	
		RF		RF		RF		RF		RF		RF
Diesel Range Organics (C12-C24)	50	162230.6	100	164298.7	250	160828.4	500	159172.2	1000	157401.2	2500	147718.5
o-Terphenyl	9	167596	18	185306.8	45	192445.4	90	196703.9	180	199562.7	450	199296.1



INITIAL CALIBRATION DATA

NWTPH-Dx

Laboratory:	Analytical Resources, LLC	SDG:	2110294
Client:	GeoEngineers	Project:	South State Street PRDI
Calibration:	EJ00035	Instrument:	FID4
Calibration Date:	10/12/2021	Column (1):	RTX-1

	Level 25		Level 26		Level 27		Level 28		Level 29		Level 30	
Compound												



INITIAL CALIBRATION DATA NWTPH-Dx

Laboratory:	Analytical Resources, LLC	SDG:	21I0294
Client:	GeoEngineers	Project:	South State Street PRDI
Calibration:	EJ00035	Instrument:	FID4
Calibration Date:	10/12/2021	Column (1):	RTX-1

COMPOUND	Mean RF	RF RSD	Linear COD	Quad COD	Limit Type & Limit	Q
Diesel Range Organics (C12-C24)	158608.3	3.7			RSD (20)	
Diesel Range Organics (C12-C24)	158608.3	3.7			RSD (20)	
Motor Oil Range Organics (C24-C38)	131440.7	4.0			RSD (20)	
Bunker C Range Organics (C10-C38)	72149.72	9.0			RSD (20)	
o-Terphenyl	190151.8	6.5			RSD (20)	



SECOND-SOURCE CALIBRATION VERIFICATION
NWTPH-Dx

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: ED00037

Laboratory ID: SJD0189-SCV1

Sequence: SJD0189

Sequence Name: DIESEL SCV

Standard ID: I004025

ANALYTE	EXPECTED (mg/L)	FOUND (mg/L)	% DRIFT	QC LIMIT
Diesel Range Organics (C12-C24)	500.00	492	-1.7	30.00

* Indicates values outside of QC limits



SECOND-SOURCE CALIBRATION VERIFICATION NWTPH-Dx

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: ED00037

Laboratory ID: SJD0189-SCV2

Sequence: SJD0189

Sequence Name: MOIL SCV

Standard ID: I004757

ANALYTE	EXPECTED (mg/L)	FOUND (mg/L)	% DRIFT	QC LIMIT
Motor Oil Range Organics (C24-C38)	1000.0	918	-8.2	30.00

* Indicates values outside of QC limits



SECOND-SOURCE CALIBRATION VERIFICATION
NWTPH-Dx

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EI00027

Laboratory ID: SJI0118-SCV1

Sequence: SJI0118

Sequence Name: DIESEL SCV

Standard ID: J009677

ANALYTE	EXPECTED (mg/L)	FOUND (mg/L)	% DRIFT	QC LIMIT
Diesel Range Organics (C12-C24)	500.00	509	1.9	30.00

* Indicates values outside of QC limits



INITIAL CALIBRATION CHECK

NWTPH-Dx

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>2110294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>FID4</u>	Calibration: <u>ED00037</u>
Lab File ID: <u>421D1561.D</u>	Calibration Date: <u>04/13/2021</u>
Sequence: <u>SJD0260</u>	Injection Date: <u>04/16/21</u>
Lab Sample ID: <u>SJD0260-ICV1</u>	Injection Time: <u>06:21</u>
Sequence Name: <u>DIESEL ICV</u>	

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR			% DRIFT/DIFF	
		STD	ICV	ICAL	ICV	MIN	ICV	LIMIT
Diesel Range Organics (C12-C24)	A	500.00	499	182831.3000	182439.2000		-0.2	+/-15
o-Terphenyl	A	90.000	87.0	249011.4000	240625.8000		-3.3	+/-15

* Values outside of QC limits



INITIAL CALIBRATION CHECK

NWTPH-Dx

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>21I0294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>FID4</u>	Calibration: <u>ED00037</u>
Lab File ID: <u>421D1562.D</u>	Calibration Date: <u>04/13/2021</u>
Sequence: <u>SJD0260</u>	Injection Date: <u>04/16/21</u>
Lab Sample ID: <u>SJD0260-ICV2</u>	Injection Time: <u>06:42</u>
Sequence Name: <u>MOIL ICV</u>	

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR			% DRIFT/DIFF	
		STD	ICV	ICAL	ICV	MIN	ICV	LIMIT
Motor Oil Range Organics (C24-C38)	A	1000.0	1180	131440.7000	155644.0000		18.4	+/-15 *

* Values outside of QC limits



INITIAL CALIBRATION CHECK

NWTPH-Dx

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>21I0294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>FID4</u>	Calibration: <u>ED00037</u>
Lab File ID: <u>421D1563.D</u>	Calibration Date: <u>04/13/2021</u>
Sequence: <u>SJD0260</u>	Injection Date: <u>04/16/21</u>
Lab Sample ID: <u>SJD0260-ICV3</u>	Injection Time: <u>07:03</u>
Sequence Name: <u>A/S Creosote ICV</u>	

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR			% DRIFT/DIFF	
		STD	ICV	ICAL	ICV	MIN	ICV	LIMIT
Creosote Range Organics (C12-C22)	A	1000.0	942	39015.8400	36759.2300		-5.8	+/-15
o-Terphenyl	A	90.000	80.9	249011.4000	223885.7000		-10.1	+/-15

* Values outside of QC limits



INITIAL CALIBRATION CHECK

NWTPH-Dx

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>2110294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>FID4</u>	Calibration: <u>ED00037</u>
Lab File ID: <u>421H2514.D</u>	Calibration Date: <u>04/13/2021</u>
Sequence: <u>SJH0325</u>	Injection Date: <u>08/25/21</u>
Lab Sample ID: <u>SJH0325-ICV1</u>	Injection Time: <u>17:21</u>
Sequence Name: <u>DIESEL ICV</u>	

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR			% DRIFT/DIFF	
		STD	ICV	ICAL	ICV	MIN	ICV	LIMIT
Diesel Range Organics (C12-C24)	A	500.00	472	182831.3000	172442.1000		-5.7	+/-15
o-Terphenyl	A	90.000	82.5	249011.4000	228178.8000		-8.3	+/-15

* Values outside of QC limits



INITIAL CALIBRATION CHECK

NWTPH-Dx

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Instrument ID:	<u>FID4</u>	Calibration:	<u>ED00037</u>
Lab File ID:	<u>421H2515.D</u>	Calibration Date:	<u>04/13/2021</u>
Sequence:	<u>SJH0325</u>	Injection Date:	<u>08/25/21</u>
Lab Sample ID:	<u>SJH0325-ICV2</u>	Injection Time:	<u>17:41</u>
Sequence Name:	<u>MOIL ICV</u>		

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR			% DRIFT/DIFF	
		STD	ICV	ICAL	ICV	MIN	ICV	LIMIT
Motor Oil Range Organics (C24-C38)	A	1000.0	1020	131440.7000	133944.3000		1.9	+/-15

* Values outside of QC limits



INITIAL CALIBRATION CHECK

NWTPH-Dx

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>21I0294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>FID4</u>	Calibration: <u>ED00037</u>
Lab File ID: <u>421H2532.D</u>	Calibration Date: <u>04/13/2021</u>
Sequence: <u>SJH0325</u>	Injection Date: <u>08/25/21</u>
Lab Sample ID: <u>SJH0325-ICV3</u>	Injection Time: <u>23:24</u>
Sequence Name: <u>JET A</u>	

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR			% DRIFT/DIFF	
		STD	ICV	ICAL	ICV	MIN	ICV	LIMIT
Jet-A Range Organics (C10-C18)	A	500.00	443	191501.4000	169508.6000			+/-15
o-Terphenyl	A	90.000	79.7	249011.4000	220595.6000		-11.4	+/-15

* Values outside of QC limits



INITIAL CALIBRATION CHECK

NWTPH-Dx

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>21I0294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>FID4</u>	Calibration: <u>ED00037</u>
Lab File ID: <u>421H2517.D</u>	Calibration Date: <u>04/13/2021</u>
Sequence: <u>SJH0325</u>	Injection Date: <u>08/25/21</u>
Lab Sample ID: <u>SJH0325-ICV4</u>	Injection Time: <u>18:22</u>
Sequence Name: <u>AK103</u>	

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR			% DRIFT/DIFF	
		STD	ICV	ICAL	ICV	MIN	ICV	LIMIT
Motor Oil Range Organics (C24-C38)	A	1000.0	945	131440.7000	124183.5000		-5.5	+/-15

* Values outside of QC limits



INITIAL CALIBRATION CHECK

NWTPH-Dx

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>21I0294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>FID4</u>	Calibration: <u>EJ00035</u>
Lab File ID: <u>421J1906.D</u>	Calibration Date: <u>10/12/2021</u>
Sequence: <u>SJJ0253</u>	Injection Date: <u>10/19/21</u>
Lab Sample ID: <u>SJJ0253-ICV1</u>	Injection Time: <u>13:10</u>
Sequence Name: <u>DIESEL ICV</u>	

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR			% DRIFT/DIFF	
		STD	ICV	ICAL	ICV	MIN	ICV	LIMIT
Diesel Range Organics (C12-C24)	A	500.00	449	158608.3000	142275.3000		-10.3	+/-15
o-Terphenyl	A	90.000	85.5	190151.8000	180674.6000		-5.0	+/-15

* Values outside of QC limits



INITIAL CALIBRATION CHECK

NWTPH-Dx

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>21I0294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>FID4</u>	Calibration: <u>EJ00035</u>
Lab File ID: <u>421J1907.D</u>	Calibration Date: <u>10/12/2021</u>
Sequence: <u>SJJ0253</u>	Injection Date: <u>10/19/21</u>
Lab Sample ID: <u>SJJ0253-ICV2</u>	Injection Time: <u>13:30</u>
Sequence Name: <u>MOIL ICV</u>	

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR			% DRIFT/DIFF	
		STD	ICV	ICAL	ICV	MIN	ICV	LIMIT
Motor Oil Range Organics (C24-C38)	A	1000.0	897	131440.7000	117956.0000		-10.3	+/-15

* Values outside of QC limits



**SECOND-SOURCE
CONTINUING CALIBRATION CHECK
NWTPH-Dx**

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Instrument ID:	<u>FID4</u>	Calibration:	<u>ED00037</u>
Lab File ID:	<u>421D1315.D</u>	Calibration Date:	<u>04/13/2021</u>
Sequence:	<u>SJD0189</u>	Injection Date:	<u>04/13/21</u>
Lab Sample ID:	<u>SJD0189-SCV1</u>	Injection Time:	<u>15:37</u>
Sequence Name:	<u>DIESEL SCV</u>		

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR (RF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Diesel Range Organics (C12-C24)	A	500.00	492	182831.3	179727.9		-1.7	+/-30

* Values outside of QC limits



**SECOND-SOURCE
CONTINUING CALIBRATION CHECK
NWTPH-Dx**

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Instrument ID:	<u>FID4</u>	Calibration:	<u>ED00037</u>
Lab File ID:	<u>421D1322.D</u>	Calibration Date:	<u>04/13/2021</u>
Sequence:	<u>SJD0189</u>	Injection Date:	<u>04/13/21</u>
Lab Sample ID:	<u>SJD0189-SCV2</u>	Injection Time:	<u>18:07</u>
Sequence Name:	<u>MOIL SCV</u>		

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR (RF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Motor Oil Range Organics (C24-C38)	A	1000.0	918	131440.7	120611.9		-8.2	+/-30

* Values outside of QC limits



CONTINUING CALIBRATION CHECK

NWTPH-Dx

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: FID4

Calibration: ED00037

Lab File ID: 421D1577.D

Calibration Date: 04/13/2021

Sequence: SJD0260

Injection Date: 04/16/21

Lab Sample ID: SJD0260-CCV1

Injection Time: 11:57

Sequence Name: DIESEL CCV

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR (RF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Diesel Range Organics (C12-C24)	A	500.00	515	182831.3	188269		3.0	+/-15
o-Terphenyl	A	90.000	90.2	249011.4	249451.7		0.2	+/-15

* Values outside of QC limits



CONTINUING CALIBRATION CHECK
NWTPH-Dx

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Instrument ID:	<u>FID4</u>	Calibration:	<u>ED00037</u>
Lab File ID:	<u>421H2530.D</u>	Calibration Date:	<u>04/13/2021</u>
Sequence:	<u>SJH0325</u>	Injection Date:	<u>08/25/21</u>
Lab Sample ID:	<u>SJH0325-CCV1</u>	Injection Time:	<u>22:43</u>
Sequence Name:	<u>DIESEL CCV</u>		

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR (RF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Diesel Range Organics (C12-C24)	A	500.00	496	182831.3	181336.9		-0.8	+/-15
o-Terphenyl	A	90.000	85.9	249011.4	237658.4		-4.6	+/-15

* Values outside of QC limits



**SECOND-SOURCE
CONTINUING CALIBRATION CHECK
NWTPH-Dx**

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Instrument ID:	<u>FID4</u>	Calibration:	<u>EI00027</u>
Lab File ID:	<u>421I0718.D</u>	Calibration Date:	<u>09/07/2021</u>
Sequence:	<u>SJI0118</u>	Injection Date:	<u>09/07/21</u>
Lab Sample ID:	<u>SJI0118-SCV1</u>	Injection Time:	<u>22:36</u>
Sequence Name:	<u>DIESEL SCV</u>		

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR (RF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Diesel Range Organics (C12-C24)	A	500.00	509	158608.3	161595.1		1.9	+/-30

* Values outside of QC limits



CONTINUING CALIBRATION CHECK
NWTPH-Dx

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Instrument ID:	<u>FID4</u>	Calibration:	<u>EJ00035</u>
Lab File ID:	<u>421J1923.D</u>	Calibration Date:	<u>10/12/2021</u>
Sequence:	<u>SJJ0253</u>	Injection Date:	<u>10/19/21</u>
Lab Sample ID:	<u>SJJ0253-CCV1</u>	Injection Time:	<u>18:54</u>
Sequence Name:	<u>DIESEL CCV</u>		

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR (RF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Diesel Range Organics (C12-C24)	A	500.00	447	158608.3	141771.7		-10.6	+/-15
o-Terphenyl	A	90.000	84.9	190151.8	179435.8		-5.7	+/-15

* Values outside of QC limits



CONTINUING CALIBRATION CHECK
NWTPH-Dx

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Instrument ID:	<u>FID4</u>	Calibration:	<u>EJ00035</u>
Lab File ID:	<u>421J1924.D</u>	Calibration Date:	<u>10/12/2021</u>
Sequence:	<u>SJJ0253</u>	Injection Date:	<u>10/19/21</u>
Lab Sample ID:	<u>SJJ0253-CCV2</u>	Injection Time:	<u>19:15</u>
Sequence Name:	<u>MOIL CCV</u>		

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR (RF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Motor Oil Range Organics (C24-C38)	A	1000.0	920	131440.7	120963.5		-8.0	+/-15

* Values outside of QC limits



CONTINUING CALIBRATION CHECK
NWTPH-Dx

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Instrument ID:	<u>FID4</u>	Calibration:	<u>EJ00035</u>
Lab File ID:	<u>421J1938.D</u>	Calibration Date:	<u>10/12/2021</u>
Sequence:	<u>SJJ0253</u>	Injection Date:	<u>10/20/21</u>
Lab Sample ID:	<u>SJJ0253-CCV3</u>	Injection Time:	<u>23:57</u>
Sequence Name:	<u>DIESEL CCV</u>		

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR (RF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Diesel Range Organics (C12-C24)	A	500.00	457	158608.3	144973.2		-8.6	+/-15
o-Terphenyl	A	90.000	87.5	190151.8	184891.4		-2.8	+/-15

* Values outside of QC limits



CONTINUING CALIBRATION CHECK NWTPH-Dx

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>21I0294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>FID4</u>	Calibration: <u>EJ00035</u>
Lab File ID: <u>421J1939.D</u>	Calibration Date: <u>10/12/2021</u>
Sequence: <u>SJJ0253</u>	Injection Date: <u>10/20/21</u>
Lab Sample ID: <u>SJJ0253-CCV4</u>	Injection Time: <u>00:17</u>
Sequence Name: <u>MOIL CCV</u>	

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR (RF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Motor Oil Range Organics (C24-C38)	A	1000.0	983	131440.7	129154.9		-1.7	+/-15

* Values outside of QC limits



CONTINUING CALIBRATION CHECK NWTPH-Dx

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>21I0294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>FID4</u>	Calibration: <u>EJ00035</u>
Lab File ID: <u>421J1953.D</u>	Calibration Date: <u>10/12/2021</u>
Sequence: <u>SJJ0253</u>	Injection Date: <u>10/20/21</u>
Lab Sample ID: <u>SJJ0253-CCV6</u>	Injection Time: <u>04:59</u>
Sequence Name: <u>MOIL CCV</u>	

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR (RF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Motor Oil Range Organics (C24-C38)	A	1000.0	991	131440.7	130239.6		-0.9	+/-15

* Values outside of QC limits



CONTINUING CALIBRATION CHECK
NWTPH-Dx

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Instrument ID:	<u>FID4</u>	Calibration:	<u>EJ00035</u>
Lab File ID:	<u>421J1966.D</u>	Calibration Date:	<u>10/12/2021</u>
Sequence:	<u>SJJ0253</u>	Injection Date:	<u>10/20/21</u>
Lab Sample ID:	<u>SJJ0253-CCV7</u>	Injection Time:	<u>09:20</u>
Sequence Name:	<u>DIESEL CCV</u>		

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR (RF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Diesel Range Organics (C12-C24)	A	500.00	508	158608.3	160999.1		1.5	+/-15
o-Terphenyl	A	90.000	94.0	190151.8	198514.4		4.4	+/-15

* Values outside of QC limits



CONTINUING CALIBRATION CHECK

NWTPH-Dx

Laboratory: <u>Analytical Resources, LLC</u>	SDG: <u>21I0294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Instrument ID: <u>FID4</u>	Calibration: <u>EJ00035</u>
Lab File ID: <u>421J1967.D</u>	Calibration Date: <u>10/12/2021</u>
Sequence: <u>SJJ0253</u>	Injection Date: <u>10/20/21</u>
Lab Sample ID: <u>SJJ0253-CCV8</u>	Injection Time: <u>09:41</u>
Sequence Name: <u>MOIL CCV</u>	

COMPOUND	TYPE	CONC. (mg/L)		RESPONSE FACTOR (RF)			% DRIFT/DIFF	
		STD	CCV	ICAL	CCV	MIN	CCV	LIMIT
Motor Oil Range Organics (C24-C38)	A	1000.0	1030	131440.7	136016.9		3.5	+/-15

* Values outside of QC limits



ANALYSIS BATCH (SEQUENCE) SUMMARY

NWTPH-Dx

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJD0189

Instrument: FID4

Calibration: ED00037

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Retention Time Standard	SJD0189-IBL1	421D1307.D	NA	04/13/21 12:46
Instrument Blank	SJD0189-IBL2	421D1308.D	NA	04/13/21 13:07
DIESEL 50	SJD0189-CAL1	421D1309.D	NA	04/13/21 13:29
DIESEL 100	SJD0189-CAL2	421D1310.D	NA	04/13/21 13:50
DIESEL 250	SJD0189-CAL3	421D1311.D	NA	04/13/21 14:11
DIESEL 500	SJD0189-CAL4	421D1312.D	NA	04/13/21 14:33
DIESEL 1000	SJD0189-CAL5	421D1313.D	NA	04/13/21 14:54
DIESEL 2500	SJD0189-CAL6	421D1314.D	NA	04/13/21 15:16
DIESEL SCV	SJD0189-SCV1	421D1315.D	NA	04/13/21 15:37
MOIL 100	SJD0189-CAL7	421D1316.D	NA	04/13/21 15:59
MOIL 250	SJD0189-CAL8	421D1317.D	NA	04/13/21 16:20
MOIL 500	SJD0189-CAL9	421D1318.D	NA	04/13/21 16:42
MOIL 1000	SJD0189-CALA	421D1319.D	NA	04/13/21 17:03
MOIL 2500	SJD0189-CALB	421D1320.D	NA	04/13/21 17:24
MOIL 5000	SJD0189-CALC	421D1321.D	NA	04/13/21 17:46
MOIL SCV	SJD0189-SCV2	421D1322.D	NA	04/13/21 18:07
AK103 100	SJD0189-CALD	421D1323.D	NA	04/13/21 18:28
AK103 250	SJD0189-CALE	421D1324.D	NA	04/13/21 18:50
AK103 500	SJD0189-CALF	421D1325.D	NA	04/13/21 19:11
AK103 1000	SJD0189-CALG	421D1326.D	NA	04/13/21 19:32
AK103 2500	SJD0189-CALH	421D1327.D	NA	04/13/21 19:53
AK103 5000	SJD0189-CALI	421D1328.D	NA	04/13/21 20:14



ANALYSIS BATCH (SEQUENCE) SUMMARY

NWTPH-Dx

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJD0260

Instrument: FID4

Calibration: ED00037

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Retention Time Standard	SJD0260-IBL1	421D1553.D	NA	04/16/21 03:34
Instrument Blank	SJD0260-IBL2	421D1554.D	NA	04/16/21 03:55
A/S CREOSOTE 100	SJD0260-CAL1	421D1555.D	NA	04/16/21 04:16
A/S CREOSOTE 250	SJD0260-CAL2	421D1556.D	NA	04/16/21 04:37
A/S CREOSOTE 500	SJD0260-CAL3	421D1557.D	NA	04/16/21 04:57
A/S CREOSOTE 1000	SJD0260-CAL4	421D1558.D	NA	04/16/21 05:18
A/S CREOSOTE 2500	SJD0260-CAL5	421D1559.D	NA	04/16/21 05:39
A/S CREOSOTE 5000	SJD0260-CAL6	421D1560.D	NA	04/16/21 06:00
DIESEL ICV	SJD0260-ICV1	421D1561.D	NA	04/16/21 06:21
MOIL ICV	SJD0260-ICV2	421D1562.D	NA	04/16/21 06:42
A/S Creosote ICV	SJD0260-ICV3	421D1563.D	NA	04/16/21 07:03
ZZZZZ	BJC0355-BLK1	421D1564.D	Water	04/16/21 07:24
ZZZZZ	BJC0355-BS1	421D1565.D	Water	04/16/21 07:45
ZZZZZ	BJC0355-BSD1	421D1566.D	Water	04/16/21 08:06
ZZZZZ	21C0181-02RE1	421D1567.D	Water	04/16/21 08:27
ZZZZZ	21C0181-03RE1	421D1568.D	Water	04/16/21 08:48
ZZZZZ	21C0181-04RE1	421D1569.D	Water	04/16/21 09:09
ZZZZZ	21C0181-05RE1	421D1570.D	Water	04/16/21 09:30
ZZZZZ	21C0181-06RE1	421D1571.D	Water	04/16/21 09:51
ZZZZZ	21C0181-07RE1	421D1572.D	Water	04/16/21 10:12
ZZZZZ	21C0181-08RE1	421D1573.D	Water	04/16/21 10:33
ZZZZZ	21C0181-09RE1	421D1574.D	Water	04/16/21 10:54
ZZZZZ	21C0181-10RE1	421D1575.D	Water	04/16/21 11:15
ZZZZZ	21C0181-11RE2	421D1576.D	Water	04/16/21 11:36
DIESEL CCV	SJD0260-CCV1	421D1577.D	NA	04/16/21 11:57
MOIL CCV	SJD0260-CCV2	421D1578.D	NA	04/16/21 12:18
A/S CRESOTE CCV	SJD0260-CCV3	421D1579.D	NA	04/16/21 12:39
ZZZZZ	21C0181-12RE1	421D1580.D	Water	04/16/21 13:00
ZZZZZ	21C0181-13RE1	421D1581.D	Water	04/16/21 13:21



ANALYSIS BATCH (SEQUENCE) SUMMARY

NWTPH-Dx

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJD0260

Instrument: FID4

Calibration: ED00037

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
<i>ZZZZZ</i>	21C0181-14RE1	421D1582.D	Water	04/16/21 13:42
<i>ZZZZZ</i>	21C0181-15RE2	421D1584.D	Water	04/16/21 14:24
<i>ZZZZZ</i>	21C0181-16RE1	421D1585.D	Water	04/16/21 14:45
DIESEL CCV	SJD0260-CCV4	421D1586.D	NA	04/16/21 15:06
MOIL CCV	SJD0260-CCV5	421D1587.D	NA	04/16/21 15:28
A/S CRESOTE CCV	SJD0260-CCV6	421D1588.D	NA	04/16/21 15:49



ANALYSIS BATCH (SEQUENCE) SUMMARY

NWTPH-Dx

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJH0325

Instrument: FID4

Calibration: ED00037

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Retention Time Standard	SJH0325-IBL1	421H2503A.D	NA	08/25/21 13:15
Instrument Blank	SJH0325-IBL2	421H2504A.D	NA	08/25/21 13:36
DIESEL ICV	SJH0325-ICV1	421H2514.D	NA	08/25/21 17:21
MOIL ICV	SJH0325-ICV2	421H2515.D	NA	08/25/21 17:41
JETA	SJH0325-CAL1	421H2516.D	NA	08/25/21 18:01
AK103	SJH0325-ICV4	421H2517.D	NA	08/25/21 18:22
ZZZZZ	BJH0396-BLK1	421H2518.D	Water	08/25/21 18:42
ZZZZZ	BJH0396-BS1	421H2519.D	Water	08/25/21 19:02
ZZZZZ	BJH0396-BSD1	421H2520.D	Water	08/25/21 19:22
ZZZZZ	21H0113-01	421H2521.D	Water	08/25/21 19:42
ZZZZZ	21H0113-02	421H2522.D	Water	08/25/21 20:02
ZZZZZ	21H0113-03	421H2523.D	Water	08/25/21 20:23
ZZZZZ	21H0113-04	421H2524.D	Water	08/25/21 20:43
ZZZZZ	21H0167-01	421H2525.D	Water	08/25/21 21:03
ZZZZZ	21H0179-01	421H2526.D	Water	08/25/21 21:23
DIESEL CCV	SJH0325-CCV1	421H2530.D	NA	08/25/21 22:43
MOIL CCV	SJH0325-CCV2	421H2531.D	NA	08/25/21 23:04
JET A	SJH0325-ICV3	421H2532.D	NA	08/25/21 23:24



ANALYSIS BATCH (SEQUENCE) SUMMARY

NWTPH-Dx

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0118

Instrument: FID4

Calibration: EI00027

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Retention Time Standard	SJI0118-IBL1	421I0710.D	NA	09/07/21 19:55
Instrument Blank	SJI0118-IBL2	421I0711.D	NA	09/07/21 20:15
Diesel 50	SJI0118-CAL1	421I0712.D	NA	09/07/21 20:35
Diesel 100	SJI0118-CAL2	421I0713.D	NA	09/07/21 20:55
Diesel 250	SJI0118-CAL3	421I0714.D	NA	09/07/21 21:15
Diesel 500	SJI0118-CAL4	421I0715.D	NA	09/07/21 21:35
Diesel 1000	SJI0118-CAL5	421I0716.D	NA	09/07/21 21:55
Diesel 2500	SJI0118-CAL6	421I0717.D	NA	09/07/21 22:15
DIESEL SCV	SJI0118-SCV1	421I0718.D	NA	09/07/21 22:36



ANALYSIS BATCH (SEQUENCE) SUMMARY

NWTPH-Dx

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0166

Instrument: FID4

Calibration: EJ00035

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Retention Time Standard	SJJ0166-IBL1	421J1203.D	NA	10/12/21 12:18
Instrument Blank	SJJ0166-IBL2	421J1204.D	NA	10/12/21 12:39
Bunker C 100 NO A/S	SJJ0166-CAL1	421J1207.D	NA	10/12/21 13:39
Bunker C 250 NO A/S	SJJ0166-CAL2	421J1208.D	NA	10/12/21 13:59
Bunker C 500 NO A/S	SJJ0166-CAL3	421J1209.D	NA	10/12/21 14:19
Bunker C 1000 NO A/S	SJJ0166-CAL4	421J1210.D	NA	10/12/21 14:39
Bunker C 2500 NO A/S	SJJ0166-CAL5	421J1211.D	NA	10/12/21 15:00
Bunker C 5000 NO A/S	SJJ0166-CAL6	421J1212.D	NA	10/12/21 15:20



ANALYSIS BATCH (SEQUENCE) SUMMARY

NWTPH-Dx

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0253

Instrument: FID4

Calibration: EJ00035

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Retention Time Standard	SJJ0253-IBL1	421J1904.D	NA	10/19/21 12:30
Instrument Blank	SJJ0253-IBL2	421J1905.D	NA	10/19/21 12:50
DIESEL ICV	SJJ0253-ICV1	421J1906.D	NA	10/19/21 13:10
MOIL ICV	SJJ0253-ICV2	421J1907.D	NA	10/19/21 13:30
ZZZZZ	BJI0741-BLK1	421J1908.D	Water	10/19/21 13:51
ZZZZZ	BJI0741-BS1	421J1909.D	Water	10/19/21 14:11
ZZZZZ	BJI0741-BSD1	421J1910.D	Water	10/19/21 14:31
ZZZZZ	21I0344-02	421J1911.D	Water	10/19/21 14:51
ZZZZZ	21I0344-03	421J1912.D	Water	10/19/21 15:12
ZZZZZ	21I0344-04	421J1913.D	Water	10/19/21 15:32
ZZZZZ	21I0344-05	421J1914.D	Water	10/19/21 15:52
ZZZZZ	21I0344-06	421J1915.D	Water	10/19/21 16:12
ZZZZZ	21I0344-07	421J1916.D	Water	10/19/21 16:33
ZZZZZ	21I0344-08	421J1917.D	Water	10/19/21 16:53
ZZZZZ	21I0344-09	421J1920.D	Water	10/19/21 17:54
ZZZZZ	21I0344-10	421J1921.D	Water	10/19/21 18:14
ZZZZZ	21I0344-11	421J1922.D	Water	10/19/21 18:34
DIESEL CCV	SJJ0253-CCV1	421J1923.D	NA	10/19/21 18:54
MOIL CCV	SJJ0253-CCV2	421J1924.D	NA	10/19/21 19:15
ZZZZZ	21I0344-12	421J1925.D	Water	10/19/21 19:35
ZZZZZ	21I0344-13	421J1926.D	Water	10/19/21 19:55
ZZZZZ	21I0344-14	421J1927.D	Water	10/19/21 20:15
Blank	BJI0737-BLK1	421J1928.D	Water	10/19/21 20:35
LCS	BJI0737-BS1	421J1929.D	Water	10/19/21 20:56
LCS Dup	BJI0737-BSD1	421J1930.D	Water	10/19/21 21:16
MW-28_092021	21I0294-01	421J1931.D	Water	10/19/21 21:36
MW-24_092021	21I0294-03	421J1932.D	Water	10/19/21 21:56
MW-60_092021	21I0294-05	421J1933.D	Water	10/19/21 22:16
MW-55_092021	21I0294-07	421J1934.D	Water	10/19/21 22:37



ANALYSIS BATCH (SEQUENCE) SUMMARY

NWTPH-Dx

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0253

Instrument: FID4

Calibration: EJ00035

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
MW-42_092021	21I0294-09	421J1935.D	Water	10/19/21 22:57
MW-54_092021	21I0294-11	421J1936.D	Water	10/19/21 23:17
ZZZZZ	21I0305-01	421J1937.D	Water	10/19/21 23:37
MOIL CCV	SJJ0253-CCV4	421J1939.D	NA	10/20/21 00:17
ZZZZZ	21I0305-02	421J1940.D	Water	10/20/21 00:38
ZZZZZ	21I0305-03	421J1941.D	Water	10/20/21 00:58
ZZZZZ	21I0305-04	421J1942.D	Water	10/20/21 01:18
ZZZZZ	BJJ0488-BLK1	421J1943.D	Water	10/20/21 01:38
ZZZZZ	BJJ0488-BS1	421J1944.D	Water	10/20/21 01:58
ZZZZZ	BJJ0488-BSD1	421J1945.D	Water	10/20/21 02:18
ZZZZZ	21J0229-03	421J1946.D	Water	10/20/21 02:38
ZZZZZ	21J0229-04	421J1947.D	Water	10/20/21 02:58
ZZZZZ	21J0229-05	421J1948.D	Water	10/20/21 03:18
ZZZZZ	21J0241-01	421J1949.D	Water	10/20/21 03:39
ZZZZZ	21J0241-02	421J1950.D	Water	10/20/21 03:59
ZZZZZ	21J0241-04	421J1951.D	Water	10/20/21 04:19
DIESEL CCV	SJJ0253-CCV5	421J1952.D	NA	10/20/21 04:39
MOIL CCV	SJJ0253-CCV6	421J1953.D	NA	10/20/21 04:59
ZZZZZ	BJI0739-BLK1	421J1954.D	Water	10/20/21 05:19
ZZZZZ	BJI0739-BS1	421J1955.D	Water	10/20/21 05:39
ZZZZZ	BJI0739-BSD1	421J1956.D	Water	10/20/21 05:59
ZZZZZ	21I0329-01	421J1957.D	Water	10/20/21 06:19
ZZZZZ	21I0329-02	421J1958.D	Water	10/20/21 06:39
ZZZZZ	21I0329-03	421J1959.D	Water	10/20/21 06:59
ZZZZZ	21I0329-04	421J1960.D	Water	10/20/21 07:20
ZZZZZ	21I0329-05	421J1961.D	Water	10/20/21 07:40
ZZZZZ	21I0329-06	421J1962.D	Water	10/20/21 08:00
DIESEL CCV	SJJ0253-CCV7	421J1966.D	NA	10/20/21 09:20
MOIL CCV	SJJ0253-CCV8	421J1967.D	NA	10/20/21 09:41



ANALYSIS BATCH (SEQUENCE) SUMMARY

NWTPH-Dx

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0253

Instrument: FID4

Calibration: EJ00035

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
DIESEL CCV	SJJ0253-CCV3	421J1938.D	NA	10/20/21 23:57



SURROGATE RECOVERY AND RT SUMMARY

NWTPH-Dx

Laboratory: <u>Analytical Resources, LLC</u>	SDG/WO: <u>21I0294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Sequence: <u>SJD0260</u>	Instrument: <u>FID4</u>
Calibration: <u>ED00037</u>	Calibration Date: <u>04/13/2021</u>

Surrogate Compound	Spike Level mg/L	% Recovery	Recovery Limits	RT	Calibration Mean RT	RT Diff	RT Diff Limit	Q
SJD0260-ICV1 (Water)			Lab File ID: 421D1561.D			Analyzed: 04/16/21 06:21		
o-Terphenyl	90.000	96.7	85 - 115	6.12	6.13	-0.0100	N/A	
SJD0260-ICV3 (Water)			Lab File ID: 421D1563.D			Analyzed: 04/16/21 07:03		
o-Terphenyl	90.000	89.9	85 - 115	6.12	6.13	-0.0100	N/A	
SJD0260-CCV1 (Water)			Lab File ID: 421D1577.D			Analyzed: 04/16/21 11:57		
o-Terphenyl	90.000	100	85 - 115	6.12	6.13	-0.0100	N/A	



SURROGATE RECOVERY AND RT SUMMARY

NWTPH-Dx

Laboratory:	<u>Analytical Resources, LLC</u>	SDG/WO:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Sequence:	<u>SJH0325</u>	Instrument:	<u>FID4</u>
Calibration:	<u>ED00037</u>	Calibration Date:	<u>04/13/2021</u>

Surrogate Compound	Spike Level mg/L	% Recovery	Recovery Limits	RT	Calibration Mean RT	RT Diff	RT Diff Limit	Q
SJH0325-ICV1 (Water)			Lab File ID: 421H2514.D			Analyzed: 08/25/21 17:21		
o-Terphenyl	90.000	91.7	85 - 115	6.01	6.13	-0.1200	N/A	
SJH0325-CCV1 (Water)			Lab File ID: 421H2530.D			Analyzed: 08/25/21 22:43		
o-Terphenyl	90.000	95.4	85 - 115	6.01	6.13	-0.1200	N/A	
SJH0325-ICV3 (Water)			Lab File ID: 421H2532.D			Analyzed: 08/25/21 23:24		
o-Terphenyl	90.000	88.6	85 - 115	6	6.13	-0.1300	N/A	



SURROGATE RECOVERY AND RT SUMMARY

NWTPH-Dx

Laboratory: Analytical Resources, LLC
 Client: GeoEngineers
 Sequence: SJJ0253
 Calibration: EJ00035

SDG/WO: 21I0294
 Project: South State Street PRDI
 Instrument: FID4
 Calibration Date: 10/12/2021

Surrogate Compound	Spike Level mg/L	% Recovery	Recovery Limits	RT	Calibration Mean RT	RT Diff	RT Diff Limit	Q
SJJ0253-IBL1 (Water)			Lab File ID: 421J1904.D		Analyzed: 10/19/21 12:30			
o-Terphenyl	100.00	99.5	50 - 150	5.92	6.001667	-0.0817	N/A	
SJJ0253-IBL2 (Water)			Lab File ID: 421J1905.D		Analyzed: 10/19/21 12:50			
o-Terphenyl	100.00	93.0	50 - 150	5.92	6.001667	-0.0817	N/A	
SJJ0253-ICV1 (Water)			Lab File ID: 421J1906.D		Analyzed: 10/19/21 13:10			
o-Terphenyl	90.000	95.0	85 - 115	5.92	6.001667	-0.0817	N/A	
SJJ0253-CCV1 (Water)			Lab File ID: 421J1923.D		Analyzed: 10/19/21 18:54			
o-Terphenyl	90.000	94.3	85 - 115	5.92	6.001667	-0.0817	N/A	
BJI0737-BLK1 (Water)			Lab File ID: 421J1928.D		Analyzed: 10/19/21 20:35			
o-Terphenyl	0.22500	100	50 - 150	5.92	6.001667	-0.0817	N/A	
BJI0737-BS1 (Water)			Lab File ID: 421J1929.D		Analyzed: 10/19/21 20:56			
o-Terphenyl	0.22500	103	50 - 150	5.93	6.001667	-0.0717	N/A	
BJI0737-BSD1 (Water)			Lab File ID: 421J1930.D		Analyzed: 10/19/21 21:16			
o-Terphenyl	0.22500	113	50 - 150	5.93	6.001667	-0.0717	N/A	
21I0294-01 (Water)			Lab File ID: 421J1931.D		Analyzed: 10/19/21 21:36			
o-Terphenyl	0.22500	97.1	50 - 150	5.93	6.001667	-0.0717	N/A	
21I0294-03 (Water)			Lab File ID: 421J1932.D		Analyzed: 10/19/21 21:56			
o-Terphenyl	0.22500	86.8	50 - 150	5.92	6.001667	-0.0817	N/A	
21I0294-05 (Water)			Lab File ID: 421J1933.D		Analyzed: 10/19/21 22:16			
o-Terphenyl	0.22500	96.7	50 - 150	5.92	6.001667	-0.0817	N/A	
21I0294-07 (Water)			Lab File ID: 421J1934.D		Analyzed: 10/19/21 22:37			
o-Terphenyl	0.22500	57.4	50 - 150	5.92	6.001667	-0.0817	N/A	
21I0294-09 (Water)			Lab File ID: 421J1935.D		Analyzed: 10/19/21 22:57			
o-Terphenyl	0.22500	106	50 - 150	5.93	6.001667	-0.0717	N/A	
21I0294-11 (Water)			Lab File ID: 421J1936.D		Analyzed: 10/19/21 23:17			
o-Terphenyl	0.22500	102	50 - 150	5.92	6.001667	-0.0817	N/A	



SURROGATE RECOVERY AND RT SUMMARY

NWTPH-Dx

Laboratory: <u>Analytical Resources, LLC</u>	SDG/WO: <u>21I0294</u>
Client: <u>GeoEngineers</u>	Project: <u>South State Street PRDI</u>
Sequence: <u>SJJ0253</u>	Instrument: <u>FID4</u>
Calibration: <u>EJ00035</u>	Calibration Date: <u>09/07/2021</u>

Surrogate Compound	Spike Level mg/L	% Recovery	Recovery Limits	RT	Calibration Mean RT	RT Diff	RT Diff Limit	Q
SJJ0253-CCV5 (Water)			Lab File ID: 421J1952.D			Analyzed: 10/20/21 04:39		
o-Terphenyl	90.000	102	85 - 115	5.92	6.001667	-0.0817	N/A	
SJJ0253-CCV7 (Water)			Lab File ID: 421J1966.D			Analyzed: 10/20/21 09:20		
o-Terphenyl	90.000	104	85 - 115	5.92	6.001667	-0.0817	N/A	
SJJ0253-CCV3 (Water)			Lab File ID: 421J1938.D			Analyzed: 10/20/21 23:57		
o-Terphenyl	90.000	97.2	85 - 115	5.92	6.001667	-0.0817	N/A	



HOLDING TIME SUMMARY

Analysis: NWT PH-Dx

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sample Name	Date Collected	Date Received	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
MW-28_092021 21I0294-01	09/20/21 10:10	09/21/21 15:38	09/27/21 11:34	7	7	10/19/21 21:36	22	40	
MW-24_092021 21I0294-03	09/20/21 11:11	09/21/21 15:38	09/27/21 11:34	7	7	10/19/21 21:56	22	40	
MW-60_092021 21I0294-05	09/20/21 11:30	09/21/21 15:38	09/27/21 11:34	7	7	10/19/21 22:16	22	40	
MW-55_092021 21I0294-07	09/20/21 12:29	09/21/21 15:38	09/27/21 11:34	6	7	10/19/21 22:37	22	40	
MW-42_092021 21I0294-09	09/20/21 12:35	09/21/21 15:38	09/27/21 11:34	6	7	10/19/21 22:57	22	40	
MW-54_092021 21I0294-11	09/20/21 13:54	09/21/21 15:38	09/27/21 11:34	6	7	10/19/21 23:17	22	40	

* Indicates hold time exceedance.



Analytical Resources, Incorporated
Analytical Chemists and Consultants

**METHOD DETECTION
AND REPORTING LIMITS
NWTPH-Dx**

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Solid

Instrument: FID4

Analyte	MDL	RL	Units
Diesel Range Organics (C12-C24)	2.34	5.00	mg/kg
Motor Oil Range Organics (C24-C38)	2.99	10.0	mg/kg



METHOD DETECTION AND REPORTING LIMITS

NWTPH-Dx

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Instrument: FID4

Analyte	MDL	RL	Units
Diesel Range Organics (C12-C24)	0.033	0.100	mg/L
Motor Oil Range Organics (C24-C38)	0.056	0.200	mg/L

- I-6884 - Chevron Motor Oil SAE 30
- I-6885 - Valvoline Motor Oil SAE 30
- I-6886 - Valvoline Motor Oil SAE 5W-30
- I-6887 - Valvoline Motor Oil SAE 40
- I-6888 - Mobil 1 Synthetic Motor Oil 10W30

Mrs
5/13/11

Ans N Gebro
5/13/11

B000124

TPHD MOIL Chevron Stock 30W
Expires 7/20/2020
Prepared By Jonathon Walter 7/20/2010



OFFICE P.O. BOX 1156, SPRINGFIELD, MO. 65801
PHONE (417) 862-3333



STORE PHONE # 425 821-8080
REMIT TO: PO BOX 790098
ST LOUIS MO 63179-0098

BILL TO 999990 SHIP TO

INVOICE NUMBER 2508-248050
INVOICE TYPE CHG. CARD SALE
INVOICE DATE 5/13/11

CASH SALE
CHEVRON INJECTOR CLEANER
SAVE INSTANTLY
BUY 1 GET 1 FREE 00000

COUNTER NO.	SPECIAL INSTRUCTIONS	SHIP VIA	CUSTOMER ORDER NO.	TIME OF ORDER	FILLED BY	CHECKED BY							
5				00:02:50									
TAX	R	QTY.	LINE	ITEM NUMBER	UNIT MEAS.	CD.	DESCRIPTION	LIST PRICE	NET PRICE	DISC %	CORE PRICE	EXTENDED PRICE	
		1		CAS EDGE 10-30	EA		10t Motor Oil	14.75	5.99			5.99	
		1		CAS EDGE 10-30	EA		10t Motor Oil	14.75	5.99			5.99	
		1		MOB 1-10-30	EA		10t Synthc Oil	13.98	4.69			4.69	
		1		VAL 5-30	EA		10t Motor Oil	7.95	4.69			4.69	
		1		VAL HD30	EA		10t Motor Oil	7.95	4.69			4.69	
		1		VAL HD40	EA		10t Motor Oil	7.95	4.69			4.69	
		1		CHP HD30	EA		MOTOR OIL	6.25	3.69			3.69	
MFG. DEFECT WARRANTY													
CREDIT CARD MASTER CARD 1264								EXPIRATION DATE		RX/XX		AUTHORIZATION 96694Z	
TOTALS 7 CUSTOMER COPY								72.44		37.93		SUB-TOTAL 37.93	
CUSTOMER SIGNATURE								CASH TEND.		MISC.		TAX / FEES	
								CHANGE		TOTAL			



OFFICE P.O. BOX 1156, SPRINGFIELD, MO. 65801
PHONE (417) 862-3333



STORE PHONE # 425 821-8080
REMIT TO: PO BOX 790098
ST LOUIS MO 63179-0098

BILL TO 999990 SHIP TO

INVOICE NUMBER 2508-248050
INVOICE TYPE CHG. CARD SALE
INVOICE DATE 5/13/11

CASH SALE
CHEVRON INJECTOR CLEANER
SAVE INSTANTLY
BUY 1 GET 1 FREE 00000

COUNTER NO.	SPECIAL INSTRUCTIONS	SHIP VIA	CUSTOMER ORDER NO.	TIME OF ORDER	FILLED BY	CHECKED BY						
5				00:02:50								
TAX	R	QTY.	LINE	ITEM NUMBER	UNIT MEAS.	CD.	DESCRIPTION	LIST PRICE	NET PRICE	DISC %	CORE PRICE	EXTENDED PRICE

I-6884 - Chevron Motor Oil SAE 30
 I-6885 - Valvoline Motor Oil SAE 30
 I-6886 - Valvoline Motor Oil SAE 5W-30
 I-6887 - Valvoline Motor Oil SAE 40
 I-6888 - Mobil 1 Synthetic Motor Oil 10W30

Mrs
5/13/11

Ans N Geben
5/13/11

B000146

TPHD MOIL Valvoline 30W
 Expires 5/13/2039
 Prepared By Jonathon Walter 5/13/2011



OFFICE P.O. BOX 1156, SPRINGFIELD, MO. 65801
 PHONE (417) 862-3333



STORE PHONE # 425 821-8080
 REMIT TO: PO BOX 790098
 ST LOUIS MO 63179-0098

BILL TO 999990 SHIP TO

INVOICE NUMBER 2508-248050
 INVOICE TYPE CHG. CARD SALE
 INVOICE DATE 5/13/11

CASH SALE
 CHEVRON INJECTOR CLEANER
 SAVE INSTANTLY
 BUY 1 GET 1 FREE 00000

COUNTER NO.	SPECIAL INSTRUCTIONS	SHIP VIA	CUSTOMER ORDER NO.	TIME OF ORDER	FILLED BY	CHECKED BY							
5				00:02:50									
TAX	R	QTY.	LINE	ITEM NUMBER	UNIT MEAS.	CD.	DESCRIPTION	LIST PRICE	NET PRICE	DISC %	CORE PRICE	EXTENDED PRICE	
		1		CAS EDGE 10-30	EA		10t Motor Oil	14.75	5.99			5.99	
		1		CAS EDGE 10-30	EA		10t Motor Oil	14.75	5.99			5.99	
		1		MOB 1-10-30	EA		10t Synthc Oil	13.98	4.69			4.69	
		1		VAL 5-30	EA		10t Motor Oil	7.95	4.69			4.69	
		1		VAL HD30	EA		10t Motor Oil	7.95	4.69			4.69	
		1		VAL HD40	EA		10t Motor Oil	7.95	4.69			4.69	
		1		CHP HD30	EA		MOTOR OIL	6.25	3.69			3.69	
MFG. DEFECT WARRANTY													
CREDIT CARD MASTER CARD 1264								EXPIRATION DATE		RX/XX		AUTHORIZATION 96694Z	
TOTALS 7 CUSTOMER COPY								72.44		37.93		SUB-TOTAL 37.93	
CASH TEND.										MISC.			
CHANGE										TAX/FEES			
CUSTOMER SIGNATURE										TOTAL			



OFFICE P.O. BOX 1156, SPRINGFIELD, MO. 65801
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STORE PHONE # 425 821-8080
 REMIT TO: PO BOX 790098
 ST LOUIS MO 63179-0098

BILL TO 999990 SHIP TO

INVOICE NUMBER 2508-248050
 INVOICE TYPE CHG. CARD SALE
 INVOICE DATE 5/13/11

CASH SALE
 CHEVRON INJECTOR CLEANER
 SAVE INSTANTLY
 BUY 1 GET 1 FREE 00000

COUNTER NO.	SPECIAL INSTRUCTIONS	SHIP VIA	CUSTOMER ORDER NO.	TIME OF ORDER	FILLED BY	CHECKED BY						
5				00:02:50								
TAX	R	QTY.	LINE	ITEM NUMBER	UNIT MEAS.	CD.	DESCRIPTION	LIST PRICE	NET PRICE	DISC %	CORE PRICE	EXTENDED PRICE

3050 Spruce Street, Saint Louis, MO 63103, USA

Website: www.sigmaaldrich.com

Email USA: techserv@sial.com

Outside USA: eurtechserv@sial.com

Certificate of Analysis

Product Name:

Triacontane - 98%

Product Number:

263842

Batch Number:

MKBL2826V

Brand:

ALDRICH

CAS Number:

638-68-6

MDL Number:

MFCD00009410

Formula:

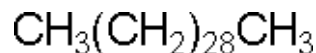
C30H62

Formula Weight:

422.81 g/mol

Quality Release Date:

20 JUN 2012



Test	Specification	Result
Appearance (Color)	White	White
Appearance (Form)	Conforms to Requirements	Flakes
Flakes or Crystalline Flakes		
Melting Point	65.0 - 69.0 °C	65.7 °C
Infrared spectrum	Conforms to Structure	Conforms
Purity (GC)	≥ 97.5 %	98.1 %



Jamie Gleason, Manager
Quality Control
Milwaukee, Wisconsin US

C003092

TPHD Triacontane NEAT
Expires 2/15/2030
Prepared By Van Spohn 8/19/2014

Sigma-Aldrich warrants, that at the time of the quality release or subsequent retest date this product conformed to the information contained in this publication. The current Specification sheet may be available at Sigma-Aldrich.com. For further inquiries, please contact Technical Service. Purchaser must determine the suitability of the product for its particular use. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Certificate of analysis

E003343

TPHD O-Terphenyl Neat
Expires 12/31/2079
Prepared By Jonathon Walter 8/10/2016

Product No.:	A19680
Product:	o-Terphenyl, 98%
Lot No.:	10114703
Appearance	White, crystalline powder
Melting point	55.0-55.9°C
Assay (GC)	99.9+ %

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ThermoFisher
S C I E N T I F I C

3050 Spruce Street, Saint Louis, MO 63103, USA

Website: www.sigmaaldrich.com

Email USA: techserv@sial.com

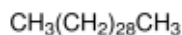
Outside USA: eurtechserv@sial.com

Certificate of Analysis

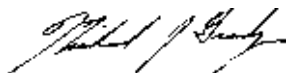
Product Name:

Triacontane - 98%

Product Number: 263842
Batch Number: MKCD2349
Brand: ALDRICH
CAS Number: 638-68-6
MDL Number: MFCD00009410
Formula: C₃₀H₆₂
Formula Weight: 422.81 g/mol
Quality Release Date: 01 JUN 2017



Test	Specification	Result
Appearance (Color)	White	White
Appearance (Form) Flakes or Crystalline Flakes	Conforms to Requirements	Flakes
Melting Point	65.0 - 69.0 °C	65.4 °C
Infrared Spectrum	Conforms to Structure	Conforms
Purity (GC)	≥ 97.5 %	98.2 %



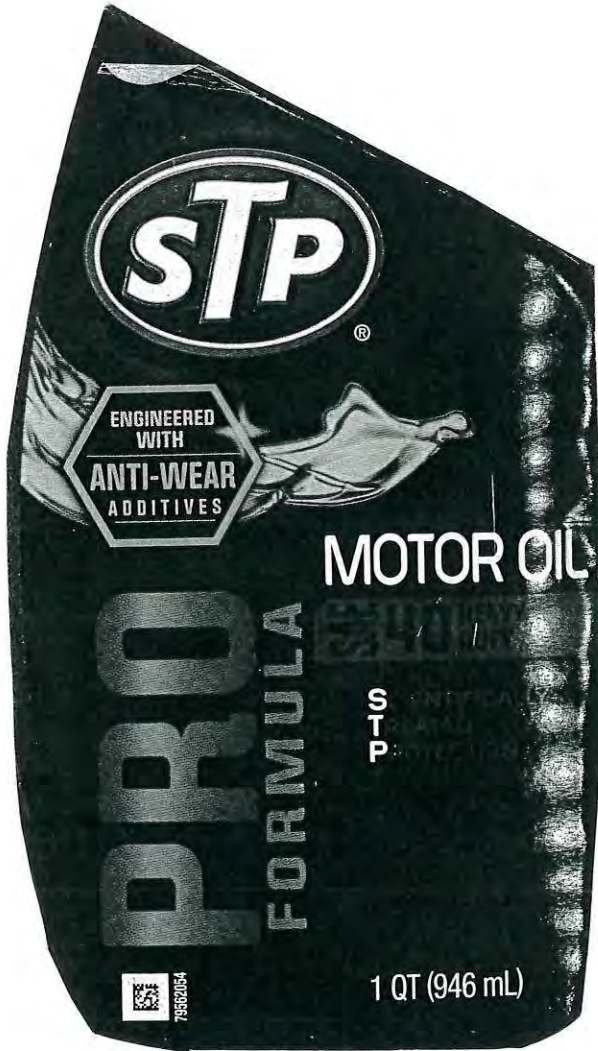
Michael Grady, Manager
Quality Control
Milwaukee, WI US

F008659

TPHD Triacontane NEAT
Expires 12/31/2079

Prepared By Joshua Rains 9/21/2017

Sigma-Aldrich warrants, that at the time of the quality release or subsequent retest date this product conformed to the information contained in this publication. The current Specification sheet may be available at Sigma-Aldrich.com. For further inquiries, please contact Technical Service. Purchaser must determine the suitability of the product for its particular use. See reverse side of invoice or packing slip for additional terms and conditions of sale.



front



back

G004796

TPHD MOIL STP 40W

Expires 12/31/2079

Prepared By Joshua Rains 5/25/2018

G 004796

5264

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number:	Turn-around Requested:	Page: <u>2</u> of <u>2</u>
ARI Client Company: <u>London Assoc Inc</u>	Phone: <u>509 327-9737</u>	Date: <u>3-27-19</u>
Client Contact: <u>Ryan Reich</u>		Ice Present? <u>Yes</u>
		No. of Coolers: <u>2</u>
		Cooler Temps: <u>2.7°C 2.4°C</u>



Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Client Project Name: <u>Avista Central Steam Plant (CSP)</u>					Analysis Requested					Notes/Comments		
Client Project #: <u>0236040</u>		Samplers: <u>Ryan Reich</u>			MWTPH-DX to Bunker C							
Sample ID	Date	Time	Matrix	No. Containers								
<u>MW 28-032719</u>	<u>3-27-19</u>	<u>15:45</u>	<u>w</u>	<u>2</u>		<u>X</u>						
<u>MW 25-032819</u>	<u>3-28-19</u>	<u>9:05</u>	<u>w</u>	<u>2</u>		<u>X</u>						
<u>MW 7-032819</u>	<u>3-28-19</u>	<u>9:55</u>	<u>w</u>	<u>2</u>		<u>X</u>						
<u>EW 3-102418</u>	<u>10-24-18</u>	<u>13:00</u>	<u>Product liquid</u>	<u>2</u>							<u>Site Bunker C Standard</u>	
											H003225	
											TPHD Bunker C Site Specific (Avista) Expires 4/1/2046 Prepared By <u>Susan Dunnihoo 3/29/2019</u>	
Comments/Special Instructions <u>* w/ acid silica gel cleanup</u>		Relinquished by: (Signature) <u>Ryan Reich</u>	Received by: (Signature) <u>Jacob Walte</u>		Relinquished by: (Signature)		Received by: (Signature)					
		Printed Name: <u>Ryan Reich</u>	Printed Name: <u>Jacob Walte</u>		Printed Name:		Printed Name:					
		Company: <u>London Assoc</u>	Company: <u>ARI</u>		Company:		Company:					
		Date & Time: <u>3-28-19 16:30</u>	Date & Time: <u>03/29/19 0950</u>		Date & Time:		Date & Time:					

Limits of Liability: ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, not withstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

Sample Retention Policy: All samples submitted to ARI will be appropriately discarded no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer, unless alternate retention schedules have been established by work-order or contract.



Appendix 20.1

ALTERNATE CERTIFICATE OF ANALYSIS

The manufacturer of the below chemical was unable to provide a Certificate of Analysis at the time of request by ARI.

Date Requested from Manufacturer: 7.16.19 - not requested.

Chemical: Pentacosane-n

Manufacturer: Chem service

Product #: NA

Lot #: 184-125A

Purity: 99%

Analyst: VTS

H006758
n-Pentacosane-Neat
Solvent / Lot: NA
Prep: 7/15/2019 by VS
Exp: 1/12/2030
Location: GC

CERTIFICATE OF ANALYSIS

Catalog No: DRH-004S-R1-5X
Description: Calibration/Window Defining Hydrocarbon Standard
Lot: 219041075
Solvent: Chloroform
Hazards: Refer to SDS for complete safety information

Date Certified: Apr 8, 2019
Expiration: Apr 8, 2029
Sample Size: 1 mL
Components: 17
Storage Condition: Ambient (>5 °C)/Sonicate



Certified Reference Material



Component	CAS #	Purity % (GC/MS)	Prepared Concentration ² (µg/mL)	Certified Analyte Concentration ¹ (µg/mL)
n-Octane	111-65-9	100.0	1017	1017
Decane	124-18-5	100.0	1014	1014
Dodecane	112-40-3	98.1	1013	994
n-Tetradecane	629-59-4	99.9	1008	1007
Hexadecane	544-76-3	98.9	1004	993
n-Octadecane	593-45-3	99.1	1013	1004
Eicosane	112-95-8	99.8	1008	1006
Docosane	629-97-0	99.1	1002	993
n-Tetracosane	646-31-1	100.0	1000	1000
Hexacosane	630-01-3	99.5	1008	1003
n-Octacosane	630-02-4	99.0	1017	1007
n-Triacontane	638-68-6	100.0	1017	1017
Dotriacontane	544-85-4	98.0	1014	994
Tetraatriacontane	14167-59-0	99.0	1012	1002
Hexatriacontane	630-06-8	98.0	1003	983
n-Octatriacontane	7194-85-6	98.5	1009	994
Tetracontane	4181-95-7	99.0	1009	999

H 007050
Recd JK
07/24/19

A product with a suffix (-1A, -2B, etc. or -01, -02, etc.) on its lot number has had its expiration date extended and is identical to the same lot number without the suffix.

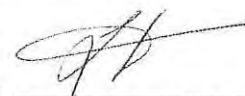
² All weights are traceable through NIST, Test No. 684/289871-17

¹ Certified Analyte Concentration = Purity x Prepared Concentration.

The Uncertainty associated with the certified concentration reported on this certificate is $\pm 2.4\%$. This value is the combined expanded uncertainty and represents an estimated standard deviation equal to the positive square root of the total variation of the uncertainty of components. A normal distribution is assumed and a coverage factor of K=2 is chosen using approximately a 95% confidence level.

Labels and certificates follow U.S. Conventions in reporting numerical values: A comma (,) is used to separate units of one-thousand or greater. A period (.) is used as a decimal place marker.

The information on this certificate may not be reproduced without the express permission of the manufacturer. See reverse side for additional information

Certified By: 
Larry Decker, Organic QC Manager

Appendix 13.1

ALTERNATE CERTIFICATE OF ANALYSIS

An effort has been made to locate the Certificate of Analysis for the below chemical and the manufacturer of the chemical was unable to provide a certificate at the time of request by ARI. This form is serving as a substitute for documentation purposes.

Date Requested from Manufacturer: 09/20/19 purchased at gas station

Chemical: Diesel #2 NEAT

H009117
TPHD Diesel #2 (76)
Expires 12/31/2079
Prepared By Joshua Rains 9/20/2019

Manufacturer: 76 gas station

Product #: N/A

17009117

Lot #: N/A

09/20/19

Purity: NEAT

Analyst: JR

13310 Interurban Ave S
Tukwila Wa 98168

STANLEY H & REBECCA
00081106449
13310 INTERURBAN A
TUKWILA , WA
09/20/2019 415774136
11:10:20 AM

3605
MASTERCARD

INVOICE 110939
AUTH 00-024386
REF370230920191109

PUMP# 8
DIESEL 2 0.058G
PRICE/GAL \$3.599

FUEL TOTAL \$ 0.20

CREDIT \$ 0.20

COMPLETION

SWIPE Exp.Date:*/**
Batch: 37 Seq Num: 23
Term ID: 8
Workstation ID: 00
Your opinion
counts! Enter to
Win 1 of 60 \$25
gas gift cards!!!
Provide feedback
www.gasvisit.com
Learn how to earn
50 cents/gallon in
fuel statement
credits. Go to
drivesavvy.com or
see details at the
pump. Restrictions
apply. Offer
expires 9/30/19.
18

H009117
M
09/20/19

COMPLETE A SURVEY
WWW.GASVISIT.COM
REGISTER TO WIN!!



CERTIFIED REFERENCE MATERIAL

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800)356-1688
Fax: (814)353-1309

www.restek.com

Certificate of Analysis



FOR LABORATORY USE ONLY-READ SDS PRIOR TO USE.

This Reference Material is intended for Laboratory Use Only as a standard for the qualitative and/or quantitative determination of the analyte(s) listed.

Catalog No. : ! **Lot No.:** #\$!%&%\$%

Description : '()*+,-./,01234254,6738)219)5)4:
'()*+,-./,01234254,6738)219)5)4.:%,\$\$\$,<=>?@;,A)19B+)3),
C9+D5(4);!/?@>2?E.+

Container Size : !,?@ **Pkg Amt:** G,!,?@

Expiration Date : A25H9, !, "\$"& **Storage:** "%FC,3D?(32+

CERTIFIED VALUES

Elution Order	Compound	Grav. Conc. (weight/volume)	Expanded Uncertainty (95% C.L.; K=2)
1	Diesel Fuel #2 - Single Source CAS # 68334-30-5.C (Lot 032404SZ) Purity ----%	5,000.0 µg/mL	+/- 29.3428 µg/mL Gravimetric +/- 148.9194 µg/mL Unstressed +/- 158.8208 µg/mL Stressed

Solvent: Methylene chloride
CAS # 75-09-2
Purity 99%

I003995

DIESEL#2 2ND SOURCE stock
Expires 3/3/2027
Prepared By Joshua Rains 5/7/2020

Column:
!"#\$%&'()*+,-./:;<=>?@

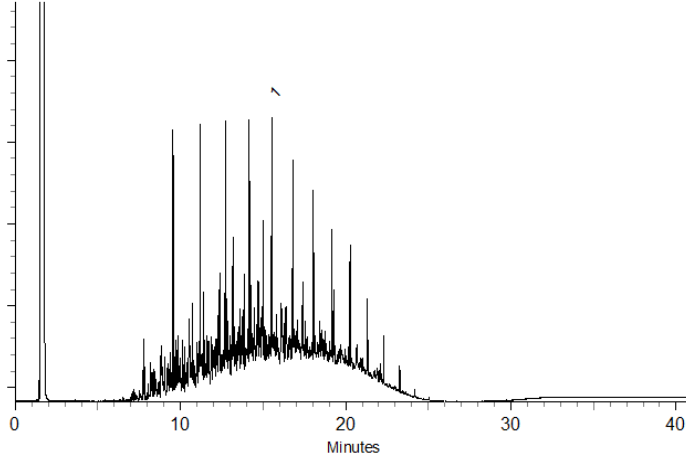
Carrier Gas:
23456789+69:*.9*#58::< 58#0!#:=%

Temp. Program:
>!#@#,26A4#&#"=9%1#@
B#0!#@C"=9%#,26A4#0!#"=9%1

Inj. Temp:
&!#@

Det. Temp:
!#@

Det. Type:
DEF



I9(*,H95D?21D=52?,5)E5*)31*,2,=)3)52+,*)1,DJ,1)*1(3=,HD34(1(D3*,H9D*)3,JD5,E5D4.H1,
2HH)E123H)K,-D5,DE1(?2+,5)*.+1*(,3,BD.5,+2L:,HD34(1(D3*,*9D.+4,L),24M.*1)4,JD5,BD.5,
*E)H(J(H,(3*15.?)31,;)19D4:,234,2EE+(H21(D3K


Dalton Stover - Operations Technician II

Date Mixed: 06-Feb-2020 Balance: B345965662


Justine Albertson - Operations Tech-ARM QC

Date Passed: 07-Feb-2020

Manufactured under Restek's ISO 9001:2015
Registered Quality System
Certificate #FM 80397

General Certified Reference Material Notes

Expiration Notes:

- TUE(521(D3,421),V2+(4,JD5,.3DE)3)4,2?E.+,*1D5)4,(3,HD?E+(23H),8(19,19),5)HD??)34)4,HD34(1(D3*K
- 73H)512(31B;,HD3H)31521(D3;,234,)UE(521(D3,DJ,19),COA,25),L2*4,D3,19),.3DE)3)4,E5D4.H1,L)(3=,*1D5)4,2HHD54(3=,1D,19),5)HD??)34)4,HD34(1(D3,JD.34,(3,19),*1D52=),J()+4K

Purity Notes:

- W.5(1B,234>D5,H9)?(H2+,(4)31(1B,25,4)1)5?(3)4,LB,D3),D5,?D5),DJ,19),JD++D8(3=,1)H93(X.)*Y,ZC>-[;:,W@C;,ZC><TC;:,ZC>A0;,@C>A0;:,O[;,234>D5,?)1(3=,ED(31K
- CD?ED.34*.8(19,2,+(*1)4,E.5(1B,DJ,+)**1923,]]^,92V),L)3,8)=(91,HD55)H1)4,1D,HD?E)3*21),JD5,(?E.5(1()*,234>D5,*2+1*K,,HD55)H1(D3,J2H1D5,(*,*)4,1D,H2+H.+21),19),2?D.31,DJ,HD?ED.34,3)H)**25B,1D,2H9(V),19),4)*(5)4,HD3H)31521(D3,DJ,19),E25)31,HD?ED.34,(3,*D+.1(D3K,,
- W.5(1B,DJ,(*D?)5(H,HD?ED.34*.(*,5)ED51)4,2*,19),*?.DJ,19),(*D?)5*K,,
- W.5(1B,V2+.)*,25),5D.34)4,1D,19),3)25)*1,89D+),3.?L)5K

Certified Uncertainty Value Notes:

- I9),.3H)512(31(*)25,4)1)5?(3)4,(3,2HHD5423H),8(19,[0_!&\$ S,234,Z.(4),%K,I9),H)51(J(4),HD?L(3)4,*15)**4,.3H)512(31B,V2+.)6,(3H+.4)*,=52V(?)15(H,.3H)512(31B;,9D?D=)3(1B,L)18))3`2?E.+,.3H)512(31B;, *1D52=),*12L(+1B.3H)512(31B,234,*9(EE(3=,*12L(+1B,.3H)512(31B,234,8)5),HD?L(3)4,.(3=,19),JD++D8(3=,JD5?.2Y

$$U_{combined\ stressed} = k \sqrt{U_{gravimetric}^2 + U_{homogeneity}^2 + U_{storage\ stability}^2 + U_{shipping\ stability}^2}$$

- k(*,2,HDV)52=),J2H1D5,DJ,;,89(H9,=(V)*,2,+V)+,DJ,HD3J(4)3H),DJ,2EE5DU(?21)+B,]%^K
- [1,(*(?ED51231,1D,3D1),1921,19),*9(EE(3=,*12L(+1B,.3H)512(31B,82*,DL12(3)4,.34)5,1)?E)521.5),JU15)?*,JD5,*E)H(J(H,1(?),.31)5V2+*a,19)5)JD5;),19),H)51(J(4),HD?L(3)4,*15)**4,.3H)512(31B,V2+.)9D.+4,D3+B,L),2EE+(4,1D,19),E5D4.H1,(J,1,82*,*1D5)4,21,3D3*1234254,1)?E)521.5),HD34(1(D3*.E,1D,234,(3H+.4(3=,&@2B*12H1,O)*1)b)H93(H2+,0)5V(H),21,888K5)*1)bKHD?>CD312H1,JD5,*)5)HD??)3421(D3*(J,BD.5,*9(E?)31,82*(3`1523*(1,JD5,?D5),1923,&42B*,21,3D3`*1234254,1)?E)521.5),HD34(1(D3*K
- #EE+B,19),H)51(J(4),HD?L(3)4,.3*15)**4,.3H)512(31B,V2+.)J,19),E5D4.H1,82*,5)H(V)4,.34)5,*1234254,*9(EE(3=,HD34(1(D3*K,;,#EE+B,19),H)51(J(4),HD?L(3)4,*15)**4,.3H)512(31B,V2+.)J,19),E5D4.H1,82*,5)H(V)4,.34)5,3D3`*1234254,HD34(1(D3*,2*,*E)H(J(4,L)+D8K,

Label Conditions	Standard Conditions	Non-Standard Conditions
"%FC,ND?(32+,0DD?,I)?E)521.5) :	c,R\$FC,	Q,R\$FC,,E,1D,&,42B*
!\$FC,D5,HD+4)5,6O)J5(=)521):	c,S\$FC,	Q,S\$FC,,E,1D,&,42B*
\$FC,D5,HD+4)5,6-5))P)5:	c,"%FC,	Q,"%FC,,E,1D,&,42B*

- 0)E2521),63D1,HD?L(3)4;,.3H)512(31B,V2+.)*,JD5,=52V(?)15(H,.3H)512(31B,25),2+*D,4(*E+2B)4,D3,19),H)51(J(H21);,(J,3)4)4;,,*)E2521),9D?D=)3(1B,L)18))3`2?E.+,.3H)512(31B;, *1D52=),*12L(+1B,.3H)512(31B,234,*9(EE(3=,*12L(+1B,.3H)512(31B,V2+.)*,25),2V2(+2L+),LB,HD312H1(3=,O)††)H93(H2+,0)5V(H),888K5)*1)bKHD?>CD312H1K*
- I9),E2Hb2=)4,2?D.31,(*,19),?(3(??.*2?E+),*(P),JD5,89(H9,.3H)512(31B,(*,V2+(4K,,19),2?E.+)*,25),DV)5`J(++4,1D,3*5),1921,19),?(3(??.E2Hb2=)4,2?D.31,H23,L),*. J(H())31+B,1523*J)5)4

Manufacturing Notes:

- CD3H)31521(D3,(*,L2*)4,.ED3,=52V(?)15(H,E5)E2521(D3,.(3=,)19)5,2,L2+23H),89D*)H2+(L521(D3,92*,L))3,V)5(J(4),42(+B,.(3=,N[0 I ,152H)2L+),8)=(91;234>D5,4(+.1(D3*,8(19,C+2;,*=+2**825)K

Handling Notes:

- 012L(+1B,DJ,19),.3DE)3)4,E5D4.H1;,89)3,*1D5)4,(3,HD?E+(23H),8(19,19),5)HD??)34)4,HD34(1(D3*;,(*,=.25231))4,195D.=9,19),UE(521(D3,4(*E+2B)4,D3,19),E5D4.H1,+2L)+,234,H)51(J(H21)K,CD312H1,O)*1)b,JD5,244(1(D32+,DE)3)4,E5D4.H1,*12L(+1B,(3JD5?21(D3;,8(19,19),b3D8+4)=>.34)5*1234(3=,1921,DE)3,E5D4.H1,*12L(+1B,(*,.LM)H1,1D,19),*E)H(J(H,9234+(3=,234,3V(5D3?)312+,HD34(1(D3*,1D,89(H9,19),E5D4.H1,(*,)UED*)4K,-D5,BD.5,HD3V)3(3H),O)*1)b,*EE+(*)4)2H1(V21)4,V(2+*,8(19,?D*1,*1234254*,E2Hb)4,(3,? @?E+)* K,@25=)5,VD+?)4)2H1(V21)4,V(2+*,25),2V2(+2L+),195D.=9,O)*1)b,2*,2,H.*1D?,D54)5(1)?K,#44(1(D32++B;,O)*1)b,*)+*,'A'C0,JD5,19),E.5ED*),DJ,=+2**825),4)2H1(V21(D3,2*,H212+D=,3.?L)5,ldR!;,89(H9,(3H+.4)*,HD?E+1),3*15.H1(D3*K
- [J,23B,.34(*D+V)4,?21)5(2+,(*,V*(L+).(3*(4),19),2?E.+,*D3(H21),19),.3DE)3)4,2?E.+,.31(+,19),?21)5(2+,(*,HD?E+1)+B,4(*D+V)4K

ThermoFisher
SCIENTIFIC

Certificate of Analysis

1 Reagent Lane
Fair Lawn, NJ 07410
201.796.7100 tel
201.796.1329 fax

ThermoFisher Scientific's Quality System has been found to conform to Quality Management System
Standard ISO9001:2008 standard by SAI Global Certificate Number CERT - 0090918

This is to certify that units of the lot number below were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. ThermoFisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Certain products (USP/FCC/NF/EP/BP/JP grades) are sold for use in food, drug, or medical device manufacturing. ThermoFisher does not maintain DMF's with the FDA. The following are the actual analytical results obtained:

Catalog Number	T291	Quality Test / Release Date	08/15/2018
Lot Number	184485		
Description	TOLUENE - OPTIMA		
Country of Origin	United States	Suggested Retest Date	Aug/2023
Chemical Origin	Organic - non animal		
BSE/TSE Comment	No animal products are used as starting raw material ingredients, or used in processing, including lubricants, processing aids, or any other material that might migrate to the finished product.		
Chemical Comment			

N/A			
Result Name	Units	Specifications	Test Value
APPEARANCE		REPORT	Clear colorless liquid free of suspended matter
ASSAY	%	>= 99.8	99.9
BENZENE	%	<= 0.05	<0.05
COLOR	APHA	<= 10	<5
EVAPORATION RESIDUE	ppm	<= 1	<0.1
IDENTIFICATION	PASS/FAIL	= PASS TEST	PASS TEST
OPTICAL ABS AT 285 NM	ABSORBANCE UNITS	<= 1	0.69
WATER (H2O)	%	<= 0.02	0.02
OPTICAL ABS AT 325 NM	ABSORBANCE UNITS	<= 0.02	0.01
OPTICAL ABS AT 350 NM	ABSORBANCE UNITS	<= 0.005	0.001
PESTICIDE RESIDUE ANALYSIS	NG/L	<= 10	<1
REFRACTIVE INDEX @ 25 DEG C		Inclusive Between 1.4930 - 1.4950	1.4940
SUBSTANCES DARKENED BY H2SO4	PASS/FAIL	= PASS TEST	PASS TEST
SULFUR COMPOUNDS	%	<= 0.003	<0.0003
OPTICAL ABS AT 300 NM	ABSORBANCE UNITS	<= 0.1	0.07

Jerusa Bailey-Wyche

Quality Assurance Specialist - Certificate of Analysis Bridgewater

I005216

Toluene

Expires 5/14/2027

Prepared By Nhon Luu 6/15/2020

Note: The data listed is valid for all package sizes of this lot of this product, expressed as an extension of this catalog number listed above. If there are any questions with this certificate, please call at (800) 227-6701.

*Based on suggested storage condition.



Dioxin Extractions QC Benchsheet

Reagent and Standard QC

Chemical Receiving Inventory #	Reagent/ Standard	Brand	Lot #	Date Received/ Made	Initial Amount	Solvent Exchange	FEV	GC/ HRMS Pass Y/N
	Toluene	Omni Solv	I005216	6/15/20	100mL	Nonane	10µL	
	DCM	Omni Solv			100mL	Nonane	10µL	
	Hexane	Omni Solv	OK		100mL	Nonane	10µL	
	MeOH	B&J	OK		100mL	Nonane	10µL	
	Nonane	Acros Organics			100µL	N/A	10µL	
	Purified Sand	Sakrete			2 scoop	Nonane	10µL	
	Glasswool	Corning Life Sciences			1" in column	Nonane	10µL	
	0% Silica	Fisher			2 scoop	Nonane	10µL	
	Acid Silica	Fisher			2 scoop	Nonane	10µL	
	Basic Silica	Fisher			2 scoop	Nonane	10µL	
	Florisil	Fluka			1 scoop	Nonane	10µL	
	Rec Standard	Wellington Labs			1mL	Nonane	10µL	
	Clean-up Standard	Wellington Labs			1mL	Nonane	10µL	
	OPR Standard	Wellington Labs			20µL	Nonane	10µL	
	QLS Standard	Wellington Labs			20µL	Nonane	10µL	

Prep Analyst/Date: *µ 6/24/20* Inst. Run Date:

Dataset: Untitled
 Last Altered: Monday, June 29, 2020 10:03:07 Pacific Daylight Time
 Printed: Monday, June 29, 2020 10:04:40 Pacific Daylight Time

Method: T:\Autospec\Methods\Dioxin200625.mdb 26 Jun 2020 07:56:21
 Calibration: T:\Autospec\Curves\200530ICIH.cdb 01 Jun 2020 10:55:54

ID: TOL I5216, Name: 20062529, Date: 26-Jun-2020, Time: 13:22:47, Conditions: AUTOSPEC01, User: pk

Compound	RT	RRT	Ion1Area	Ion2Area	RRF	Ratio	Pred R	Noise 1	Noise 2	Height 1	Height 2	S/N 1	SNFlag	EMPC	Int.1	Int.2	pg
2378-TCDF					0.795		0.770	502	912								
12378-PeCDF					0.797		1.550	617	1077								
23478-PeCDF	30.165	1.001	1.227e2	1.579e2	0.962	0.777	1.550	617	1077	2.10e3	3.93e3	3.4	YES	YES	bb	db	0.021
123478-HxCDF					0.973		1.240	730	521								
234678-HxCDF					0.984		1.240	730	521								
123678-HxCDF					0.916		1.240	730	521								
123789-HxCDF					0.922		1.240	730	521								
1234678-HpCDF					1.096		1.050	407	561								
1234789-HpCDF					1.055		1.050	407	561								
OCDF					1.325		0.890	699	892								
2378-TCDD					1.140		0.770	598	496								
12378-PeCDD					1.091		1.550	796	359								
123478-HxCDD					0.922		1.240	426	461								
123678-HxCDD					0.949		1.240	426	461								
123789-HxCDD					0.847		1.240	426	461								
1234678-HpCDD	39.214	1.000	1.780e2	1.648e2	1.124	1.080	1.050	623	450	5.26e3	4.42e3	8.4	YES	NO	db	bd	0.056
OCDD	43.632	1.001	7.460e2	8.959e2	1.237	0.833	0.890	548	755	1.46e4	1.18e4	26.6	YES	NO	db	bb	0.395
13C-2378-TCDF	24.683	1.007	8.253e5	1.052e6	2.214	0.784	0.770	2142	1231	1.27e7	1.60e7	5920.7	YES	NO	bb	bb	104.193
13C-12378-PeCDF	28.785	1.175	9.077e5	5.652e5	1.903	1.606	1.550	3236	2267	1.39e7	8.73e6	4292.3	YES	NO	bb	bb	95.101
13C-23478-PeCDF	30.132	1.230	8.542e5	5.386e5	1.845	1.586	1.550	3236	2267	1.36e7	8.60e6	4196.7	YES	NO	bb	bb	92.784
13C-123478-HxCDF	33.782	0.953	3.067e5	6.177e5	1.198	0.496	0.510	985	2180	4.77e6	9.43e6	4845.3	YES	NO	bd	bd	100.338
13C-123678-HxCDF	33.927	0.957	3.240e5	6.472e5	1.488	0.501	0.510	985	2180	4.94e6	9.69e6	5021.3	YES	NO	db	db	84.878
13C-234678-HxCDF	34.828	0.982	2.825e5	5.661e5	1.195	0.499	0.510	985	2180	4.58e6	9.04e6	4654.9	YES	NO	bb	bb	92.321
13C-123789-HxCDF	35.875	1.012	2.245e5	4.600e5	1.014	0.488	0.510	985	2180	3.58e6	7.24e6	3633.6	YES	NO	bb	bb	87.800
13C-1234678-HpCDF	37.756	1.065	2.347e5	5.376e5	1.197	0.437	0.440	1921	1828	3.90e6	8.90e6	2030.5	YES	NO	bb	bb	83.898
13C-1234789-HpCDF	39.893	1.125	1.546e5	3.545e5	0.893	0.436	0.440	1921	1828	2.31e6	5.25e6	1200.4	YES	NO	bb	bb	74.159
13C-1234-TCDD	24.501	0.000	3.592e5	4.546e5	1.000	0.790	0.770	1294	805	5.73e6	7.24e6	4430.9	YES	NO	bb	bb	100.000
13C-2378-TCDD	25.302	1.033	4.262e5	5.508e5	1.193	0.774	0.770	1294	805	6.55e6	8.49e6	5063.6	YES	NO	bb	bb	100.651
13C-12378-PeCDD	30.388	1.240	5.085e5	2.920e5	0.962	1.741	1.550	1585	769	8.14e6	4.57e6	5135.1	YES	NO	bb	bb	102.293
13C-123478-HxCDD	34.951	0.986	4.607e5	3.535e5	1.059	1.303	1.240	1709	1194	7.44e6	5.71e6	4354.5	YES	NO	bd	bd	99.975
13C-123678-HxCDD	35.062	0.989	4.656e5	3.558e5	1.278	1.309	1.240	1709	1194	7.41e6	5.66e6	4332.5	YES	NO	db	db	83.562
13C-1234678-HpCDD	39.203	1.105	2.827e5	2.610e5	0.843	1.083	1.050	1161	1015	4.45e6	4.04e6	3833.9	YES	NO	bb	bb	83.842
13C-OCDD	43.605	1.230	3.233e5	3.491e5	0.616	0.926	0.890	1678	2408	4.02e6	4.31e6	2392.6	YES	NO	bb	bb	141.987

Dataset: Untitled
 Last Altered: Monday, June 29, 2020 10:03:07 Pacific Daylight Time
 Printed: Monday, June 29, 2020 10:04:40 Pacific Daylight Time

ID: TOL I5216, Name: 20062529, Date: 26-Jun-2020, Time: 13:22:47, Conditions: AUTOSPEC01, User: pk

Compound	RT	RRT	Ion1Area	Ion2Area	RRF	Ratio	Pred R	Noise 1	Noise 2	Height 1	Height 2	S/N 1	SNFlag	EMPC	Int.1	Int.2	pg
13C-123789-HxCDD	35.463	0.000	4.323e5	3.368e5	1.000	1.283	1.240	1709	1194	6.94e6	5.37e6	4058.0	YES	NO	bb	bb	100.000
37CL-2378-TCDD	25.227	1.030	1.071e2		1.258			1328		2.42e3		1.8	NO		db		0.010
1368-TCDF					1.007		0.770	502	912								
1289-TCDF					0.754		0.770	502	912								
13468-PECDF					1.099		1.550	293	640								
12389-PECDF	31.178	1.083	1.504e2	7.409e1	0.841	2.030	1.550	617	1077	2.46e3	2.87e3	4.0	NO	YES	bb	bb	0.018
123468-HXCDF					1.142		1.240	730	521								
1368-TCDD					1.214		0.770	598	496								
1289-TCDD					1.061		0.770	598	496								
12479-PECDD					2.040		1.550	796	359								
12389-PECDD					1.257		1.550	796	359								
124679-HXCDD					1.164		1.240	426	461								
1234679-HPCDD	38.245	0.976	8.609e1	1.019e2	1.378	0.845	1.050	623	450	1.89e3	2.90e3	3.0	YES	YES	bb	bb	0.025
Total-tetrafurans			0.000e0		0.852			502		0.00e0							
Total-penta1			0.000e0					293		0.00e0							
Total-pentafurans			0.000e0		0.867			617		0.00e0							
Total-hexafurans			0.000e0		0.987			730		0.00e0							
Total-heptafurans			0.000e0		1.076			407		0.00e0							
Total-Furans			0.000e0		0.978			502		0.00e0							
Total-tetradiioxins			0.000e0		1.138			598		0.00e0							
Total-pentadiioxins			0.000e0		1.463			796		0.00e0							
Total-hexadiioxins			0.000e0		0.971			426		0.00e0							
Total-heptadiioxins			1.780e2		1.251			623		5.26e3							0.056
Total-Dioxins			9.240e2		1.187			598		1.99e4							0.451
Total-TEQ			9.240e2					598		1.99e4							0.451
FUNCTION1 PFK			1.728e5					220633		4.73e6							
FUNCTION2 PFK			0.000e0					159655		0.00e0							
FUNCTION3 PFK			0.000e0					198585		0.00e0							
FUNCTION4 PFK			2.228e5					179610		7.02e6							
FUNCTION5 PFK			2.507e4					138501		1.09e6							
FUNCTION1 HXCDPE			0.000e0					189		0.00e0							
FUNCTION1 HPCDPE			4.279e2					738		9.46e3							0.000
FUNCTION2 HPCDPE			1.573e2					792		4.18e3							0.000
FUNCTION3 OCDPE			8.296e1					216		3.72e3							0.000
FUNCTION4 NCDPE			0.000e0					279		0.00e0							
FUNCTION5 DCDPE			0.000e0					233		0.00e0							



CERTIFIED REFERENCE MATERIAL

110 Benner Circle
Bellefonte, PA 16823-8812
Tel: (800)356-1688
Fax: (814)353-1309

www.restek.com

Certificate of Analysis



FOR LABORATORY USE ONLY-READ SDS PRIOR TO USE.

This Reference Material is intended for Laboratory Use Only as a standard for the qualitative and/or quantitative determination of the analyte(s) listed.

Catalog No. : 31233 **Lot No.:** A0170640

Description : Diesel Fuel #2 Standard (Unweathered)
Diesel Fuel #2 Standard (Unweathered) 5,000 µg/mL, Methylene Chloride, 1mL/ampul

Container Size : 2 mL **Pkg Amt:** > 1 mL

Expiration Date : April 30, 2028 **Storage:** 25°C nominal

Ship: Ambient

CERTIFIED VALUES

Elution Order	Compound	Grav. Conc. (weight/volume)	Expanded Uncertainty (95% C.L.; K=2)		
1	Diesel Fuel #2 - Single Source CAS # 68334-30-5.C (Lot 032404SZ) Purity ----%	5,008.0 µg/mL	+/- 29.3897	µg/mL	Gravimetric
			+/- 149.1577	µg/mL	Unstressed
			+/- 159.0749	µg/mL	Stressed

Solvent: Methylene chloride
CAS # 75-09-2
Purity 99%

J006454

DIESEL#2 2ND SOURCE stock
Expires 4/30/2028
Prepared By Joshua Rains 6/18/2021

Column:

! "\$#%&'()*+,-./:;<=>?@

Carrier Gas:

23456789+69: *9 *#;:;<58#0!#;=%

Temp. Program:

>!@#,\$26A4#&#'"=9981#?@
B#0!#@C"-9%#,26A4#0!#"=9%1

Inj. Temp:

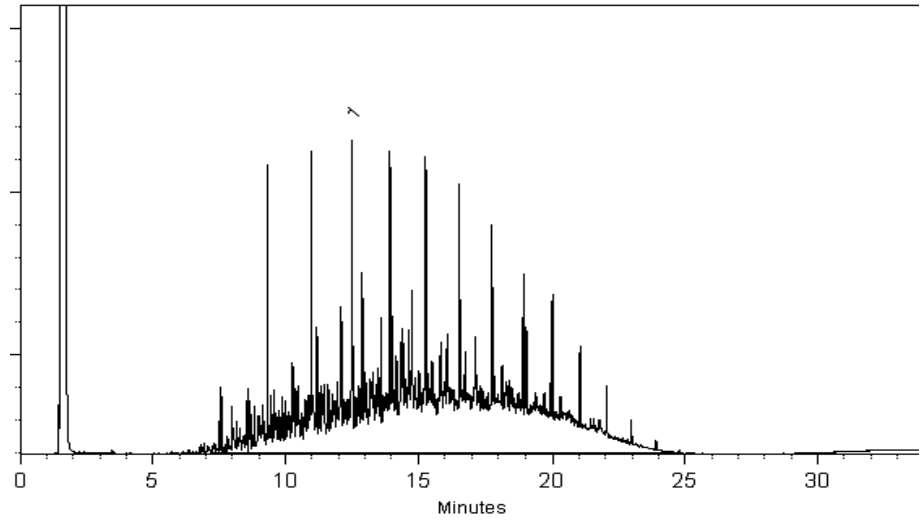
&!#@

Det. Temp:

!#@

Det. Type:

DEF



This chromatogram represents a general set of testing conditions chosen for product acceptance. For optimal results in your lab, conditions should be adjusted for your specific instrument, method, and application.


Erik Strommer - Operations Tech I

Date Mixed: 25-Mar-2021 **Balance:** 1128353505


Marlina Cowan - Operations Tech I

Date Passed: 30-Mar-2021

<p>Manufactured under Restek's ISO 9001:2015 Registered Quality System Certificate #FM 80397</p>

General Certified Reference Material Notes

Expiration Notes:

- Expiration date valid for unopened ampul stored in compliance with the recommended conditions.
- Uncertainty, concentration, and expiration of the CRM are based on the unopened product being stored according to the recommended condition found in the storage field.

Purity Notes:

- Purity and/or chemical identity are determined by one or more of the following techniques: GC/FID, HPLC, GC/μECD, GC/MS, LC/MS, RI, and/or melting point.
- Compounds with a listed purity of less than 99% have been weight corrected to compensate for impurities and/or salts. A correction factor is used to calculate the amount of compound necessary to achieve the desired concentration of the parent compound in solution.
- Purity of isomeric compounds is reported as the sum of the isomers.
- Purity values are rounded to the nearest whole number.

Certified Uncertainty Value Notes:

- The uncertainties are determined in accordance with ISO 17034 and Guide 35. The certified combined stressed uncertainty value (includes gravimetric uncertainty, homogeneity between-ampul uncertainty, storage stability uncertainty and shipping stability uncertainty and were combined using the following formula:

$$U_{combined\ stressed} = k \sqrt{U_{gravimetric}^2 + U_{homogeneity}^2 + U_{storage\ stability}^2 + U_{shipping\ stability}^2}$$

k is a coverage factor of 2, which gives a level of confidence of approximately 95%.

- It is important to note that the shipping stability uncertainty was obtained under temperature extremes for specific time intervals; therefore, the certified combined stressed uncertainty value should only be applied to the product if it was stored at non-standard temperature conditions up to and including 7 days. Contact Restek Technical Service at www.restek.com/Contact-Us for use recommendations if your shipment was in-transit for more than 7 days at non-standard temperature conditions.
- Apply the certified combined unstressed uncertainty value if the product was received under standard shipping conditions. Apply the certified combined stressed uncertainty value if the product was received under non-standard conditions as specified below.

Label Conditions	Standard Conditions	Non-Standard Conditions
25°C Nominal (Room Temperature)	< 60°C	≥ 60°C up to 7 days
10°C or colder (Refrigerate)	< 40°C	≥ 40°C up to 7 days
0°C or colder (Freezer) -20°C or colder (Deep Freezer)	< 25°C	≥ 25°C up to 7 days

- Separate (not combined) uncertainty values for gravimetric uncertainty are also displayed on the certificate, if needed, separate homogeneity between-ampul uncertainty, storage stability uncertainty and shipping stability uncertainty values are available by contacting Restek Technical Service at www.restek.com/Contact-Us.
- The packaged amount is the minimum sample size for which uncertainty is valid. The ampules are over-filled to ensure that the minimum packaged amount can be sufficiently transferred.

Manufacturing Notes:

- Concentration is based upon gravimetric preparation using either a balance whose calibration has been verified daily using NIST traceable weights, and/or dilutions with Class A glassware.

Handling Notes:

- Stability of the unopened product, when stored in compliance with the recommended conditions, is guaranteed through the expiration displayed on the product label and certificate. Contact Restek for additional opened product stability information, with the knowledge/understanding that open product stability is subject to the specific handling and environmental conditions to which the product is exposed. For your convenience Restek supplies deactivated vials with most standards packed in 2mL ampules. Larger volume deactivated vials are available through Restek as a custom ordered item. Additionally, Restek sells DMDCS for the purpose of glassware deactivation as catalog number 31861, which includes complete instructions.



Version	00
Molecular weight	422.82
Quality Test / Release Date	01/10/2012
Molecular Formula	C30 H62
CAS No	638-68-6
Linear Formula	CH3(CH2)28CH3
Flash Point (°C)	238

Certificate of Analysis

This is to certify that units of the above mentioned lot number were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Acros Organics expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Unless otherwise stated, these products are not intended for dialysis, parenteral, or injectable use without further processing. The following are the actual analytical results obtained:

Catalog Number	27805	Quality Test / Release Date	01/10/2012
Lot Number	A0314709		
Description	Triacontane, 98%		
Country of Origin	SWEDEN		
Declaration of Origin			

BSE/TSE comment 1	
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Chemical Comment	
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Result name	Units	Specifications	Test Value
Appearance		WHITE SHINY FLAKES	WHITE SHINY FLAKES
Infrared spectrometry		AUTHENTIC	AUTHENTIC
Melting point		65°C to 67°C	67°C
Separat. techn. GC		>=97.5 %	99.4 %



A handwritten signature in black ink, appearing to read "L. Van Den Broek".

L. Van Den Broek, QA Manager

Issued: 07-26-2013

Acros Organics
 ENA23, zone1, nr 1350, Janssen Pharmaceuticaalaan 3a, B-2440 Geel, Belgium
 Tel +32 14/57.52.11 - Fax +32 14/59.34.34 Internet: <http://www.acros.com>
 1 Regent Lane, Fair Lawn, NJ 07410, USA Fax 201-796-1329

J007974

TPHD Triacontane NEAT

Expires 1/30/2079

Prepared By Christopher T. Orcilla 8/3/2021



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B UCT-KED

MW-24_092021

Dissolved Metals

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-04 A SDG: 21I0294

Sampled: 09/20/21 11:11 Prepared: 10/07/21 11:34 File ID: XDT_m1211012-153

% Solids: 0.00 Preparation: REN EPA 600/4-79-020.4.1.4.HNO3 Analyzed: 10/13/21 04:18
matrix

Batch: BJJ0192 Sequence: SJJ0168 Initial/Final: 25 mL / 25 mL

Instrument: ICPMS1 Calibration: EJ00039

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7782-49-2	Selenium-78, Dissolved	<0.500	1	0.179	0.500	U



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B UCT-KED

MW-60_092021

Dissolved Metals

Laboratory: Analytical Resources, LLC
 Client: GeoEngineers
 Project: South State Street PRDI
 Matrix: Water Laboratory ID: 21I0294-06 A SDG: 21I0294
 Sampled: 09/20/21 11:30 Prepared: 10/07/21 11:34 File ID: XDT_m1211012-165
 % Solids: 0.00 Preparation: REN EPA 600/4-79-020.4.1.4.HNO3 Analyzed: 10/13/21 05:23
 Batch: BJJ0192 Sequence: SJJ0168 Initial/Final: 25 mL / 25 mL
 Instrument: ICPMS1 Calibration: EJ00039

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7782-49-2	Selenium-78, Dissolved	2.65	10	1.79	5.00	J, D



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B UCT-KED

MW-55_092021

Dissolved Metals

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-08 A SDG: 21I0294

Sampled: 09/20/21 12:29 Prepared: 10/07/21 11:34 File ID: XDT_m1211012-167

% Solids: 0.00 Preparation: REN EPA 600/4-79-020.4.1.4.HNO3 Analyzed: 10/13/21 05:32
matrix

Batch: BJJ0192 Sequence: SJJ0168 Initial/Final: 25 mL / 25 mL

Instrument: ICPMS1 Calibration: EJ00039

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7782-49-2	Selenium-78, Dissolved	<5.00	10	1.79	5.00	U



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B UCT-KED

MW-42_092021

Dissolved Metals

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-10 A SDG: 21I0294

Sampled: 09/20/21 12:35 Prepared: 10/07/21 11:34 File ID: XDT_m1211012-170

% Solids: 0.00 Preparation: REN EPA 600/4-79-020.4.1.4.HNO3 Analyzed: 10/13/21 05:48
matrix

Batch: BJJ0192 Sequence: SJJ0168 Initial/Final: 25 mL / 25 mL

Instrument: ICPMS1 Calibration: EJ00039

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7782-49-2	Selenium-78, Dissolved	3.71	10	1.79	5.00	J, D



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B UCT-KED

MW-54_092021

Dissolved Metals

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-12 A SDG: 21I0294

Sampled: 09/20/21 13:54 Prepared: 10/07/21 11:34 File ID: XDT_m1211012-172

% Solids: 0.00 Preparation: REN EPA 600/4-79-020.4.1.4.HNO3 Analyzed: 10/13/21 05:57
matrix

Batch: BJJ0192 Sequence: SJJ0168 Initial/Final: 25 mL / 25 mL

Instrument: ICPMS1 Calibration: EJ00039

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7782-49-2	Selenium-78, Dissolved	<5.00	10	1.79	5.00	U



Form I
METHOD BLANK DATA SHEET
EPA 6020B UCT-KED
Dissolved Metals

Blank

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Batch: BJJ0192

Laboratory ID: BJJ0192-BLK1

Prepared: 10/07/21 11:34

Matrix: Water

Preparation: REN EPA 600/4-79-020 4

Analyzed: 10/12/21 00:05

Sequence: SJJ0155

Calibration: EJ00033

Instrument: ICPMS1

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7782-49-2	Selenium-78	ND	1	0.179	0.500	U



LCS / LCS DUPLICATE RECOVERY
EPA 6020B UCT-KED
Dissolved Metals

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>10/12/21 00:09</u>
Batch:	<u>BJJ0192</u>	Laboratory ID:	<u>BJJ0192-BS1</u>
Preparation:	<u>REN EPA 600/4-79-020 4.1.4 HNO3 matrix</u>	Sequence Name:	<u>LCS</u>
Initial/Final:	<u>25 mL / 25 mL</u>		

COMPOUND	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	Q	LCS % REC. #	QC LIMITS REC.
Selenium-78 (dissolved)	80.0	78.2		97.7	80 - 120

* Indicates values outside of QC limits



DUPLICATES
EPA 6020B UCT-KED
Dissolved Metals

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: BJJ0192-DUP1

Batch: BJJ0192

Lab Source ID: 21I0294-02

Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Initial/Final: 25 mL / 25 mL

Source Sample Name: MW-28_092021

% Solids:

ANALYTE	CONTROL LIMIT	SAMPLE CONCENTRATION (ug/L)	C	DUPLICATE CONCENTRATION (ug/L)	C	RPD %	Q
Selenium-78 (dissolved)	20	0.307	J	ND	U		

*: Values outside of QC limits

L: Analyte concentration is <=5 times the reporting limit and the replicate control limit defaults to Dup = +/-RL instead of 20% RPD



MS / MS DUPLICATE RECOVERY
EPA 6020B UCT-KED
Dissolved Metals

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>10/12/21 05:01</u>
Batch:	<u>BJJ0192</u>	Laboratory ID:	<u>BJJ0192-MS1</u>
Preparation:	<u>REN EPA 600/4-79-020 4.1.4 HNO3 matrix</u>	Sequence Name:	<u>Matrix Spike</u>
Initial/Final:	<u>25 mL / 25 mL</u>	Source Sample:	<u>MW-28_092021</u>

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	Q	MS CONCENTRATION (ug/L)	Q	MS % REC. #	QC LIMITS REC.
Selenium-78 (dissolved)	80.0	0.307	J	75.6		94.1	75 - 125

* Values outside of QC limits



MS / MS DUPLICATE RECOVERY
EPA 6020B UCT-KED
Dissolved Metals

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>10/12/21 05:06</u>
Batch:	<u>BJJ0192</u>	Laboratory ID:	<u>BJJ0192-MSD1</u>
Preparation:	<u>REN EPA 600/4-79-020 4.1.4 HNO3 matrix</u>	Sequence Name:	<u>Matrix Spike Dup</u>
Initial/Final:	<u>25 mL / 25 mL</u>	Source Sample:	<u>MW-28_092021</u>

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	Q	MSD % REC. #	% RPD #	QC LIMITS	
						RPD	REC.
Selenium-78 (dissolved)	80.0	75.8		94.4	0.342	20	75 - 125

* Values outside of QC limits



INITIAL CALIBRATION DATA

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00033

Instrument: ICPMS1

Calibration Date: 10/11/2021 13:20

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
		RF		RF		RF		RF		RF		RF
Selenium-78, Dissolved	0	0	0.5	82	10	49.5	20	46.75	50	46.62	100	44.21



INITIAL CALIBRATION DATA

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00039

Instrument: ICPMS1

Calibration Date: 10/12/2021 15:04

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
		RF		RF		RF		RF		RF		RF
Selenium-78, Dissolved	0	0	0.5	86	10	48.7	20	46.4	50	45.48	100	44.38



INITIAL AND CONTINUING CALIBRATION CHECK

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00033

Control Limit: +/- 10.00%

Sequence: SJJ0155

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SJJ0155-ICV1	Selenium-78 (dissolved)	80.000	78.2	97.7	ug/L	PA 6020B UCT-KE
SJJ0155-CCV1	Selenium-78 (dissolved)	50.000	50.8	102	ug/L	PA 6020B UCT-KE
SJJ0155-CCV2	Selenium-78 (dissolved)	50.000	50.6	101	ug/L	PA 6020B UCT-KE
SJJ0155-CCV3	Selenium-78 (dissolved)	50.000	50.2	100	ug/L	PA 6020B UCT-KE
SJJ0155-CCV4	Selenium-78 (dissolved)	50.000	49.9	99.9	ug/L	PA 6020B UCT-KE
SJJ0155-CCV5	Selenium-78 (dissolved)	50.000	50.9	102	ug/L	PA 6020B UCT-KE
SJJ0155-CCV6	Selenium-78 (dissolved)	50.000	50.9	102	ug/L	PA 6020B UCT-KE
SJJ0155-CCV7	Selenium-78 (dissolved)	50.000	51.3	103	ug/L	PA 6020B UCT-KE
SJJ0155-CCV9	Selenium-78 (dissolved)	50.000	49.5	99.1	ug/L	PA 6020B UCT-KE
SJJ0155-CCVA	Selenium-78 (dissolved)	50.000	52.5	105	ug/L	PA 6020B UCT-KE
SJJ0155-CCVB	Selenium-78 (dissolved)	50.000	50.8	102	ug/L	PA 6020B UCT-KE
SJJ0155-CCVC	Selenium-78 (dissolved)	50.000	49.9	99.9	ug/L	PA 6020B UCT-KE
SJJ0155-CCVD	Selenium-78 (dissolved)	50.000	51.6	103	ug/L	PA 6020B UCT-KE
SJJ0155-CCVE	Selenium-78 (dissolved)	50.000	51.1	102	ug/L	PA 6020B UCT-KE
SJJ0155-CCVF	Selenium-78 (dissolved)	50.000	50.9	102	ug/L	PA 6020B UCT-KE
SJJ0155-CCVG	Selenium-78 (dissolved)	50.000	50.3	101	ug/L	PA 6020B UCT-KE
SJJ0155-CCVH	Selenium-78 (dissolved)	50.000	51.6	103	ug/L	PA 6020B UCT-KE
SJJ0155-CCVI	Selenium-78 (dissolved)	50.000	50.4	101	ug/L	PA 6020B UCT-KE

* Values outside of QC limits



INITIAL AND CONTINUING CALIBRATION CHECK

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Control Limit: +/- 10.00%

Sequence: SJJ0168

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SJJ0168-ICV1	Selenium-78 (dissolved)	80.000	76.5	95.6	ug/L	PA 6020B UCT-KE
SJJ0168-CCV1	Selenium-78 (dissolved)	50.000	50.6	101	ug/L	PA 6020B UCT-KE
SJJ0168-CCV2	Selenium-78 (dissolved)	50.000	50.8	102	ug/L	PA 6020B UCT-KE
SJJ0168-CCV3	Selenium-78 (dissolved)	50.000	50.3	101	ug/L	PA 6020B UCT-KE
SJJ0168-CCV4	Selenium-78 (dissolved)	50.000	52.1	104	ug/L	PA 6020B UCT-KE
SJJ0168-CCV5	Selenium-78 (dissolved)	50.000	50.7	101	ug/L	PA 6020B UCT-KE
SJJ0168-CCV6	Selenium-78 (dissolved)	50.000	51.7	103	ug/L	PA 6020B UCT-KE
SJJ0168-CCV7	Selenium-78 (dissolved)	50.000	51.0	102	ug/L	PA 6020B UCT-KE
SJJ0168-CCV8	Selenium-78 (dissolved)	50.000	50.8	102	ug/L	PA 6020B UCT-KE
SJJ0168-CCV9	Selenium-78 (dissolved)	50.000	50.3	101	ug/L	PA 6020B UCT-KE
SJJ0168-CCVA	Selenium-78 (dissolved)	50.000	51.2	102	ug/L	PA 6020B UCT-KE
SJJ0168-CCVB	Selenium-78 (dissolved)	50.000	50.8	102	ug/L	PA 6020B UCT-KE
SJJ0168-CCVC	Selenium-78 (dissolved)	50.000	50.1	100	ug/L	PA 6020B UCT-KE
SJJ0168-CCVD	Selenium-78 (dissolved)	50.000	50.4	101	ug/L	PA 6020B UCT-KE
SJJ0168-CCVE	Selenium-78 (dissolved)	50.000	50.3	101	ug/L	PA 6020B UCT-KE
SJJ0168-CCVF	Selenium-78 (dissolved)	50.000	50.9	102	ug/L	PA 6020B UCT-KE
SJJ0168-CCVG	Selenium-78 (dissolved)	50.000	51.7	103	ug/L	PA 6020B UCT-KE
SJJ0168-CCVH	Selenium-78 (dissolved)	50.000	50.8	102	ug/L	PA 6020B UCT-KE
SJJ0168-CCVI	Selenium-78 (dissolved)	50.000	51.3	103	ug/L	PA 6020B UCT-KE
SJJ0168-CCVJ	Selenium-78 (dissolved)	50.000	52.0	104	ug/L	PA 6020B UCT-KE
SJJ0168-CCVK	Selenium-78 (dissolved)	50.000	48.9	97.8	ug/L	PA 6020B UCT-KE
SJJ0168-CCVL	Selenium-78 (dissolved)	50.000	50.3	101	ug/L	PA 6020B UCT-KE

* Values outside of QC limits



INSTRUMENT BLANKS
EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00033

Sequence: SJJ0155

Date Analyzed: 10/11/21 13:54

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0155-IBL1	Selenium-78 (dissolved)	-0.103	0.179	0.500	ug/L	
SJJ0155-ICB1	Selenium-78 (dissolved)	0.0620	0.179	0.500	ug/L	
SJJ0155-CCB1	Selenium-78 (dissolved)	0.0650	0.179	0.500	ug/L	
SJJ0155-IBL2	Selenium-78 (dissolved)	0.176	0.179	0.500	ug/L	
SJJ0155-IBL3	Selenium-78 (dissolved)	0.0950	0.179	0.500	ug/L	
SJJ0155-IBL4	Selenium-78 (dissolved)	0.0900	0.179	0.500	ug/L	
SJJ0155-CCB2	Selenium-78 (dissolved)	0.00	0.179	0.500	ug/L	
SJJ0155-IBL5	Selenium-78 (dissolved)	-0.0230	0.179	0.500	ug/L	
SJJ0155-CCB3	Selenium-78 (dissolved)	0.0160	0.179	0.500	ug/L	
SJJ0155-CCB4	Selenium-78 (dissolved)	-0.0420	0.179	0.500	ug/L	
SJJ0155-IBL6	Selenium-78 (dissolved)	-0.0700	0.179	0.500	ug/L	
SJJ0155-CCB5	Selenium-78 (dissolved)	-0.0380	0.179	0.500	ug/L	
SJJ0155-IBL7	Selenium-78 (dissolved)	-0.0300	0.179	0.500	ug/L	
SJJ0155-CCB6	Selenium-78 (dissolved)	-0.0610	0.179	0.500	ug/L	
SJJ0155-IBL8	Selenium-78 (dissolved)	-0.0910	0.179	0.500	ug/L	
SJJ0155-CCB7	Selenium-78 (dissolved)	-0.120	0.179	0.500	ug/L	
SJJ0155-CCB9	Selenium-78 (dissolved)	0.0700	0.179	0.500	ug/L	
SJJ0155-IBLA	Selenium-78 (dissolved)	-0.0290	0.179	0.500	ug/L	
SJJ0155-CCBA	Selenium-78 (dissolved)	-0.00200	0.179	0.500	ug/L	
SJJ0155-IBLB	Selenium-78 (dissolved)	-0.0580	0.179	0.500	ug/L	
SJJ0155-CCBB	Selenium-78 (dissolved)	-0.0870	0.179	0.500	ug/L	
SJJ0155-IBLC	Selenium-78 (dissolved)	0.0540	0.179	0.500	ug/L	
SJJ0155-CCBC	Selenium-78 (dissolved)	0.0230	0.179	0.500	ug/L	
SJJ0155-IBLD	Selenium-78 (dissolved)	0.0240	0.179	0.500	ug/L	
SJJ0155-CCBD	Selenium-78 (dissolved)	0.0610	0.179	0.500	ug/L	
SJJ0155-CCBE	Selenium-78 (dissolved)	-0.0430	0.179	0.500	ug/L	
SJJ0155-IBLE	Selenium-78 (dissolved)	-0.0710	0.179	0.500	ug/L	
SJJ0155-IBLF	Selenium-78 (dissolved)	-0.0390	0.179	0.500	ug/L	
SJJ0155-CCBF	Selenium-78 (dissolved)	0.112	0.179	0.500	ug/L	
SJJ0155-IBLG	Selenium-78 (dissolved)	-0.208	0.179	0.500	ug/L	
SJJ0155-IBLH	Selenium-78 (dissolved)	-0.0940	0.179	0.500	ug/L	
SJJ0155-CCBG	Selenium-78 (dissolved)	0.0220	0.179	0.500	ug/L	
SJJ0155-IBLI	Selenium-78 (dissolved)	-0.0720	0.179	0.500	ug/L	
SJJ0155-IBLJ	Selenium-78 (dissolved)	-0.0810	0.179	0.500	ug/L	



INSTRUMENT BLANKS EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00033

Sequence: SJJ0155

Date Analyzed: 10/12/21 07:25

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0155-CCBH	Selenium-78 (dissolved)	-0.111	0.179	0.500	ug/L	
SJJ0155-IBLK	Selenium-78 (dissolved)	0.0280	0.179	0.500	ug/L	
SJJ0155-IBLL	Selenium-78 (dissolved)	0.00400	0.179	0.500	ug/L	
SJJ0155-CCBI	Selenium-78 (dissolved)	-0.0710	0.179	0.500	ug/L	



INSTRUMENT BLANKS
EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Sequence: SJJ0168

Date Analyzed: 10/12/21 15:39

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0168-IBL1	Selenium-78 (dissolved)	0.117	0.179	0.500	ug/L	
SJJ0168-ICB1	Selenium-78 (dissolved)	0.0230	0.179	0.500	ug/L	
SJJ0168-CCB1	Selenium-78 (dissolved)	0.0820	0.179	0.500	ug/L	
SJJ0168-IBL2	Selenium-78 (dissolved)	0.0460	0.179	0.500	ug/L	
SJJ0168-IBL3	Selenium-78 (dissolved)	0.129	0.179	0.500	ug/L	
SJJ0168-CCB2	Selenium-78 (dissolved)	0.0500	0.179	0.500	ug/L	
SJJ0168-IBL4	Selenium-78 (dissolved)	0.0630	0.179	0.500	ug/L	
SJJ0168-CCB3	Selenium-78 (dissolved)	0.0180	0.179	0.500	ug/L	
SJJ0168-IBL5	Selenium-78 (dissolved)	0.0190	0.179	0.500	ug/L	
SJJ0168-CCB4	Selenium-78 (dissolved)	0.00100	0.179	0.500	ug/L	
SJJ0168-IBL6	Selenium-78 (dissolved)	0.0190	0.179	0.500	ug/L	
SJJ0168-CCB5	Selenium-78 (dissolved)	-0.0220	0.179	0.500	ug/L	
SJJ0168-CCB6	Selenium-78 (dissolved)	-0.0190	0.179	0.500	ug/L	
SJJ0168-IBL7	Selenium-78 (dissolved)	0.0750	0.179	0.500	ug/L	
SJJ0168-CCB7	Selenium-78 (dissolved)	0.0820	0.179	0.500	ug/L	
SJJ0168-IBL8	Selenium-78 (dissolved)	-0.0490	0.179	0.500	ug/L	
SJJ0168-IBL9	Selenium-78 (dissolved)	-0.0650	0.179	0.500	ug/L	
SJJ0168-CCB8	Selenium-78 (dissolved)	-0.00400	0.179	0.500	ug/L	
SJJ0168-IBLA	Selenium-78 (dissolved)	-0.0810	0.179	0.500	ug/L	
SJJ0168-IBLB	Selenium-78 (dissolved)	0.0110	0.179	0.500	ug/L	
SJJ0168-CCB9	Selenium-78 (dissolved)	0.0650	0.179	0.500	ug/L	
SJJ0168-CCBA	Selenium-78 (dissolved)	0.0240	0.179	0.500	ug/L	
SJJ0168-IBLC	Selenium-78 (dissolved)	0.0490	0.179	0.500	ug/L	
SJJ0168-IBLD	Selenium-78 (dissolved)	0.0490	0.179	0.500	ug/L	
SJJ0168-CCBB	Selenium-78 (dissolved)	0.00200	0.179	0.500	ug/L	
SJJ0168-IBLE	Selenium-78 (dissolved)	-0.0190	0.179	0.500	ug/L	
SJJ0168-IBLF	Selenium-78 (dissolved)	-0.0330	0.179	0.500	ug/L	
SJJ0168-CCBC	Selenium-78 (dissolved)	0.0810	0.179	0.500	ug/L	
SJJ0168-IBLG	Selenium-78 (dissolved)	0.0610	0.179	0.500	ug/L	
SJJ0168-IBLH	Selenium-78 (dissolved)	0.0190	0.179	0.500	ug/L	
SJJ0168-CCBD	Selenium-78 (dissolved)	0.201	0.179	0.500	ug/L	
SJJ0168-CCBE	Selenium-78 (dissolved)	0.00100	0.179	0.500	ug/L	
SJJ0168-IBLI	Selenium-78 (dissolved)	-0.115	0.179	0.500	ug/L	
SJJ0168-IBLJ	Selenium-78 (dissolved)	-0.0750	0.179	0.500	ug/L	



INSTRUMENT BLANKS EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Sequence: SJJ0168

Date Analyzed: 10/13/21 05:18

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0168-CCBF	Selenium-78 (dissolved)	-0.0860	0.179	0.500	ug/L	
SJJ0168-IBLK	Selenium-78 (dissolved)	-0.0650	0.179	0.500	ug/L	
SJJ0168-IBLL	Selenium-78 (dissolved)	-0.00700	0.179	0.500	ug/L	
SJJ0168-CCBG	Selenium-78 (dissolved)	0.0610	0.179	0.500	ug/L	
SJJ0168-IBLM	Selenium-78 (dissolved)	-0.0460	0.179	0.500	ug/L	
SJJ0168-IBLN	Selenium-78 (dissolved)	-0.00400	0.179	0.500	ug/L	
SJJ0168-CCBH	Selenium-78 (dissolved)	-0.101	0.179	0.500	ug/L	
SJJ0168-CCBI	Selenium-78 (dissolved)	-0.0550	0.179	0.500	ug/L	
SJJ0168-IBLO	Selenium-78 (dissolved)	-0.0420	0.179	0.500	ug/L	
SJJ0168-IBLP	Selenium-78 (dissolved)	-0.0600	0.179	0.500	ug/L	
SJJ0168-CCBJ	Selenium-78 (dissolved)	0.00800	0.179	0.500	ug/L	
SJJ0168-IBLQ	Selenium-78 (dissolved)	-0.157	0.179	0.500	ug/L	
SJJ0168-CCBK	Selenium-78 (dissolved)	-0.0840	0.179	0.500	ug/L	
SJJ0168-IBLR	Selenium-78 (dissolved)	-0.130	0.179	0.500	ug/L	
SJJ0168-CCBL	Selenium-78 (dissolved)	-0.0210	0.179	0.500	ug/L	



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0155

Instrument: ICPMS1

Calibration: EJ00033

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
CAL 0	SJJ0155-CAL1	XDT_m1211011-006	NA	10/11/21 13:20
CAL 1 - LOW CHECK	SJJ0155-CAL2	XDT_m1211011-007	NA	10/11/21 13:25
CAL 2	SJJ0155-CAL3	XDT_m1211011-008	NA	10/11/21 13:30
CAL 3	SJJ0155-CAL4	XDT_m1211011-009	NA	10/11/21 13:35
CAL 4	SJJ0155-CAL5	XDT_m1211011-010	NA	10/11/21 13:40
CAL 5	SJJ0155-CAL6	XDT_m1211011-011	NA	10/11/21 13:47
RINSE	SJJ0155-IBL1	XDT_m1211011-012	NA	10/11/21 13:54
Initial Cal Check	SJJ0155-ICV1	XDT_m1211011-017	NA	10/11/21 14:23
Initial Cal Blank	SJJ0155-ICB1	XDT_m1211011-018	NA	10/11/21 14:31
Calibration Check	SJJ0155-CCV1	XDT_m1211011-019	NA	10/11/21 14:36
Calibration Blank	SJJ0155-CCB1	XDT_m1211011-020	NA	10/11/21 14:44
Instrument RL Check	SJJ0155-CRL1	XDT_m1211011-021	NA	10/11/21 14:48
Interference Check A	SJJ0155-IFA1	XDT_m1211011-022	NA	10/11/21 14:56
Interference Check B	SJJ0155-IFB1	XDT_m1211011-023	NA	10/11/21 15:00
LR300	SJJ0155-HCV2	XDT_m1211011-025	NA	10/11/21 15:10
Instrument Blank	SJJ0155-IBL2	XDT_m1211011-026	NA	10/11/21 15:17
LR200	SJJ0155-HCV1	XDT_m1211011-027	NA	10/11/21 15:24
Instrument Blank	SJJ0155-IBL3	XDT_m1211011-028	NA	10/11/21 15:29
Instrument Blank	SJJ0155-IBL4	XDT_m1211011-029	NA	10/11/21 15:35
Calibration Check	SJJ0155-CCV2	XDT_m1211011-030	NA	10/11/21 15:41
Calibration Blank	SJJ0155-CCB2	XDT_m1211011-031	NA	10/11/21 15:48
ZZZZZ	21J0025-01	XDT_m1211011-038	Water	10/11/21 16:29
Instrument Blank	SJJ0155-IBL5	XDT_m1211011-041	NA	10/11/21 16:49
Calibration Check	SJJ0155-CCV3	XDT_m1211011-042	NA	10/11/21 16:55
Calibration Blank	SJJ0155-CCB3	XDT_m1211011-043	NA	10/11/21 17:04
Calibration Check	SJJ0155-CCV4	XDT_m1211011-045	NA	10/11/21 17:14
Calibration Blank	SJJ0155-CCB4	XDT_m1211011-046	NA	10/11/21 17:21
ZZZZZ	21J0025-01RE1	XDT_m1211011-052	Water	10/11/21 17:57
Instrument Blank	SJJ0155-IBL6	XDT_m1211011-055	NA	10/11/21 18:17



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0155

Instrument: ICPMS1

Calibration: EJ00033

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Calibration Check	SJJ0155-CCV5	XDT_m1211011-056	NA	10/11/21 18:22
Calibration Blank	SJJ0155-CCB5	XDT_m1211011-057	NA	10/11/21 18:29
Instrument Blank	SJJ0155-IBL7	XDT_m1211011-067	NA	10/11/21 19:25
Calibration Check	SJJ0155-CCV6	XDT_m1211011-068	NA	10/11/21 19:31
Calibration Blank	SJJ0155-CCB6	XDT_m1211011-070	NA	10/11/21 19:44
Instrument Blank	SJJ0155-IBL8	XDT_m1211011-080	NA	10/11/21 20:37
Calibration Check	SJJ0155-CCV7	XDT_m1211011-081	NA	10/11/21 20:42
Calibration Blank	SJJ0155-CCB7	XDT_m1211011-082	NA	10/11/21 20:49
Calibration Check	SJJ0155-CCV9	XDT_m1211011-093	NA	10/11/21 23:54
Calibration Blank	SJJ0155-CCB9	XDT_m1211011-094	NA	10/12/21 00:01
Blank	BJJ0192-BLK1	XDT_m1211011-095	Water	10/12/21 00:05
LCS	BJJ0192-BS1	XDT_m1211011-096	Water	10/12/21 00:09
ZZZZZ	21I0287-16	XDT_m1211011-100	Water	10/12/21 00:28
Instrument Blank	SJJ0155-IBLA	XDT_m1211011-104	NA	10/12/21 00:47
Calibration Check	SJJ0155-CCVA	XDT_m1211011-105	NA	10/12/21 00:53
Calibration Blank	SJJ0155-CCBA	XDT_m1211011-106	NA	10/12/21 01:00
Instrument Blank	SJJ0155-IBLB	XDT_m1211011-116	NA	10/12/21 01:53
Calibration Check	SJJ0155-CCVB	XDT_m1211011-117	NA	10/12/21 01:58
Calibration Blank	SJJ0155-CCBB	XDT_m1211011-118	NA	10/12/21 02:05
ZZZZZ	BJJ0081-BLK3	XDT_m1211011-119	Water	10/12/21 02:10
ZZZZZ	BJJ0081-BS3	XDT_m1211011-120	Water	10/12/21 02:15
Instrument Blank	SJJ0155-IBLC	XDT_m1211011-128	NA	10/12/21 02:52
Calibration Check	SJJ0155-CCVC	XDT_m1211011-129	NA	10/12/21 02:58
Calibration Blank	SJJ0155-CCBC	XDT_m1211011-130	NA	10/12/21 03:06
Instrument Blank	SJJ0155-IBLD	XDT_m1211011-140	NA	10/12/21 03:53
Calibration Check	SJJ0155-CCVD	XDT_m1211011-141	NA	10/12/21 03:59
Calibration Blank	SJJ0155-CCBD	XDT_m1211011-142	NA	10/12/21 04:07
Calibration Check	SJJ0155-CCVE	XDT_m1211011-144	NA	10/12/21 04:16
Calibration Blank	SJJ0155-CCBE	XDT_m1211011-145	NA	10/12/21 04:24



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0155

Instrument: ICPMS1

Calibration: EJ00033

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Instrument Blank	SJJ0155-IBLE	XDT_m1211011-147	NA	10/12/21 04:33
MW-28_092021	21I0294-02	XDT_m1211011-151	Water	10/12/21 04:52
MW-28_092021	BJJ0192-DUP1	XDT_m1211011-152	Water	10/12/21 04:57
MW-28_092021	BJJ0192-MS1	XDT_m1211011-153	Water	10/12/21 05:01
MW-28_092021	BJJ0192-MSD1	XDT_m1211011-154	Water	10/12/21 05:06
Instrument Blank	SJJ0155-IBLF	XDT_m1211011-155	NA	10/12/21 05:11
Calibration Check	SJJ0155-CCVF	XDT_m1211011-156	NA	10/12/21 05:17
Calibration Blank	SJJ0155-CCBF	XDT_m1211011-157	NA	10/12/21 05:24
Instrument Blank	SJJ0155-IBLG	XDT_m1211011-160	NA	10/12/21 05:38
ZZZZZ	21I0331-02	XDT_m1211011-162	Water	10/12/21 05:48
ZZZZZ	21I0331-01	XDT_m1211011-163	Water	10/12/21 05:52
Instrument Blank	SJJ0155-IBLH	XDT_m1211011-167	NA	10/12/21 06:11
Calibration Check	SJJ0155-CCVG	XDT_m1211011-168	NA	10/12/21 06:17
Calibration Blank	SJJ0155-CCBG	XDT_m1211011-169	NA	10/12/21 06:25
Instrument Blank	SJJ0155-IBLI	XDT_m1211011-176	NA	10/12/21 06:58
ZZZZZ	21I0326-01	XDT_m1211011-177	Water	10/12/21 07:03
ZZZZZ	21I0326-03	XDT_m1211011-178	Water	10/12/21 07:07
Instrument Blank	SJJ0155-IBLJ	XDT_m1211011-179	NA	10/12/21 07:12
Calibration Check	SJJ0155-CCVH	XDT_m1211011-180	NA	10/12/21 07:18
Calibration Blank	SJJ0155-CCBH	XDT_m1211011-181	NA	10/12/21 07:25
Instrument Blank	SJJ0155-IBLK	XDT_m1211011-186	NA	10/12/21 07:49
Instrument Blank	SJJ0155-IBLL	XDT_m1211011-189	NA	10/12/21 08:03
Calibration Check	SJJ0155-CCVI	XDT_m1211011-190	NA	10/12/21 08:08
Calibration Blank	SJJ0155-CCBI	XDT_m1211011-191	NA	10/12/21 08:15



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0168

Instrument: ICPMS1

Calibration: EJ00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
CAL 0	SJJ0168-CAL1	XDT_m1211012-015	NA	10/12/21 15:04
CAL 1 - LOW CHECK	SJJ0168-CAL2	XDT_m1211012-016	NA	10/12/21 15:09
CAL 2	SJJ0168-CAL3	XDT_m1211012-017	NA	10/12/21 15:14
CAL 3	SJJ0168-CAL4	XDT_m1211012-018	NA	10/12/21 15:19
CAL 4	SJJ0168-CAL5	XDT_m1211012-019	NA	10/12/21 15:24
CAL 5	SJJ0168-CAL6	XDT_m1211012-020	NA	10/12/21 15:31
RINSE	SJJ0168-IBL1	XDT_m1211012-021	NA	10/12/21 15:39
Initial Cal Check	SJJ0168-ICV1	XDT_m1211012-023	NA	10/12/21 15:45
Initial Cal Blank	SJJ0168-ICB1	XDT_m1211012-024	NA	10/12/21 15:53
Calibration Check	SJJ0168-CCV1	XDT_m1211012-025	NA	10/12/21 15:58
Calibration Blank	SJJ0168-CCB1	XDT_m1211012-026	NA	10/12/21 16:06
Instrument RL Check	SJJ0168-CRL1	XDT_m1211012-027	NA	10/12/21 16:13
Interference Check A	SJJ0168-IFA1	XDT_m1211012-028	NA	10/12/21 16:19
Interference Check B	SJJ0168-IFB1	XDT_m1211012-029	NA	10/12/21 16:23
LR200	SJJ0168-HCV1	XDT_m1211012-030	NA	10/12/21 16:29
LR300	SJJ0168-HCV2	XDT_m1211012-031	NA	10/12/21 16:34
Instrument Blank	SJJ0168-IBL2	XDT_m1211012-032	NA	10/12/21 16:41
Instrument Blank	SJJ0168-IBL3	XDT_m1211012-033	NA	10/12/21 16:48
Calibration Check	SJJ0168-CCV2	XDT_m1211012-034	NA	10/12/21 16:55
Calibration Blank	SJJ0168-CCB2	XDT_m1211012-035	NA	10/12/21 17:02
Instrument Blank	SJJ0168-IBL4	XDT_m1211012-045	NA	10/12/21 17:58
Calibration Check	SJJ0168-CCV3	XDT_m1211012-046	NA	10/12/21 18:03
Calibration Blank	SJJ0168-CCB3	XDT_m1211012-047	NA	10/12/21 18:11
Instrument Blank	SJJ0168-IBL5	XDT_m1211012-057	NA	10/12/21 19:07
Calibration Check	SJJ0168-CCV4	XDT_m1211012-058	NA	10/12/21 19:12
Calibration Blank	SJJ0168-CCB4	XDT_m1211012-059	NA	10/12/21 19:20
Instrument Blank	SJJ0168-IBL6	XDT_m1211012-069	NA	10/12/21 20:21
Calibration Check	SJJ0168-CCV5	XDT_m1211012-070	NA	10/12/21 20:26
Calibration Blank	SJJ0168-CCB5	XDT_m1211012-071	NA	10/12/21 20:34



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0168

Instrument: ICPMS1

Calibration: EJ00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Calibration Check	SJJ0168-CCV6	XDT_m1211012-073	NA	10/12/21 20:45
Calibration Blank	SJJ0168-CCB6	XDT_m1211012-074	NA	10/12/21 20:52
Instrument Blank	SJJ0168-IBL7	XDT_m1211012-084	NA	10/12/21 21:46
Calibration Check	SJJ0168-CCV7	XDT_m1211012-085	NA	10/12/21 21:51
Calibration Blank	SJJ0168-CCB7	XDT_m1211012-086	NA	10/12/21 21:58
Instrument Blank	SJJ0168-IBL8	XDT_m1211012-091	NA	10/12/21 22:22
Instrument Blank	SJJ0168-IBL9	XDT_m1211012-096	NA	10/12/21 22:51
Calibration Check	SJJ0168-CCV8	XDT_m1211012-097	NA	10/12/21 22:56
Calibration Blank	SJJ0168-CCB8	XDT_m1211012-098	NA	10/12/21 23:03
Instrument Blank	SJJ0168-IBLA	XDT_m1211012-102	NA	10/12/21 23:26
Instrument Blank	SJJ0168-IBLB	XDT_m1211012-108	NA	10/13/21 00:01
Calibration Check	SJJ0168-CCV9	XDT_m1211012-109	NA	10/13/21 00:07
Calibration Blank	SJJ0168-CCB9	XDT_m1211012-110	NA	10/13/21 00:14
Calibration Check	SJJ0168-CCVA	XDT_m1211012-112	NA	10/13/21 00:23
Calibration Blank	SJJ0168-CCBA	XDT_m1211012-113	NA	10/13/21 00:31
Instrument Blank	SJJ0168-IBLC	XDT_m1211012-118	NA	10/13/21 00:59
Instrument Blank	SJJ0168-IBLD	XDT_m1211012-123	NA	10/13/21 01:27
Calibration Check	SJJ0168-CCVB	XDT_m1211012-124	NA	10/13/21 01:32
Calibration Blank	SJJ0168-CCBB	XDT_m1211012-125	NA	10/13/21 01:39
Instrument Blank	SJJ0168-IBLE	XDT_m1211012-130	NA	10/13/21 02:07
Instrument Blank	SJJ0168-IBLF	XDT_m1211012-135	NA	10/13/21 02:36
Calibration Check	SJJ0168-CCVC	XDT_m1211012-136	NA	10/13/21 02:41
Calibration Blank	SJJ0168-CCBC	XDT_m1211012-137	NA	10/13/21 02:48
Instrument Blank	SJJ0168-IBLG	XDT_m1211012-142	NA	10/13/21 03:16
ZZZZZ	21I0326-02	XDT_m1211012-143	Water	10/13/21 03:21
ZZZZZ	21I0326-04	XDT_m1211012-144	Water	10/13/21 03:26
ZZZZZ	21I0326-05	XDT_m1211012-145	Water	10/13/21 03:31
ZZZZZ	21I0326-06	XDT_m1211012-146	Water	10/13/21 03:37
Instrument Blank	SJJ0168-IBLH	XDT_m1211012-147	NA	10/13/21 03:44



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0168

Instrument: ICPMS1

Calibration: EJ00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Calibration Check	SJJ0168-CCVD	XDT_m1211012-148	NA	10/13/21 03:49
Calibration Blank	SJJ0168-CCBD	XDT_m1211012-149	NA	10/13/21 03:57
Calibration Check	SJJ0168-CCVE	XDT_m1211012-151	NA	10/13/21 04:06
Calibration Blank	SJJ0168-CCBE	XDT_m1211012-152	NA	10/13/21 04:13
MW-24_092021	21I0294-04	XDT_m1211012-153	Water	10/13/21 04:18
Instrument Blank	SJJ0168-IBLI	XDT_m1211012-157	NA	10/13/21 04:38
ZZZZZ	21I0320-02	XDT_m1211012-158	Water	10/13/21 04:43
ZZZZZ	21I0320-04	XDT_m1211012-159	Water	10/13/21 04:47
ZZZZZ	21I0320-20	XDT_m1211012-160	Water	10/13/21 04:52
Instrument Blank	SJJ0168-IBLJ	XDT_m1211012-162	NA	10/13/21 05:06
Calibration Check	SJJ0168-CCVF	XDT_m1211012-163	NA	10/13/21 05:11
Calibration Blank	SJJ0168-CCBF	XDT_m1211012-164	NA	10/13/21 05:18
MW-60_092021	21I0294-06	XDT_m1211012-165	Water	10/13/21 05:23
MW-55_092021	21I0294-08	XDT_m1211012-167	Water	10/13/21 05:32
Instrument Blank	SJJ0168-IBLK	XDT_m1211012-169	NA	10/13/21 05:43
MW-42_092021	21I0294-10	XDT_m1211012-170	Water	10/13/21 05:48
MW-54_092021	21I0294-12	XDT_m1211012-172	Water	10/13/21 05:57
ZZZZZ	21I0320-06	XDT_m1211012-173	Water	10/13/21 06:03
Instrument Blank	SJJ0168-IBLL	XDT_m1211012-174	NA	10/13/21 06:11
Calibration Check	SJJ0168-CCVG	XDT_m1211012-175	NA	10/13/21 06:16
Calibration Blank	SJJ0168-CCBG	XDT_m1211012-176	NA	10/13/21 06:23
ZZZZZ	21I0320-08	XDT_m1211012-178	Water	10/13/21 06:32
ZZZZZ	21I0320-10	XDT_m1211012-180	Water	10/13/21 06:42
Instrument Blank	SJJ0168-IBLM	XDT_m1211012-181	NA	10/13/21 06:48
ZZZZZ	21I0320-12	XDT_m1211012-182	Water	10/13/21 06:53
ZZZZZ	21I0320-14	XDT_m1211012-184	Water	10/13/21 07:02
Instrument Blank	SJJ0168-IBLN	XDT_m1211012-186	NA	10/13/21 07:16
Calibration Check	SJJ0168-CCVH	XDT_m1211012-187	NA	10/13/21 07:21
Calibration Blank	SJJ0168-CCBH	XDT_m1211012-188	NA	10/13/21 07:28



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0168

Instrument: ICPMS1

Calibration: EJ00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Calibration Check	SJJ0168-CCVI	XDT_m1211012-190	NA	10/13/21 07:37
Calibration Blank	SJJ0168-CCBI	XDT_m1211012-191	NA	10/13/21 07:45
ZZZZZ	21I0320-16	XDT_m1211012-193	Water	10/13/21 07:54
ZZZZZ	21I0320-18	XDT_m1211012-195	Water	10/13/21 08:04
Instrument Blank	SJJ0168-IBLO	XDT_m1211012-196	NA	10/13/21 08:10
Instrument Blank	SJJ0168-IBLP	XDT_m1211012-201	NA	10/13/21 08:38
Calibration Check	SJJ0168-CCVJ	XDT_m1211012-202	NA	10/13/21 08:43
Calibration Blank	SJJ0168-CCBJ	XDT_m1211012-203	NA	10/13/21 08:50
Instrument Blank	SJJ0168-IBLQ	XDT_m1211012-213	NA	10/13/21 09:37
Calibration Check	SJJ0168-CCVK	XDT_m1211012-214	NA	10/13/21 09:42
Calibration Blank	SJJ0168-CCBK	XDT_m1211012-215	NA	10/13/21 09:49
Instrument Blank	SJJ0168-IBLR	XDT_m1211012-219	NA	10/13/21 10:09
Calibration Check	SJJ0168-CCVL	XDT_m1211012-220	NA	10/13/21 10:14
Calibration Blank	SJJ0168-CCBL	XDT_m1211012-221	NA	10/13/21 10:22



ICP INTERFERENCE CHECK SAMPLE
EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00033

Sequence: SJJ0155

Standard ID: J010724

Lab Sample ID	Analyte	True	Found	%R	Units
SJJ0155-IFA1	Selenium-78 (dissolved)	0	0.0670		ug/L

* Indicates %R outside of QC limits

NOTE: True value and %R are populated only for analytes found in the interference check standards, and will be seen only if those analytes were requested.



ICP INTERFERENCE CHECK SAMPLE
EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00033

Sequence: SJJ0155

Standard ID: J010724

Lab Sample ID	Analyte	True	Found	%R	Units
SJJ0155-IFB1	Selenium-78 (dissolved)	0	0.0410		ug/L

* Indicates %R outside of QC limits

NOTE: True value and %R are populated only for analytes found in the interference check standards, and will be seen only if those analytes were requested.



ICP INTERFERENCE CHECK SAMPLE
EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Sequence: SJJ0168

Standard ID: J010724

Lab Sample ID	Analyte	True	Found	%R	Units
SJJ0168-IFA1	Selenium-78 (dissolved)	0	0.0820		ug/L

* Indicates %R outside of QC limits

NOTE: True value and %R are populated only for analytes found in the interference check standards, and will be seen only if those analytes were requested.



ICP INTERFERENCE CHECK SAMPLE
EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Sequence: SJJ0168

Standard ID: J010724

Lab Sample ID	Analyte	True	Found	%R	Units
SJJ0168-IFB1	Selenium-78 (dissolved)	0	0.0450		ug/L

* Indicates %R outside of QC limits

NOTE: True value and %R are populated only for analytes found in the interference check standards, and will be seen only if those analytes were requested.



DETECTION LEVEL STANDARD
EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00033

Sequence: SJJ0155

Lab Sample ID: SJJ0155-CRL1

Analyte	True	Found	%R	Units	QC Limits
Selenium-78 (dissolved)	0.50000	0.611	122	ug/L	50 - 150

* Values outside of QC limits



DETECTION LEVEL STANDARD
EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Sequence: SJJ0168

Lab Sample ID: SJJ0168-CRL1

Analyte	True	Found	%R	Units	QC Limits
Selenium-78 (dissolved)	0.50000	0.584	117	ug/L	50 - 150

* Values outside of QC limits



HIGH-CONCENTRATION CALIBRATION VERIFICATION

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00033

Laboratory ID: SJJ0155-HCV1

Sequence: SJJ0155

Standard ID: J010416

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Selenium-78 (dissolved)	200.00	239	19.5	10.00

* Values outside of QC limits



HIGH-CONCENTRATION CALIBRATION VERIFICATION

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00033

Laboratory ID: SJJ0155-HCV2

Sequence: SJJ0155

Standard ID: J010417

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Selenium-78 (dissolved)	300.00	348	16.0	10.00

* Values outside of QC limits



HIGH-CONCENTRATION CALIBRATION VERIFICATION

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00039

Laboratory ID: SJJ0168-HCV1

Sequence: SJJ0168

Standard ID: J010416

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Selenium-78 (dissolved)	200.00	238	18.9 *	10.00

* Values outside of QC limits



HIGH-CONCENTRATION CALIBRATION VERIFICATION

EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00039

Laboratory ID: SJJ0168-HCV2

Sequence: SJJ0168

Standard ID: J010417

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Selenium-78 (dissolved)	300.00	349	16.2 *	10.00

* Values outside of QC limits



HOLDING TIME SUMMARY

Analysis: EPA 6020B UCT-KED

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sample Name	Date Collected	Date Received	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
MW-28_092021 21I0294-02	09/20/21 10:10	09/21/21 15:38	10/07/21 11:34	17	180	10/12/21 04:52	22	180	
MW-24_092021 21I0294-04	09/20/21 11:11	09/21/21 15:38	10/07/21 11:34	17	180	10/13/21 04:18	23	180	
MW-60_092021 21I0294-06	09/20/21 11:30	09/21/21 15:38	10/07/21 11:34	17	180	10/13/21 05:23	23	180	
MW-55_092021 21I0294-08	09/20/21 12:29	09/21/21 15:38	10/07/21 11:34	16	180	10/13/21 05:32	23	180	
MW-42_092021 21I0294-10	09/20/21 12:35	09/21/21 15:38	10/07/21 11:34	16	180	10/13/21 05:48	23	180	
MW-54_092021 21I0294-12	09/20/21 13:54	09/21/21 15:38	10/07/21 11:34	16	180	10/13/21 05:57	23	180	
Duplicate BJJ0192-DUP1	09/20/21 10:10	09/21/21 15:38	10/07/21 11:34	17	180	10/12/21 04:57	22	180	
Matrix Spike BJJ0192-MS1	09/20/21 10:10	09/21/21 15:38	10/07/21 11:34	17	180	10/12/21 05:01	22	180	
Matrix Spike Dup BJJ0192-MSD1	09/20/21 10:10	09/21/21 15:38	10/07/21 11:34	17	180	10/12/21 05:06	22	180	

* Indicates hold time exceedance.



Analytical Resources, Incorporated
Analytical Chemists and Consultants

**METHOD DETECTION
AND REPORTING LIMITS
EPA 6020B UCT-KED**

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Instrument: ICPMS1

Analyte	MDL	RL	Units
Selenium-78 (dissolved)	0.179	0.500	ug/L

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGAG10
Lot Number: P2-AG679501
Matrix: 7% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Silver
Starting Material: Ag Shot
Starting Material Lot#: 2217
Starting Material Purity: 99.9993%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9996 ± 30 µg/mL
Density: 1.053 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **10015 ± 56 µg/mL**
ICP Assay NIST SRM 3151 Lot Number: 160729

Assay Method #2 **9992 ± 25 µg/mL**
Volhard NIST SRM 999c Lot Number: 999c

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

s Ag <	M Eu <	0.000253	O Na	0.005562	M Se <	0.018179	M Zn	0.005799	
O Al	0.006295	O Fe	0.002932	M Nb <	0.000253	M Si	0.022484	M Zr <	0.005559
M As <	0.002403	M Ga <	0.000253	M Nd <	0.000253	M Sm <	0.000253		
M Au	0.001634	M Gd <	0.000253	O Ni <	0.005472	M Sn	0.001927		
O B <	0.009978	M Ge <	0.000754	M Os <	0.000254	O Sr	0.000086		
M Ba <	0.000785	M Hf <	0.000253	M P <	0.053784	M Ta <	0.000253		
M Be <	0.002407	M Hg <	0.001332	M Pb	0.003281	M Tb <	0.000253		
M Bi	0.001671	M Ho <	0.000253	M Pd <	0.001382	M Te <	0.003715		
O Ca	0.007115	M In <	0.003483	M Pr <	0.000253	M Th <	0.000253		
M Cd <	0.000253	M Ir <	0.000254	M Pt <	0.000253	M Ti <	0.002706		
M Ce <	0.000573	O K	0.004010	M Rb <	0.000253	M Tl <	0.000253		
M Co <	0.000253	M La <	0.000253	M Re <	0.000253	M Tm <	0.000253		
O Cr <	0.005043	O Li <	0.000214	M Rh <	0.000253	M U <	0.000253		
M Cs <	0.002769	M Lu <	0.000253	M Ru <	0.000254	M V <	0.000822		
O Cu	0.004614	O Mg	0.001034	M S <	0.560935	M W <	0.002146		
M Dy <	0.000253	M Mn <	0.000253	M Sb <	0.006899	M Y <	0.000253		
M Er <	0.000253	M Mo <	0.000479	M Sc <	0.000733	M Yb <	0.000253		

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 107.87 +1 6 Ag(H₂O)₆⁺
Chemical Compatibility -Stable in HNO₃, and HF. Avoid basic media. Ag forms more insoluble salts than any other metal. It also is subject to photochemical reduction to the metal in HCl media although 10 µg/mL solutions in 10% HCl [AgCl_x1-x] are commonly used in the analytical laboratory. The most common solubility problems exist with arsenate, arsenite , bromide, chloride, iodide, carbonate , chromate, cyanide, iodate, oxalate, oxide, sulfate, sulfide, tartrate, and thiocyanate in aqueous media. The addition of nitric acid renders many of these salts soluble.

Stability - 2-100 ppb levels stable for 75+ days when mixed with equivalent levels of all other elements including the precious metals (where chloride is present) when in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Ag Containing Samples (Preparation and Solution) -Metal (Soluble in HNO₃); Oxides (Soluble in HNO₃); Ores (Digestion with conc. HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 107 amu	1 ppt	N/A	91Zr16O
ICP-OES 243.779 nm	0.12/0.01 µg/mL	1	Mn, Th, Ni, Rh
ICP-OES 328.068 nm	0.007/0.0007 µg/mL	1	Ce, Rh, V
ICP-OES 338.289 nm	0.013/0.001 µg/mL	1	Ce, Cr, Th

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 07, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- June 07, 2023

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Supervisor, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGAS10
 Lot Number: R2-AS691113
 Matrix: 2% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Arsenic
 Starting Material: As Pieces
 Starting Material Lot#: 2208
 Starting Material Purity: 99.9980%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9981 ± 55 µg/mL
Density: 1.028 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **9981 ± 55 µg/mL**
 ICP Assay NIST SRM 3103a Lot Number: 100818

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i) (X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$
 w_i = the weighting factors for each method calculated using the inverse square of the variance:
 $w_i = (1/u_{char i}^2) / (\sum(1/u_{char i}^2))$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2
 u_{char} = $[\sum(w_i)^2 (u_{char i})^2]^{1/2}$ where $u_{char i}$ are the errors from each characterization method
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with
 $u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2
 $u_{char a}$ = the errors from characterization
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag <	0.001578	M Eu <	0.000526	O Na	0.036136	M Se <	0.014204	O Zn <	0.003390
O Al	0.006694	M Fe	0.002633	O Nb <	0.011526	O Si	0.139479	M Zr <	0.003156
s As <		M Ga <	0.000526	M Nd <	0.000526	M Sm <	0.000526		
M Au <	0.000526	M Gd <	0.000526	O Ni <	0.005537	M Sn <	0.001052		
M B	0.017011	M Ge <	0.000526	M Os <	0.000526	M Sr <	0.000526		
M Ba <	0.000526	M Hf <	0.000526	O P <	0.056500	M Ta <	0.000526		
O Be <	0.001130	M Hg <	0.002104	M Pb <	0.000526	M Tb <	0.000526		
M Bi <	0.002104	M Ho <	0.000526	M Pd <	0.000526	M Te <	0.003682		
O Ca	0.005657	M In <	0.000526	M Pr <	0.002630	M Th <	0.000526		
M Cd <	0.000526	M Ir <	0.000526	M Pt <	0.000526	O Ti <	0.001017		
M Ce <	0.000526	O K	0.003865	M Rb <	0.002104	M Tl <	0.000526		
M Co <	0.003156	M La <	0.000526	M Re <	0.000526	M Tm <	0.000526		
M Cr	0.000877	M Li <	0.000526	M Rh <	0.000526	M U <	0.000526		
M Cs <	0.002104	M Lu <	0.000526	M Ru <	0.000526	M V <	0.001578		
M Cu <	0.003156	O Mg	0.000235	O S <	0.056500	M W <	0.000526		
M Dy <	0.000526	M Mn <	0.001052	M Sb <	0.000526	M Y <	0.000526		
M Er <	0.000526	M Mo <	0.000526	M Sc <	0.002104	M Yb <	0.000526		

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 74.92 ; mix of +3 and +5 ; 6 ; H₃AsO₄ and HAsO₂

Chemical Compatibility - Arsenic has no cationic chemistry. It is soluble in HCl, HNO₃, H₃PO₄, H₂SO₄ and HF aqueous matrices water and NH₄OH . It is stable with most inorganic anions (forms arsenate when boiled with chromate) but many cationic metals form the insoluble arsenates under pH neutral conditions. When fluorinated and / or under acidic conditions arsenate formation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO₃ / LDPE container.

As Containing Samples (Preparation and Solution) - Metal (soluble in 1:1 H₂O / HNO₃); Oxides (the oxide exists in crystalline and amorphous forms where the amorphous form is more water soluble. The oxides typically dissolve in dilute acidic solutions when boiled); Minerals (one gram of powdered sample is fused in a Ni crucible with 10 grams of a 1:1 mix of K₂CO₃ and KNO₃ and the melt extracted with hot water); Organic Matrices (0.2 to 0.5 grams of sample are fused with 15 grams of a 1:1 Na₂CO₃ / Na₂O₂ mix in a Ni crucible. The fuseate is extracted with water and acidified with HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 75 amu	20 ppt	N/A	40Ar35Cl, 59Co16O, 36Ar38Ar1H,8Ar37C I,Ar39K, 150Nd2+,150Sm2+
ICP-OES 189.042 nm	0.05/0.005 µg/mL	1	Cr
ICP-OES 193.696 nm	0.1/0.01 µg/mL	1	V, Ge
ICP-OES 228.812 nm	0.1/0.01 µg/mL	1	Cd, Pt, Ir, Co

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 25, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **March 25, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGCD10
 Lot Number: P2-CD675954
 Matrix: 3% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Cadmium
 Starting Material: Cd Shot
 Starting Material Lot#: 1954
 Starting Material Purity: 99.9998%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10014 ± 30 µg/mL
Density: 1.029 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10021 ± 32 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #2	10038 ± 43 µg/mL ICP Assay NIST SRM 3108 Lot Number: 130116
Assay Method #3	9996 ± 30 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char i})^2]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag	0.000834	O Eu <	0.002146	O Na	0.003359	M Se <	0.003997	O Zn	0.000251
O Al	0.002435	O Fe <	0.001180	M Nb <	0.000399	O Si	0.009519	M Zr <	0.000399
M As <	0.003997	M Ga <	0.000399	M Nd <	0.000399	M Sm <	0.000799		
M Au <	0.002809	M Gd <	0.000399	M Ni <	0.002398	M Sn <	0.000799		
M B <	0.005197	M Ge <	0.004397	M Os <	0.000401	O Sr <	0.000107		
M Ba <	0.000399	M Hf <	0.000399	O P <	0.023606	M Ta <	0.000399		
O Be <	0.000107	O Hg <	0.010730	M Pb <	0.001599	M Tb <	0.000399		
M Bi <	0.000399	M Ho <	0.000399	M Pd <	0.000799	M Te <	0.005596		
O Ca	0.001399	O In <	0.015558	M Pr <	0.000399	M Th <	0.000399		
s Cd <		M Ir <	0.000401	M Pt <	0.000399	O Ti <	0.000536		
M Ce <	0.000399	O K	0.004479	M Rb <	0.000399	M Tl	0.000625		
M Co <	0.000399	M La <	0.000399	M Re <	0.000399	M Tm <	0.000399		
M Cr <	0.001199	O Li <	0.000214	M Rh <	0.000399	M U <	0.000399		
M Cs <	0.000399	M Lu <	0.000399	M Ru <	0.000401	M V <	0.001599		
O Cu <	0.003219	O Mg	0.000083	O S <	0.021460	M W <	0.000799		
M Dy <	0.000399	O Mn <	0.000429	M Sb <	0.001599	M Y <	0.000399		
M Er <	0.000399	M Mo <	0.000399	O Sc <	0.000429	M Yb <	0.000399		

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 112.41 +2 4 Cd₂(OH)(aq)₃₊ and Cd(OH)(aq)

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, and HF. Avoid basic media forming insoluble carbonate and hydroxide.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO₃ / LDPE container.

Cd Containing Samples (Preparation and Solution) -Metal (soluble in HNO₃); Oxides (soluble in HCl or HNO₃); Ores (dissolve in HCl /HNO₃ then take to fumes with H₂SO₄. The silica and lead sulfate are filtered off after the addition of water); Organic based (dry ash at 450°C and dissolve ash in HCl), (sulfuric / peroxide acid digestion).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 111 amu	11 ppt	n/a	95Mo16O
ICP-OES 214.438 nm	0.003 / 0.0003 µg/mL	1	Pt, Ir
ICP-OES 226.502 nm	0.003 / 0.0003 µg/mL	1	Ir
ICP-OES 228.802 nm	0.003 / 0.0003 µg/mL	1	Co, Ir, As, Pt

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 07, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- March 07, 2023

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Supervisor, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGCO10
Lot Number: N2-CO671028
Matrix: 3% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Cobalt
Starting Material: COBALT
Starting Material Lot#: 1749
Starting Material Purity: 99.9978%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9988 ± 34 µg/mL
Density: 1.057 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	9973 ± 32 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #2	10024 ± 50 µg/mL ICP Assay NIST SRM traceable to 3113 Lot Number: M2-CO661665

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Ag	0.022956	M	Eu <	0.000422	O Na	0.008125	M	Se <	0.009290	M	Zn	0.007197	
O Al	0.013621	O	Fe	0.048700	M	Nb <	0.000422	O	Si	0.017539	M	Zr <	0.014357
i As <		M	Ga <	0.000844	M	Nd <	0.017735	M	Sm <	0.001689			
M Au <	0.000583	M	Gd	0.003247	O	Ni <	0.043642	M	Sn <	0.005067			
M B <	0.013512	M	Ge <	0.004645	M	Os <	0.000583	O	Sr	0.000841			
O Ba	0.071210	M	Hf <	0.000422	n	P <		M	Ta <	0.000422			
O Be <	0.001771	M	Hg <	0.002334	M	Pb	0.010094	M	Tb <	0.001689			
M Bi	0.000614	M	Ho <	0.000422	M	Pd <	0.000422	M	Te <	0.008445			
O Ca	0.025034	M	In <	0.003378	M	Pr <	0.006756	M	Th <	0.000422			
M Cd <	0.000844	M	Ir <	0.000583	M	Pt <	0.000422	M	Ti <	0.002533			
M Ce	0.002721	O	K	0.005785	M	Rb <	0.001689	M	Tl <	0.000422			
s Co <		M	La	0.000877	M	Re	0.016853	M	Tm <	0.000422			
M Cr <	0.020269	O	Li	0.000262	M	Rh <	0.000422	M	U <	0.000422			
M Cs	0.000877	M	Lu <	0.000422	M	Ru <	0.000583	M	V <	0.001689			
M Cu	0.007197	O	Mg	0.003444	n	S <		M	W <	0.000844			
M Dy <	0.000422	O	Mn <	0.006072	M	Sb <	0.005911	M	Y	0.001228			
M Er <	0.000422	M	Mo <	0.005911	M	Sc <	0.001689	M	Yb <	0.003378			

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.93 +2 6 Co(H₂O)₆²⁺

Chemical Compatibility - Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Co Containing Samples (Preparation and Solution) - Metal (soluble in HNO₃); Oxides (Soluble in HCl); Ores (dissolve in HCl / HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 59 amu	2 ppt	n/a	42Ca16O1H , 40Ar18O1H , 36Ar23Na, 43Ca16O, 24Mg35Cl
ICP-OES 228.616 nm	0.01/0.001 µg/mL	1	
ICP-OES 237.862 nm	0.01/0.002 µg/mL	1	W, Re, Al, Ta
ICP-OES 238.892 nm	0.01/0.002 µg/mL	1	Fe, W, Ta

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 15, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **January 15, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Supervisor, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGCR(3)10
Lot Number: P2-CR684202
Matrix: 10% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Chromium
Starting Material: Cr METAL
Starting Material Lot#: 2077
Starting Material Purity: 99.9942%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10056 ± 49 µg/mL
Density: 1.084 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10061 ± 71 µg/mL ICP Assay NIST SRM 3112a Lot Number: 170630
Assay Method #2	10052 ± 64 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char i}^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.000540	M Eu < 0.003200	O Na < 0.130027	M Se < 0.012000	O Zn < 0.002700
O Al < 0.016626	O Fe < 0.202502	M Nb < 0.022000	n Si <	M Zr < 0.020000
M As < 0.003836	O Ga < 0.031000	M Nd < 0.000540	M Sm < 0.035000	
M Au < 0.000540	M Gd < 0.000540	O Ni < 0.009165	M Sn < 0.004049	
M B < 0.049000	M Ge < 0.005400	M Os < 0.088000	O Sr < 0.000250	
O Ba < 0.002000	M Hf < 0.000540	i P <	M Ta < 0.000540	
O Be < 0.000250	M Hg < 0.001600	M Pb < 0.002557	M Tb < 0.000540	
M Bi < 0.008952	M Ho < 0.000540	M Pd < 0.001100	M Te < 0.004800	
O Ca < 0.074605	M In < 0.001100	M Pr < 0.000540	M Th < 0.000540	
M Cd < 0.000540	M Ir < 0.000540	M Pt < 0.000540	O Ti < 0.013428	
M Ce < 0.000540	O K < 0.034105	i Rb <	M Tl < 0.001100	
O Co < 0.002900	M La < 0.001100	M Re < 0.002700	O Tm < 0.001800	
s Cr <	O Li < 0.000130	M Rh < 0.032000	M U < 0.001100	
M Cs < 0.019000	M Lu < 0.000540	M Ru < 0.094000	O V < 0.159869	
O Cu < 0.010018	O Mg < 0.001449	i S <	M W < 0.028000	
M Dy < 0.000540	O Mn < 0.014000	M Sb < 0.008600	M Y < 0.001100	
M Er < 0.016000	O Mo < 0.013000	O Sc < 0.001400	M Yb < 0.000540	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 52.00 +3 6 Cr(H₂O)₆³⁺

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Cr₃ Containing Samples (Preparation and Solution) -Metal (soluble in HCl); Oxides/Ores (Chrome ore/oxides are very difficult to dissolve. The following procedures [A-D] are commonly used: A. Fusion with KHSO₄ and extraction with hot KCl. The residue fused with Na₂CO₃ and KClO₃, 3:1. B. Fusion with NaKSO₄ and NaF 2:1, C. Fusion with magnesia or lime and sodium or potassium carbonates, 4:1. D. Fusion with Na₂O₂ or NaOH and KNO₃ or NaOH and Na₂O₂. Nickel, iron, copper, or silver crucibles should be used for D. Platinum may be used for A, B, C); Organic Matrices (ash at 4500C followed by one of the fusion methods above or sulfuric/hydrogen peroxide acid digestions may be applicable to non oxide containing samples).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 52 amu	40 ppt	N/A	36S16O, 36Ar16O - The 50Cr, 53Cr, 54Cr lines suffer from many more potential interferences from sulfur, chlorine and argon compounds of oxygen, nitrogen and carbon.
ICP-OES 205.552 nm	0.006/0.0008 µg/mL	1	Os
ICP-OES 276.654 nm	0.01/0.001 µg/mL	1	Cu, Ta, V
ICP-OES 284.325 nm	0.008/0.0007 µg/mL	1	

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 02, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **November 02, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGCU10
 Lot Number: P2-CU682108
 Matrix: 3% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Copper
 Starting Material: Cu Metal
 Starting Material Lot#: 2095
 Starting Material Purity: 99.9996%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10013 ± 30 µg/mL
Density: 1.032 g/mL (measured at 20 ± 4 °C)

Assay Information:

- Assay Method #1** **9977 ± 50 µg/mL**
 ICP Assay NIST SRM 3114 Lot Number: 121207

- Assay Method #2** **10024 ± 26 µg/mL**
 EDTA NIST SRM 928 Lot Number: 928

- Assay Method #3** **10007 ± 46 µg/mL**
 Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.007542	M Eu < 0.000942	O Na < 0.001434	M Se < 0.016971	M Zn < 0.005657
O Al < 0.000609	O Fe < 0.008700	M Nb < 0.000942	O Si < 0.003052	M Zr < 0.000942
M As < 0.010371	M Ga < 0.000942	M Nd < 0.000942	M Sm < 0.000942	
M Au < 0.001885	M Gd < 0.000942	M Ni < 0.003781	M Sn < 0.005657	
O B < 0.003663	M Ge < 0.005657	M Os < 0.000942	M Sr < 0.000942	
M Ba < 0.004253	M Hf < 0.000942	O P < 0.031668	M Ta < 0.000942	
M Be < 0.000942	O Hg < 0.007064	M Pb < 0.005789	M Tb < 0.000942	
M Bi < 0.000942	M Ho < 0.000942	M Pd < 0.000942	M Te < 0.004714	
O Ca < 0.002304	M In < 0.000942	M Pr < 0.000942	M Th < 0.000942	
M Cd < 0.000942	M Ir < 0.000942	M Pt < 0.000942	O Ti < 0.002801	
M Ce < 0.000942	O K < 0.000763	M Rb < 0.000942	M Tl < 0.000942	
M Co < 0.001890	M La < 0.000942	M Re < 0.000942	M Tm < 0.000942	
M Cr < 0.005657	O Li < 0.000243	i Rh < 0.000942	M U < 0.000942	
M Cs < 0.000942	M Lu < 0.000942	M Ru < 0.039588	M V < 0.003771	
s Cu < 0.000942	O Mg < 0.000320	O S < 0.007174	M W < 0.005657	
M Dy < 0.000942	O Mn < 0.000793	M Sb < 0.001885	M Y < 0.000942	
M Er < 0.000942	M Mo < 0.005657	M Sc < 0.000942	M Yb < 0.000942	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 63.55 +2 6 Cu(H₂O)₆²⁺

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Cu Containing Samples (Preparation and Solution) -Metal (soluble in HNO₃); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 63 amu	10 ppt	n/a	40Ar23Na 47Ti16O, 14N12C37Cl, 16O12C35Cl, 23Na40Ca
ICP-OES 219.958 nm	0.01/.002 µg/mL	1	Th, Ta, Nb, U, Hf
ICP-OES 224.700 nm	0.01/.001 µg/mL	1	Pb, Ir, Ni, W
ICP-OES 324.754 nm	0.06/.001 µg/mL		Nb, U, Th, Mo, Hf

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 24, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- August 24, 2023

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGMN10
 Lot Number: P2-MN687536
 Matrix: 3% (v/v) HNO₃
 Value / Analyte(s): 10 000 µg/mL ea:
 Manganese
 Starting Material: Mn Metal
 Starting Material Lot#: 2275
 Starting Material Purity: 99.9909%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10046 ± 30 µg/mL
Density: 1.035 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10045 ± 25 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #2	10083 ± 68 µg/mL ICP Assay NIST SRM 3132 Lot Number: 050429
Assay Method #3	10031 ± 47 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.001500	M Eu < 0.000730	O Na 0.176713	M Se < 0.006600	M Zn 0.009960
O Al 0.004337	M Fe < 0.650000	M Nb < 0.000730	O Si 0.097995	M Zr < 0.000730
M As < 0.008000	M Ga 0.004337	M Nd < 0.001500	M Sm < 0.000730	
M Au < 0.000730	M Gd < 0.000730	M Ni 0.024097	M Sn < 0.002200	
M B 0.069078	M Ge < 0.004400	M Os < 0.000730	O Sr 0.000931	
M Ba < 0.001500	M Hf < 0.000730	i P <	M Ta < 0.000730	
M Be < 0.000730	M Hg < 0.002200	M Pb 0.007389	M Tb < 0.000730	
M Bi < 0.003000	M Ho < 0.000730	M Pd < 0.000730	M Te < 0.019000	
O Ca 0.062652	M In < 0.003000	M Pr < 0.000730	M Th < 0.000730	
M Cd < 0.001500	M Ir < 0.000730	M Pt < 0.000730	O Ti < 0.006500	
M Ce < 0.007300	O K 0.006425	M Rb < 0.006600	M Tl < 0.000730	
O Co 0.014779	M La < 0.003000	M Re < 0.000730	M Tm < 0.000730	
O Cr 0.273102	O Li 0.000417	M Rh < 0.003000	M U < 0.001500	
M Cs < 0.000730	M Lu < 0.000730	M Ru < 0.004400	M V < 0.000730	
O Cu 0.007711	O Mg 0.321297	i S <	M W < 0.004400	
M Dy < 0.001500	s Mn <	M Sb < 0.021000	O Y 0.001365	
M Er < 0.001500	M Mo 0.010281	O Sc < 0.004100	M Yb < 0.000730	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 54.94 +2 6 Mn(H₂O)₆2+

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO₃/LDPE container.

Mn Containing Samples (Preparation and Solution) -Metal (Soluble in dilute acids); Oxides (Soluble in dilute acids); Ores (Dissolve with HCl. If silica is present add HF and then fume off silica by adding H₂SO₄ and heat to SO₃ fumes - dense white fumes).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 55 amu	10 ppt	n/a	40Ar14N1H,39K16 O,37Cl18O,40Ar15 N,38Ar17O,36Ar18O 1H ,38Ar16O1H,37Cl17 O1H,23Na32S
ICP-OES 257.610 nm	0.0014 / 0.00002 µg/mL	1	Ce, W, Re
ICP-OES 259.373 nm	0.0016 / 0.00002 µg/mL	1	U, Ta, Mo, Fe, Nb
ICP-OES 260.569 nm	0.0021 / 0.00002 µg/mL	1	Co

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 05, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **January 05, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGNI10
 Lot Number: P2-NI686384
 Matrix: 3% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Nickel
 Starting Material: Ni Metal
 Starting Material Lot#: 2277 and 2282
 Starting Material Purity: 99.9992%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9979 ± 30 µg/mL
Density: 1.038 g/mL (measured at 20 ± 4 °C)

Assay Information:

- Assay Method #1** **9971 ± 54 µg/mL**
 ICP Assay NIST SRM 3136 Lot Number: 120619

- Assay Method #2** **9970 ± 32 µg/mL**
 EDTA NIST SRM 928 Lot Number: 928

- Assay Method #3** **9993 ± 33 µg/mL**
 Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char i}^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag	0.002606	M Eu	<	0.001100	O Na	0.004965	O Se	<	0.067000	M Zn	0.006578	
M Al	<	0.013000	O Fe	0.018618	M Nb	<	0.001100	O Si	0.010923	M Zr	<	0.001100
O As	<	0.067000	M Ga	<	0.001100	M Nd	<	0.001100	M Sm	<	0.001100	
M Au	<	0.002100	M Gd	<	0.001100	s Ni	<		M Sn	<	0.016000	
M B	<	0.017000	M Ge	<	0.004200	M Os	0.002110	O Sr	<	0.000940		
M Ba	<	0.001100	M Hf	<	0.001100	i P	<		M Ta	<	0.001100	
O Be	<	0.000410	M Hg	0.014895	M Pb	0.006578	M Tb	<	0.001100			
M Bi	<	0.004200	M Ho	<	0.001100	M Pd	<	0.001100	M Te	<	0.015000	
O Ca	0.003351	M In	<	0.001100	M Pr	<	0.001100	M Th	<	0.001100		
M Cd	0.001365	M Ir	0.004716	M Pt	<	0.001100	M Ti	<	0.004200			
M Ce	<	0.001100	O K	0.004716	M Rb	<	0.001100	M Tl	<	0.001100		
O Co	0.017377	M La	<	0.001100	M Re	0.001737	M Tm	<	0.001100			
O Cr	<	0.006700	O Li	<	0.000140	M Rh	<	0.006300	M U	<	0.001100	
M Cs	<	0.007300	M Lu	<	0.001100	M Ru	<	0.019000	M V	<	0.002100	
M Cu	0.004096	O Mg	0.000372	i S	<			M W	<	0.006300		
M Dy	<	0.001100	O Mn	<	0.001900	M Sb	0.005833	O Y	<	0.000540		
M Er	<	0.001100	M Mo	<	0.008400	M Sc	<	0.002100	M Yb	<	0.001100	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.69 +2 6 Ni(H₂O)₆²⁺

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Ni Containing Samples (Preparation and Solution) -Metal (Soluble in HNO₃); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 60 amu	100 ppt	n/a	43Ca16O1H , 44Ca16O, 23Na37Cl
ICP-OES 221.647 nm	0.01 / 0.0009 µg/mL	1	Si
ICP-OES 231.604 nm	0.02 / 0.002 µg/mL	1	Sb, Ta, Co
ICP-OES 232.003 nm	0.02 / 0.006 µg/mL	1	Cr, Re, Os, Nb, Ag, Pt, Fe

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 02, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- December 02, 2023

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGZN10
 Lot Number: P2-ZN686137
 Matrix: 2% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Zinc
 Starting Material: Zn Shot
 Starting Material Lot#: 2201
 Starting Material Purity: 99.9993%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10040 ± 30 µg/mL
Density: 1.033 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10009 ± 54 µg/mL ICP Assay NIST SRM 3168a Lot Number: 120629
Assay Method #2	10049 ± 33 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #3	10041 ± 28 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char i}^2))]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.003057	M Eu < 0.000509	O Na < 0.001874	M Se < 0.023441	s Zn <
O Al < 0.005720	O Fe < 0.006348	M Nb < 0.000509	O Si < 0.057200	M Zr < 0.000509
M As < 0.003057	M Ga < 0.007134	M Nd < 0.000509	M Sm < 0.000509	
M Au < 0.000510	M Gd < 0.000509	M Ni < 0.000509	M Sn < 0.000509	
O B < 0.017160	M Ge < 0.003057	M Os < 0.000510	M Sr < 0.000509	
M Ba < 0.000509	M Hf < 0.000509	O P < 0.057200	M Ta < 0.000509	
M Be < 0.000509	M Hg < 0.001021	O Pb < 0.023870	M Tb < 0.000509	
M Bi < 0.005095	M Ho < 0.000509	M Pd < 0.002038	M Te < 0.023441	
O Ca < 0.033793	M In < 0.000509	M Pr < 0.000509	M Th < 0.000509	
O Cd < 0.003924	M Ir < 0.000510	M Pt < 0.000509	M Ti < 0.000509	
M Ce < 0.000509	O K < 0.001499	M Rb < 0.002038	M Tl < 0.009172	
M Co < 0.000509	M La < 0.000509	M Re < 0.000509	M Tm < 0.000509	
O Cr < 0.001549	O Li < 0.000457	M Rh < 0.000509	M U < 0.000509	
M Cs < 0.000509	M Lu < 0.000509	M Ru < 0.006129	M V < 0.000509	
O Cu < 0.010296	O Mg < 0.000349	O S < 0.034320	M W < 0.001019	
M Dy < 0.000509	M Mn < 0.000509	M Sb < 0.001019	M Y < 0.000509	
M Er < 0.000509	M Mo < 0.000509	M Sc < 0.000509	M Yb < 0.000509	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 65.39 +2 4 Zn(OH)(aq)1+

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media forming insoluble carbonate and hydroxide. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Zn Containing Samples (Preparation and Solution) -Metal (soluble in HNO₃); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO₃); Organic based (dry ash at 4500C and dissolve ash in HCl) (sulfuric/peroxide acid digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 66 amu	7 ppt	N/A	50Ti16O,50Cr16O, 50V16O, 34S16O2, 32S16O18O, 32S17O2, 33S16O17O, 32S34S, 33S2
ICP-OES 202.548 nm	0.004/0.0002 µg/mL	1	Nb, Cu, Co, Hf
ICP-OES 206.200 nm	0.006/0.0006 µg/mL	1	Sb, Ta, Bi, Os
ICP-OES 213.856 nm	0.002/0.0004 µg/mL	1	Ni, Cu, V

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 05, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **December 05, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGU1
Lot Number: P2-U683975
Matrix: 2% (v/v) HNO₃
Value / Analyte(s): 1 000 µg/mL ea:
Uranium
Starting Material: Uranyl Nitrate
Starting Material Lot#: 1948
Starting Material Purity: 99.9985%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 1001 ± 5 µg/mL
Density: 1.010 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **1001 ± 5 µg/mL**
ICP Assay NIST SRM 3164 Lot Number: 080521

Assay Method #2 **1002 ± 6 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/(u_{char j}^2)))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

u_{char} = $[\sum(w_i)^2 (u_{char i}^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Certified Abundance:

IV's Certified Abundance

Isotope	Atom %
Uranium 238U	99.8 ± 0.1
Uranium 235U	0.24 ± 0.05

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.000103	M Eu < 0.000103	M Na < 0.020618	M Se < 0.001246	M Zn < 0.003533
M Al < 0.003740	M Fe < 0.001029	M Nb < 0.000207	M Si < 0.035027	M Zr < 0.000103
M As < 0.001143	M Ga < 0.001350	M Nd < 0.000623	M Sm < 0.000311	
M Au < 0.000207	M Gd < 0.000311	M Ni < 0.008313	M Sn < 0.007273	
M B < 0.005819	M Ge < 0.001974	M Os < 0.000103	M Sr < 0.001039	
M Ba < 0.002286	M Hf < 0.000103	i P <	M Ta < 0.000103	
M Be < 0.001350	M Hg < 0.000415	M Pb < 0.000103	M Tb < 0.000103	
M Bi < 0.000103	M Ho < 0.000103	M Pd < 0.000207	M Te < 0.006234	
M Ca < 0.010391	M In < 0.000103	M Pr < 0.000103	M Th < 0.010535	
M Cd < 0.000103	M Ir < 0.000103	M Pt < 0.000103	M Ti < 0.000207	
M Ce < 0.000103	M K < 0.041565	M Rb < 0.000519	M Tl < 0.000103	
M Co < 0.000415	M La < 0.001662	M Re < 0.000103	M Tm < 0.000103	
M Cr < 0.001870	M Li < 0.001662	M Rh < 0.000103	s U <	
M Cs < 0.000175	M Lu < 0.000103	M Ru < 0.000519	M V < 0.000207	
M Cu < 0.000792	M Mg < 0.002493	i S <	M W < 0.000103	
M Dy < 0.000103	M Mn < 0.001454	M Sb < 0.000103	M Y < 0.000103	
M Er < 0.000103	M Mo < 0.000415	M Sc < 0.006234	M Yb < 0.000103	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 238.03 +6 8 UO₂²⁺(uranyl)

Chemical Compatibility - Soluble in HCl and HNO₃. Avoid H₃PO₄. H₂SO₄ and HF matrices should not be a problem depending upon [U]. Although the UO₂²⁺ ion is distinctly basic, any U+4 will precipitate in basic media. UO₂²⁺salts are generally soluble in water and UO₂²⁺ is stable with most metals and inorganic anions. The uranyl phosphate is insoluble in water. UF₄ and UF₆ are water soluble.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO₃ / LDPE container.

U Containing Samples (Preparation and Solution) -Metal (Dissolves rapidly in HCl and HNO₃); Oxide (Soluble in HNO₃); Ores (Digest for 1-2 hours with 1 gram of ore to 30 mL 1:1 HNO₃. Silica insolubles are removed by filtration after bringing the sample to fumes with conc. H₂SO₄.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 238 amu	2 ppt	N/A	206Pb16O2
ICP-OES 263.553 nm	0.3 / 0.01 µg/mL	1	Ce, Ir, Th, Rh, W, Zr, Ta, Ti, V, Hf, Fe, Re, Ru
ICP-OES 367.007 nm	0.3 / 0.02 µg/mL	1	Th, Ce
ICP-OES 385.958 nm	0.3 / 0.01 µg/mL	1	Th, Fe

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 28, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **September 28, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution
 Catalog Number: AR-6020ICS-0A10
 Lot Number: R2-MEB692465
 Matrix: 1.4% (v/v) HNO3
 Value / Analyte(s):
 1 000 µg/mL ea:
 Chloride,
 200 µg/mL ea:
 Carbon,
 100 µg/mL ea:
 Calcium, Aluminum,
 Iron, Potassium,
 Magnesium, Sodium,
 Phosphorus, Sulfur,
 2 µg/mL ea:
 Titanium, Molybdenum

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Aluminum, Al	100.0 ± 0.3 µg/mL	Calcium, Ca	100.0 ± 0.5 µg/mL
Carbon, C	200.1 ± 0.5 µg/mL	Chloride, Cl	1 000 ± 5 µg/mL
Iron, Fe	100.0 ± 0.5 µg/mL	Magnesium, Mg	100.0 ± 0.5 µg/mL
Molybdenum, Mo	2.001 ± 0.012 µg/mL	Phosphorus, P	100.1 ± 0.6 µg/mL
Potassium, K	100.0 ± 0.5 µg/mL	Sodium, Na	100.0 ± 0.5 µg/mL
Sulfur, S	100.0 ± 0.5 µg/mL	Titanium, Ti	2.001 ± 0.017 µg/mL

Density: 1.007 g/mL (measured at 20 ± 4 °C)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Al	ICP Assay	3101a	140903
Al	EDTA	928	928
C	Acidimetric	84L	84L
Ca	ICP Assay	3109a	130213
Ca	EDTA	928	928
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
K	ICP Assay	3141a	140813
K	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mo	ICP Assay	3134	130418
Na	ICP Assay	3152a	120715
Na	Gravimetric		See Sec. 4.2
P	ICP Assay	3139a	060717
P	Acidimetric	84L	84L
S	Acidimetric	84L	84L
S	ICP Assay	traceable to 3154	M2-S657208
Ti	ICP Assay	3162a	130925

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char i}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

u_{char} = $[\sum(w_i)^2 (u_{char i}^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a)(u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

April 22, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **April 22, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGAG10
Lot Number: P2-AG688237
Matrix: 7% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Silver
Starting Material: Ag Shot
Starting Material Lot#: 2217
Starting Material Purity: 99.9993%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10004 ± 30 µg/mL
Density: 1.054 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	9984 ± 32 µg/mL ICP Assay NIST SRM 3151 Lot Number: 160729
Assay Method #2	10016 ± 26 µg/mL Volhard NIST SRM 999c Lot Number: 999c

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i})^2 / (\sum(1/(u_{char\ j})^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

s Ag <	M Eu <	0.000253	O Na	0.005563	M Se <	0.018179	M Zn	0.005800	
O Al	0.006296	O Fe	0.002932	M Nb <	0.000253	M Si	0.022487	M Zr <	0.005559
M As <	0.002403	M Ga <	0.000253	M Nd <	0.000253	M Sm <	0.000253		
M Au	0.001635	M Gd <	0.000253	O Ni <	0.005472	M Sn	0.001928		
O B <	0.009978	M Ge <	0.000754	M Os <	0.000254	O Sr	0.000086		
M Ba <	0.000785	M Hf <	0.000253	M P <	0.053784	M Ta <	0.000253		
M Be <	0.002407	M Hg <	0.001332	M Pb	0.003281	M Tb <	0.000253		
M Bi	0.001671	M Ho <	0.000253	M Pd <	0.001382	M Te <	0.003715		
O Ca	0.007116	M In <	0.003483	M Pr <	0.000253	M Th <	0.000253		
M Cd <	0.000253	M Ir <	0.000254	M Pt <	0.000253	M Ti <	0.002706		
M Ce <	0.000573	O K	0.004010	M Rb <	0.000253	M Tl <	0.000253		
M Co <	0.000253	M La <	0.000253	M Re <	0.000253	M Tm <	0.000253		
O Cr <	0.005043	O Li <	0.000214	M Rh <	0.000253	M U <	0.000253		
M Cs <	0.002769	M Lu <	0.000253	M Ru <	0.000254	M V <	0.000822		
O Cu	0.004614	O Mg	0.001035	M S <	0.560935	M W <	0.002146		
M Dy <	0.000253	M Mn <	0.000253	M Sb <	0.006899	M Y <	0.000253		
M Er <	0.000253	M Mo <	0.000479	M Sc <	0.000733	M Yb <	0.000253		

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 107.87 +1 6 Ag(H₂O)₆+
Chemical Compatibility -Stable in HNO₃, and HF. Avoid basic media. Ag forms more insoluble salts than any other metal. It also is subject to photochemical reduction to the metal in HCl media although 10 µg/mL solutions in 10% HCl [AgCl_x1-x] are commonly used in the analytical laboratory. The most common solubility problems exist with arsenate, arsenite, bromide, chloride, iodide, carbonate, chromate, cyanide, iodate, oxalate, oxide, sulfate, sulfide, tartrate, and thiocyanate in aqueous media. The addition of nitric acid renders many of these salts soluble.

Stability - 2-100 ppb levels stable for 75+ days when mixed with equivalent levels of all other elements including the precious metals (where chloride is present) when in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Ag Containing Samples (Preparation and Solution) -Metal (Soluble in HNO₃); Oxides (Soluble in HNO₃); Ores (Digestion with conc. HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 107 amu	1 ppt	N/A	91Zr16O
ICP-OES 243.779 nm	0.12/0.01 µg/mL	1	Mn, Th, Ni, Rh
ICP-OES 328.068 nm	0.007/0.0007 µg/mL	1	Ce, Rh, V
ICP-OES 338.289 nm	0.013/0.001 µg/mL	1	Ce, Cr, Th

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 29, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- January 29, 2024

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char i}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i^2 (u_{char i})^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

OE<!" >% ' 9\$(! (%\$&#G& () N*+E V# #5 95G` &5 \$<#15) ; \$) : >#%") 5" I E<& 95\$(!& ;) %&#< \$!& V#G& #%& %&>) %& 2 # 15F !5() #\$\$) 95((<& +7 ? A ? 95\$(Q&%)%#5' (<& : &# ' 9%& : &5(2_&F<15F #5' V#G : & ' !G(!) 5 &%)%& *5 %%& \$#" & ' _<&#& 5) N*+E +7 ? A ? #% #V#1G#G&2 (<& (& : 15G) 9" & " (!b" ">&\$!;!& ' I

4.1 Thermometer Calibration

OT6(<&%) : & (& % #& N*+E (%\$&#G& (<%)9F< (<%) : & (& (<# (#& \$#G# (& GQ#5 #\$\$\$& !(& \$#G#(!) 5 #G) %) %Q

4.2 Balance Calibration

OT6#5#Q!\$#6G#6#5\$& " #& \$#G# (& GQ#5 #\$\$\$& !(& \$#G#(!) 5 #G) %) %Q#5' >% \$& ' 9%& E<& _&F<(" 9" & ;) %& (!5F #& #559#G\$) : >%& () : # " (& _&F<(" #5' #& (%\$&#G& () N*+E I

4.3 Glassware Calibration

OT5 !5G) 9" & >% \$& ' 9%& ! " 9" & () \$#G# (& #G= # " T F# " " _ #& 9" & !5 (<& : #59;#\$(9%5F #5' 89#G(Q \$) 5(%6) ; =7 ? A ? " I

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

=7 ? A ? " #& (& (& ;) % (#& : & (#G\$! : >9%1& " GQTU#6*=@ B+ #5' *=@?+I E<& %& " 9G ; % : (<& :) " (" &5" ! (V& : (<) ' ;) %&#< &G : &5(2" %&>) %& G&G_1 +) G(!) 5" (& (& GQ*=@? _ &#& #5#G& ' !5 #5 dH@ @!6&#& =G#5 7)) : I T5 dH@ @!6&#& " KKKKRDV & ; ! \$1&5 (;) %<& %& () V#6) ; >%#4& " ') _ 5 () / IO Y : I

? TF f // / - D / ? B9 f // / / gR , N# // / D / C / ? +& f // / - 1 / / ? I5 // / K - R0
" T6 f // / - 1 / - 1 CR1 ? NG f // / / gR , +! // / D0 / g / , I % // / 0g . 0
? T" f // / / gR / , 4 # / I - K - R0D ? N' f // / / gR ? + : f // / / gR
? T9 f // / / gR ? 4' f // / 1 - / / , N! // / - - / C ? +5 f // / / gR /
, h f // / C - / / ? 4 & f // / - 1 / / ? , " f // / R / / , + % // / / gD0/
, h# // / - CgDC ? X; f // / C . / / 5 @ f // / / gR ? E# f // / / gR
, h& f // / - 0 / / ? XF f // / g - / / ? @G // / / gD0 / ? EG f // / / gR
? h! f // / R - / / ? X) f // / / gR ? @ f // / / gR ? E& f // / 0 / / /
, =# // / . - 1 CR ? *5 f // / / K / ? @% f // / / gR ? E< f // / / gR
? = ' f // / - 1 / / ? *% f // / / gR ? @ f // / / gR , E! // / - - 1 C
? =& f // / C . / / , i // / D0 / g / ? 7G f // / - 1 / / ? E6 f // / / gR
, =) // / - K K ? H# f // / C K / ? 7& f // / / gR ? E : f // / / gR
, =% // / - 1 CRD , H // / / - 1 C ? 7< f // / / gR ? d f // / - 1 / /
? =" // / D0 / g ? H9 f // / / gR ? 79 f // / / gR ? J f // / D1 / /
, =9 // / 01gK , ? F // / gKOR ! + f // / / gR ? j f // / - C / /
? ^Q f // / D1 / / , ? 5 // / - gD0 ? +G f // / 1 C / ? k f // / / gR
? B% f // / / gR ? ?) f // / - C / / ? +\$ f // / C - / / ? kG f // / / gR

? O=<&\$ & GQ*=@? + , O=<&\$ & GQ*=@ B+ !O+&\$(%6*5(&#\$& 5 ON) (= <&\$ & e) % " O+) 6Q!) 5 + (#5' # % B6& &5

6.0 INTENDED USE

Oe) %<& \$#G#(!) 5) ; #5#Q!\$#6!5" (9 : &5(" #5' V#G #(!) 5) ; #5#Q!\$#6: & (<) " # " #>>%>#%#(&

@#F&C) ; 1

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

0+() % G&_ && #>>%U: #(&Q1m 0/ m = _ <|& !5 " &#&' E= E G#F1

Qj <|& " () %& !5 (<& " &#&' E= E G#F2(%5">!) 5); (<!" =7 ? A ? !" 5&F&F1G& T;(&%) >&5!5F (<& " &#&' E= E G#F (%5">!) 5); (<& =7 ? A ? _ !&) \$\$\$9%&" 9&15F !5 # F%# 9#6!5\$%&# & !5 (<& #5#&Q& \$) 5\$&5(%!) 5! P1 *(! (<& %&">) 5"!G&(Q); (<& 9" &%) (\$\$\$) 95(;) %<!" &;&\$(! j <&5 (<& G) ((&!" _ &|F<& G) (< G&); %& #5' #;(&%G&15F >#F&\$' !5 ") %F&2 (<& : #"" ' !; &%&5&) G' &%&' _ !&G& # : &#" 9%&); (%5">!) 5 : #"" 9"" 1

OT;(&%) >&5!5F (<& " &#&' E= E G#F2` &&> \$#> (!F<(& " &#&' _ <&5 5) (!5 9" & #5' ") % G&_ &&5 1m 01m = j : !5! !c& (<& &; &\$") ; (%5">!) 5! d"&#(C' m 1m = j : !5! !c& VY& : &(%\$' !&(!) 5 &%%)%_ <&5 9" !5F (<& %&>) %&' &5"!(Q ^) 5) (>|&(& ;%: (<& \$) 5(#!5&% ^) 5) (%&9% %& :) V&' #889) (" () \$) 5(#!5&%

Oe) %) %& !5;) %:#(!) 52W"!(www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - CgIKRn0 g T&XC, Rgn0
Chemical Compatibility -+) G& !5 X= QXN, 02Xe #5' XC+, 11 TVY! 5&9(%6: & !#1 +) G& !5 " (%5F& G# \$ N#, X ;) %: !5F (<& T&, XPILXC, FC- O' >&\$!&I +(#G& _ !(< :) " (: &(#& #5' !5) %!\$ #5! 5" I E<& >< " ><#(& ! " !5") G& !5 _ #(&%#5') 5& " &F<(& ") G& !5 # \$! I
Stability - CQ // >>G&V& " (#G& ;) %) 5(< " !5 - V XN, 0 AH^@B \$) 5(#!5&% - Q / 2 // >>: ") G(!) 5" \$<& : ! \$& " (#G& ;) %&#% !5 ODV XN, 0 AH^@B \$) 5(#!5&%
Al Containing Samples (Preparation and Solution) -? &(#6lh& (' ! " ") G&' !5 X= 6AXN, 0 P&OT&, 0 LN#C=, (; 9" !) 5 ! @ (Po

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences
*=@0+ C. #: 9	0/ >>(<	NAT	- C= - DN2- 0= - 1N2 - X- C= - 1N2 -- h- g, 2 D1= %Qn2 D1e&Qn
*=@OB+ - g. I/ . R5:	/ I- A I / K YFA H	-	e&
*=@OB+ 0K111/ - 5:	/ I/ DA I / g YFA H	-	d2 =&
*=@OB+ 0Kgl- DC5:	/ I/ OA I / g YFA H	-	?) 2 !%2 &

8.0 HAZARDOUS INFORMATION

O&# " & %& ;) (<& + # ; & Q^ # (# + <& & (;) %& ;) %:#(!) 5 %&F#% !5F (<!" =7 ? A ? !

9.0 HOMOGENEITY

OE<!" ") G(!) 5 _ # : !U' #\$\$\$) %!5F () #5 !5G) 9" &>%\$&' 9%& #5' !" F9#%5(&& () G&< :) F&5& 9" I X) :) F&5&!(Q' #(# !5' ! \$#(& (<#((<& &5' 9" &%<) 96 (#' &# : !5! : 9: "#: >&." !c&); / IC: H() #"" 9%& < :) F&5&!(Q

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

OM+7 = &%d(\$#(& N9: G&%M+7 Q/ 01

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

O= <& : ! \$#6E&" (!5F OT \$\$\$&' !(&' A TCHT = &%d(\$#(& N9: G&%RR0/ -

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

OT & %&5&\$? #(&%#6@)% 9\$&%OT \$\$\$&' !(&' A TCHT = &%d(\$#(& N9: G&%RR0/ C

! # %& !&) ! + # - . (00 (1 * 2 " 3 \$ 4 5 # 6 * (7 2 8 & % ! 8 , # 0) % & ; : < / . (= ? @ * 3 " A 2 " " B C 0 0 D D E < E @ : 0 9 C F 9 0 0 . (G % H F : 0 9 C F 9 0 1 : @ ! " # % ! & 6 ' ! + # - 9 " J @ K L & ! " # % ! & 6 ' ! + # - 9 " J

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

@#F&0 ; 1

11.1 Certification Issue Date

p#59%QC. 2C/ C-

OE<& \$%!(\$#!) 5 !" V#6 _!(<15 (< &: &#" 9%&: &5(95\$(Q">&\$;!&' >)%VW &' (<=&=7 ? A? ? !" " () %&' #5' <#5' &' !5 #\$\$) %5\$&_!(<15" (%\$(!) 5" FIV&5 !5 +&\$. 1-1 E<!" \$&%!(\$#!) 5 !" 59&: !&' !; !5" (%\$(!) 5" !5 +&\$. 1- #%&5) (;) &' %& ; (<=&=7 ? A? ? !" ' #: #F&' 2\$) 5(#: !5#(& 2) %& (<&%!" &:)' !; !&' !

11.2 Lot Expiration Date

QJanuary 27, 2025

OE<&' #(& #; (&%_ <1\$< (<" =7 ? A? ? "<) 96 5) (G& 9" &' !

OE<& 0 (&L!%!() 5 ' #(& %&: &\$(" (<& >&%&') ; (!: & (<#((<&" (#G0(Q); # =7 ? A? ? \$5 G&" 9>>) %&' GQ0 5F (&%: "(#G0(Q)" (9' !&" \$) 5' 9\$(&') 5 >%>&%Q" () %&' #5' <#5' &' =7 ? A? ? " ! H) (&L!%!() 5 !" 0: !(&' >% #%Q&Q (%5" >1%!() 5 L0 "") ; _#(&% %& (<&") 0(!) 5P#5' 15; %&89&5(Q&Q\$<&: !5#6" (#G0(Q

11.3 Period of Validity

O+ &#&' E= E h#F , >&5 ^ #(&Sqqqqqqqqqqqqqqqqqqqqqqqqqqqqqqq

OE<" =7 ? A? ? "<) 96 5) (G& 9" &' 0 5F&%<#5) 5& Q#%!) %!"U:) 5(<" 15 (<& \$#" &) ; # 0/ : HG ((0P ; %& (<&' #(&) ;) >&5!5F (<& #0: !5!c&' G#F) %#; (&% <#&' #(& FIV&5 !5 +&\$! -- 1C2_ <1\$<&V&%\$) : &" ; !%!(E<" !" \$) 5(15F&5(9>) 5 (<=&=7 ? A? ? G&15F " () %&' #5' <#5' &' !5 #\$\$) %5\$&_!((<&15" (%\$(!) 5" FIV&5 !5 +&\$! . 1-1

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

? !\$<#&6h) (< ^! %&\$() %2M9#0(Q=) 5(%6



Certifying Officer:

@#964 #!5&" = <#!%:#5 A+ &5!) %E&\$<5!\$#6^ !%&\$() %



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGAS10
 Lot Number: R2-AS691113
 Matrix: 2% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Arsenic
 Starting Material: As Pieces
 Starting Material Lot#: 2208
 Starting Material Purity: 99.9980%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9981 ± 55 µg/mL
Density: 1.028 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **9981 ± 55 µg/mL**
 ICP Assay NIST SRM 3103a Lot Number: 100818

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i) (X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$
 w_i = the weighting factors for each method calculated using the inverse square of the variance:
 $w_i = (1/u_{char i}^2) / (\sum(1/u_{char i}^2))$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2
 u_{char} = $[\sum(w_i)^2 (u_{char i})^2]^{1/2}$ where $u_{char i}$ are the errors from each characterization method
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with
 $u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2
 $u_{char a}$ = the errors from characterization
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag <	0.001578	M Eu <	0.000526	O Na	0.036136	M Se <	0.014204	O Zn <	0.003390
O Al	0.006694	M Fe	0.002633	O Nb <	0.011526	O Si	0.139479	M Zr <	0.003156
s As <		M Ga <	0.000526	M Nd <	0.000526	M Sm <	0.000526		
M Au <	0.000526	M Gd <	0.000526	O Ni <	0.005537	M Sn <	0.001052		
M B	0.017011	M Ge <	0.000526	M Os <	0.000526	M Sr <	0.000526		
M Ba <	0.000526	M Hf <	0.000526	O P <	0.056500	M Ta <	0.000526		
O Be <	0.001130	M Hg <	0.002104	M Pb <	0.000526	M Tb <	0.000526		
M Bi <	0.002104	M Ho <	0.000526	M Pd <	0.000526	M Te <	0.003682		
O Ca	0.005657	M In <	0.000526	M Pr <	0.002630	M Th <	0.000526		
M Cd <	0.000526	M Ir <	0.000526	M Pt <	0.000526	O Ti <	0.001017		
M Ce <	0.000526	O K	0.003865	M Rb <	0.002104	M Tl <	0.000526		
M Co <	0.003156	M La <	0.000526	M Re <	0.000526	M Tm <	0.000526		
M Cr	0.000877	M Li <	0.000526	M Rh <	0.000526	M U <	0.000526		
M Cs <	0.002104	M Lu <	0.000526	M Ru <	0.000526	M V <	0.001578		
M Cu <	0.003156	O Mg	0.000235	O S <	0.056500	M W <	0.000526		
M Dy <	0.000526	M Mn <	0.001052	M Sb <	0.000526	M Y <	0.000526		
M Er <	0.000526	M Mo <	0.000526	M Sc <	0.002104	M Yb <	0.000526		

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 74.92 ; mix of +3 and +5 ; 6 ; H3AsO4 and HAsO2

Chemical Compatibility - Arsenic has no cationic chemistry. It is soluble in HCl, HNO3, H3PO4, H2SO4 and HF aqueous matrices water and NH4OH. It is stable with most inorganic anions (forms arsenate when boiled with chromate) but many cationic metals form the insoluble arsenates under pH neutral conditions. When fluorinated and / or under acidic conditions arsenate formation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO3 / LDPE container.

As Containing Samples (Preparation and Solution) - Metal (soluble in 1:1 H2O / HNO3); Oxides (the oxide exists in crystalline and amorphous forms where the amorphous form is more water soluble. The oxides typically dissolve in dilute acidic solutions when boiled); Minerals (one gram of powdered sample is fused in a Ni crucible with 10 grams of a 1:1 mix of K2CO3 and KNO3 and the melt extracted with hot water); Organic Matrices (0.2 to 0.5 grams of sample are fused with 15 grams of a 1:1 Na2CO3 / Na2O2 mix in a Ni crucible. The fuseate is extracted with water and acidified with HNO3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 75 amu	20 ppt	N/A	40Ar35Cl, 59Co16O, 36Ar38Ar1H,8Ar37C I,Ar39K, 150Nd2+,150Sm2+
ICP-OES 189.042 nm	0.05/0.005 µg/mL	1	Cr
ICP-OES 193.696 nm	0.1/0.01 µg/mL	1	V, Ge
ICP-OES 228.812 nm	0.1/0.01 µg/mL	1	Cd, Pt, Ir, Co

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 25, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **March 25, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGBA10
Lot Number: P2-BA682107
Matrix: 2% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Barium
Starting Material: Ba(NO₃)₂
Starting Material Lot#: Mixed Lots
Starting Material Purity: 99.9995%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10072 ± 32 µg/mL
Density: 1.024 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **10054 ± 80 µg/mL**
ICP Assay NIST SRM 3104a Lot Number: 140909

Assay Method #2 **10075 ± 30 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char i}^2))]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.001538	O Eu < 0.028728	O Na < 0.006767	M Se < 0.007964	O Zn < 0.004335
M Al < 0.005194	M Fe < 0.016554	M Nb < 0.000200	O Si < 0.020780	M Zr < 0.000271
M As < 0.000519	M Ga < 0.000200	M Nd < 0.000200	M Sm < 0.082480	
M Au < 0.003452	M Gd < 0.000200	M Ni < 0.001290	M Sn < 0.000200	
M B < 0.002519	M Ge < 0.000430	M Os < 0.000752	O Sr < 0.027070	
s Ba <	M Hf < 0.002746	O P < 0.044677	M Ta < 0.001008	
M Be < 0.000430	M Hg < 0.001063	M Pb < 0.002257	M Tb < 0.000200	
M Bi < 0.002971	M Ho < 0.000200	M Pd < 0.000286	M Te < 0.001470	
O Ca < 0.026224	M In < 0.000200	M Pr < 0.000200	M Th < 0.000200	
M Cd < 0.000200	M Ir < 0.000446	M Pt < 0.000200	M Ti < 0.000324	
M Ce < 0.004362	O K < 0.011526	M Rb < 0.001487	M Tl < 0.000200	
M Co < 0.000200	O La < 0.091587	M Re < 0.000200	M Tm < 0.000954	
M Cr < 0.002191	O Li < 0.002181	M Rh < 0.000200	M U < 0.000200	
M Cs < 0.001640	M Lu < 0.002934	M Ru < 0.000200	M V < 0.000229	
M Cu < 0.003646	O Mg < 0.002379	O S < 0.073041	M W < 0.001627	
M Dy < 0.000200	M Mn < 0.000902	M Sb < 0.000514	O Y < 0.019637	
M Er < 0.000556	M Mo < 0.000455	M Sc < 0.000478	M Yb < 0.001991	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 137.33 +2 6 Ba(H₂O)₆+2

Chemical Compatibility - Soluble in HCl, and HNO₃. Avoid H₂SO₄, HF and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate, iodate, molybdate, sulfite and tungstate in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1 -10,000 ppm solutions chemically stable for years in 1-3.5% HNO₃ / LDPE container.

Ba Containing Samples (Preparation and Solution) -Metal(is best dissolved in diluted HNO₃); Ores(Carbonate fusion in Pt0 followed by HCl dissolution. If sulfate is present dissolve the fuseate using HCl / tartaric acid to prevent BaSO₄ precipitate); Organic Matrices (dry ash and dissolve in dilute HCl.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 138 amu	1 ppt	N/A	122Sn16O, 122Te16O
ICP-OES 230.424 nm	0.004/0.0005 µg/mL	1	Mo, Ir, Co
ICP-OES 233.527 nm	0.004/0.0003 µg/mL	1	
ICP-OES 455.403 nm	0.002/0.0001 µg/mL	1	Zr, U

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 13, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **September 13, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is a ISO 17025:2017 certified laboratory. We are a member of the International Laboratory Accreditation Cooperation (ILAC) and the United States of America (USA) National Association of Testing Authorities (NATA). We are also a member of the International Union of Pure and Applied Chemistry (IUPAC) and the International Union of Pure and Applied Physics (IUPAP). We are a member of the International Union of Pure and Applied Mathematics (IUPM) and the International Union of Pure and Applied Chemistry (IUPAC). We are a member of the International Union of Pure and Applied Physics (IUPAP) and the International Union of Pure and Applied Mathematics (IUPM).



2.0 PRODUCT DESCRIPTION

Product Name: 15F T5#6 Q&=9"(): 4 %' &+) 9(!) 5
 =#(#0 F N9: G&% =4 UB-/
 H)(N9: G&% @COUB. RRVD
 ? #(%#S VX LYAPZN, 0
 J#0& AT5#6 Q&L" PS - / / / / [FA H&#S
 U&%G&9:
 +(#%15F ? #(%%#6S U&%G&9: ' !#\$&#(&
 +(#%15F ? #(%%#6H) (\ S CCC-
 +(#%15F ? #(%%#6@%CS KKIKKKRX

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: - / / 0V] 0D[FA H
Density: - 1- 1/ FA HL: &#"9%' # (C /] 1 ^=P

Assay Information:

Assay Method #1	10051 ± 42 µg/mL *=@T""#QN*+E +7? 0- / D# H) (N9: G&%/ K/ D- 1
Assay Method #2	10008 ± 59 µg/mL =#G96#& N*+E +7? H) (N9: G&%+ && +&\$! 11C

OE<&=#G96#(& J#0&! " # Y#0& \$#G96#(& ;%): (<& _&F<()); # "(#%15F : #(%%#6<#(<#" G&&5 \$&%1!& ' !%&\$@Y" I # N#!) 5#6*5" (!9(&); +(#5' #'%" #5' E&\$<5) 0 FQLN*+EP+7? A? I +&& +&\$ 11C;) %G#0#5\$& (%\$&#G0(Q

E<& ;) 66] 15F &89#(!) 5" #'& 9" & !5 (<& \$#G96#!) 5); (<& \$&&1!& Y#6& #5' (<& 95\$&%#!5(Q 7 &>) %& 95\$&%#!5(!& %&>%& &5(& V#5' & 95\$&%#!5(!& &V#&"& & # (#>>%V# #(&Q(<& KDX \$) 5;! &5\$& 6&&69" !5F # \$) Y&%F& ;#\$() %& ; ` a Q

@#F&-); 1

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$
 w_i = the weighting factors for each method calculated using the inverse square of the variance:
 $w_i = (1/u_{char i}^2) / (\sum(1/u_{char i}^2))$

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2
 $u_{char} = [\sum(w_i^2 (u_{char i}^2))]^{1/2}$ where $u_{char i}$ are the errors from each characterization method
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with
 $u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2
 $u_{char a}$ = the errors from characterization
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

OE<!" >% ' 9\$(!" (%\$&#G& () N*+E Y# #5 95G` &5 \$<#15) ; \$) : >#%") 5" I E<& 95\$(!& ;) %&#< \$!& Y#9& #%& %& >) %& 2 # 15F !5() #\$\$) 95((<& +7 ? A ? 95\$(Q&%)%#5' (<& : &#" 9%& &5(2_&F<15F #5' Y) @: &' !@(!) 5 &%)%& *5 %%& \$#" &' _<&#& 5) N*+E +7 ? A ? #%& #Y#1@G&2 (<& (&: 15G) 9" &' (!b" ">&\$!;!&'

4.1 Thermometer Calibration

OT6(<&%) : &(&% #%& N*+E (%\$&#G& (<%9F< (<&%) : &(&% (<#(#%& \$#0G#(&' GQ#5 #\$\$\$& !(&' \$#0G#(!) 5 (#G) %%) %Q

4.2 Balance Calibration

OT6#5#Q!\$#6G#6#5\$&" #%& \$#0G#(&' GQ#5 #\$\$\$& !(&' \$#0G#(!) 5 (#G) %%) %Q#5' >%\$& 9%& E<&_&F<(" 9" &' ;) %& (!5F #%& #559#6Q\$) : >%& () : #" (&%_&F<(" #5' #%& (%\$&#G& () N*+E

4.3 Glassware Calibration

OT5 !5G) 9" & >%\$& 9%& !" 9" &' () \$#0G#(=#" " T F##" "_#%& 9" &' !5 (<& : #59;#\$(9%5F #5' 89#0(Q \$) 5(%6) ; =7 ? A ? " !

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

=7 ? A ? " #%& (&' &' ;) % (#& : &(#6\$!: >9%1&" GQTV#6*=@ B+ #5' *=@?+I E<& &' 96 ; (%& :) (" &5" !(Y& : (<) ' ;) %&#< &6: &5(2" %& >) %& G&6_1 +) @(!) 5" (&' (&' GQ*=@?+ _&#& #5#Q&' !5 #5 dH@ @!6&#& =6#5 7)) : ! T5 dH@ @!6&#& KKKKRDx & ; ! \$1&5 (;) %& (& :) Y#6) ; >%\$&#&' ') _5 () / 10 [: !

? TF	// 1D1-1 ?	B9 f	// // OD1 ,	N#	// - D' /K ?	+& f	// - DDD ,	k5	// / 1/ DK
, T6	// / R' DR ,	e&	// -- . 1K ?	NG f	// // OD1 ,	+!	// V0. K0 ,	k% f	// / . /V1
? T" f	// / V1.0 ?	4 # f	// // OD1 ?	N' f	// // OD1 ?	+:	f	// // OD1	
? T9 f	// // C1R ?	4' f	// // OD1 ?	N! f	// / C' 01 ?	+5 f	// / OD1C		
, U f	// / C- W- ?	4 & f	// // D' R ?	, " f	// // C1R ?	+% f	// // OD1		
? U#	// / - . V/ ?	Z; f	// // OD1 ,	@ f	// VV/ D' / ?	E# f	// // OD1		
" U& f	? ?	ZF f	// / - C11 ?	@G f	// / - C- ?	EG f	// // OD1		
? U! f	// // OD1 ?	Z) f	// // OD1 ?	@ f	// // OD1 ?	E& f	// / - . R		
, =#	// - DDD ?	*5 f	// // OD1 ?	@% f	// // OD1 ?	E< f	// // OD1		
? =' f	// // OD1 ?	*% f	// // C1R ?	@ f	// // OD1 ,	E! f	// / CCV		
? =& f	// // OD1 ,	h	// 0- - C ?	7G f	// // D' R ?	E6 f	// // OD1		
? =) f	// / 1/ VR ?	H# f	// // OD1 ?	7& f	// // OD1 ?	E:	// // OD1		
? =% f	// / - DDD ,	H f	// // VV ?	7< f	// // OD1 ?	d f	// // OD1		
? ="	// / - V1C ?	H9 f	// // OD1 ?	79 f	// // C1R ?	J f	// // D' R		
? =9 f	// / D' RD ,	? F	// / - K/ . !	+ f	? ?	i f	// / 1/ VR		
? gQ f	// // OD1 ,	? 5 f	// / - 000 ?	+G f	// // OD1 ?	j f	// // OD1		
? B% f	// // OD1 ?	?) f	// // . VC ,	+ \$ f	// / - 000 ?	j G f	// // OD1		

$$? O = < & $ ' & GQ* = @ + , O = < & $ ' & GQ* = @ B+ ! O + & $ (% 6 * 5 (& % & % 5 $ & & 5 ON) (= < & $ ' & e) % " O +) 6 Q !) 5 + (# 5' # % B 6 & & 5 ($$

6.0 INTENDED USE

Oe) % < & \$ #0G#(!) 5) ; #5#Q!\$#6!5" (% &5(" #5' Y#6 #(!) 5) ; #5#Q!\$#6: & (<' " # " # > > % > % # (&)

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

Open in a safe place, away from heat, light, and moisture. Do not use if the seal is broken.

Store in a cool, dry place. Do not use if the seal is broken. The material is stable under normal conditions. It is not flammable, non-toxic, and non-corrosive. It is not an oxidizing or reducing agent. It is not a strong acid or base. It is not a strong oxidant or reductant. It is not a strong irritant. It is not a strong sensitizer. It is not a strong carcinogen. It is not a strong mutagen. It is not a strong teratogen. It is not a strong reproductive toxicant. It is not a strong developmental toxicant. It is not a strong immunotoxicant. It is not a strong neurotoxicant. It is not a strong hepatotoxicant. It is not a strong nephrotoxicant. It is not a strong cardiotoxicant. It is not a strong hematotoxicant. It is not a strong immunosuppressant. It is not a strong immunostimulant. It is not a strong immunomodulator. It is not a strong immunoinhibitor. It is not a strong immunoenhancer. It is not a strong immunosuppressant. It is not a strong immunostimulant. It is not a strong immunomodulator. It is not a strong immunoinhibitor. It is not a strong immunoenhancer.

Do not use if the seal is broken. The material is stable under normal conditions. It is not flammable, non-toxic, and non-corrosive. It is not an oxidizing or reducing agent. It is not a strong acid or base. It is not a strong oxidant or reductant. It is not a strong irritant. It is not a strong sensitizer. It is not a strong carcinogen. It is not a strong mutagen. It is not a strong teratogen. It is not a strong reproductive toxicant. It is not a strong developmental toxicant. It is not a strong immunotoxicant. It is not a strong neurotoxicant. It is not a strong hepatotoxicant. It is not a strong nephrotoxicant. It is not a strong cardiotoxicant. It is not a strong hematotoxicant. It is not a strong immunosuppressant. It is not a strong immunostimulant. It is not a strong immunomodulator. It is not a strong immunoinhibitor. It is not a strong immunoenhancer.

For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - KI - mC1 U&LZC, PmC

Chemical Compatibility - +) @G& 15 Z= @Zn, 02 Zc+, 1 #5' Ze #89& 9" : #(%\$&' I +(#G&_ !(< #6: #5' 15) %5#5\$ #5!) 5" 1

Stability - CQ // >> G&Y&6 " (#G& ;) %) 5(<" 15 - X ZN, 0 AHg@B\$) 5(#15&% - G / 2 // >>: ") @(!) 5" \$<&: !\$#6Q" (#G& ;) %C#% 15 DQ / X ZN, 0 AHg@B\$) 5(#15&%

Be Containing Samples (Preparation and Solution) - ? &# 6!" G& (" !") @&' 15' 1G(&' ZC+, 1 PrU&, LG) 165F 5!(%\$2<Q %\$<@ %\$2) % 969%\$ #5! ") % hZ+, 1 ;9"! 5Pn %&' LZC+, 1 Ae ' !F&" (!) 5) %\$#%6 5#(;9"! 5 !5 @ (Pn , %5#5!\$? #(%\$&' L" 969%\$A&%V &' !F&" (!) 5) %5!(%\$A 969%\$A&%\$<@ %\$ #5! ' &\$) : >)" (!) 52) % Q#" < #5' ' !") @(!) 5 #5\$) %!5F () (<& U&, >%\$&' 9% #G) Y&P!

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences
*=@0+ K#: 9	1 >>(<	NAT	
*=@0B+ 0011RV- 5:	// // 0A // // - V [FA H	-	e&2E#2?)
*=@0B+ 0- 0I/ 1C5:	// // 0A // // K [FA H	-	J2 = &2 d
*=@0B+ 0- 0I- / . 5:	// // . A // // D [FA H	-	= &2E<2E:

8.0 HAZARDOUS INFORMATION

Open in a safe place, away from heat, light, and moisture. Do not use if the seal is broken.

9.0 HOMOGENEITY

Open in a safe place, away from heat, light, and moisture. Do not use if the seal is broken. The material is stable under normal conditions. It is not flammable, non-toxic, and non-corrosive. It is not an oxidizing or reducing agent. It is not a strong acid or base. It is not a strong oxidant or reductant. It is not a strong irritant. It is not a strong sensitizer. It is not a strong carcinogen. It is not a strong mutagen. It is not a strong teratogen. It is not a strong reproductive toxicant. It is not a strong developmental toxicant. It is not a strong immunotoxicant. It is not a strong neurotoxicant. It is not a strong hepatotoxicant. It is not a strong nephrotoxicant. It is not a strong cardiotoxicant. It is not a strong hematotoxicant. It is not a strong immunosuppressant. It is not a strong immunostimulant. It is not a strong immunomodulator. It is not a strong immunoinhibitor. It is not a strong immunoenhancer.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

OM+7 = &%4!\$#(& N9: G&%M+7 G / 01

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

O= <&: !\$#6E&" (!5F OT\$5\$&' !(&' A TCHT = &%4!\$#(& N9: G&%RR0// -

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

OT &:&%5\$5\$? #(&%#6@% 9\$&%OT\$5\$&' !(&' A TCHT = &%4!\$#(& N9: G&%RR0// C

!" #5%1&0" ! + # - / 00 (1" * 2! 3" 4 5 #6" (7 2#& %/ 8. #6.) %Q; 0< / :=? @ " 3" A 2!" B C 0 0 D D 0 < E @; 0 F C F 9 0 / 0 . (G % H F 0 F C F 9 0: @ " # % 1 & 6" ! + # - 9 " J @ K L & " # % 1 & 6" ! + # - 9 " J

11.0 CERTIFICATION, LOT EXPIRATION, PERIOD OF VALIDITY AND REVISION HISTORY

@F&0 ; 1

11.1 Certification Issue Date

T>%6CC2C/ - K

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11.2 Lot Expiration Date

April 22, 2023

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11.3 Period of Validity

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11.4 Revision Status

O7 &Y!" !) 5 - O7 &Y!" &') 5 E<9%# Qp#5 - 12C C- GQ9(%&) 5F1 7 &Y!" !) 5 _#" : # & ;) %& ;) @ _!5F %&#") 5S ?) ' !;!&' +&\$(!) 5 . =<& ! \$6e) %: !5 +) @(!) 5!

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

? ! \$<#&6U)) (< g! %&\$() %2M9#@Q=) 5(%6



Certifying Officer:

@#964 #!5&" =<#1%:#5 A+ &5!) %E&\$<5!\$#6g !%&\$() %



@#F&1) ; 1

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGCA10
 Lot Number: R2-CA697921
 Matrix: 2% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Calcium
 Starting Material: Calcium Oxide
 Starting Material Lot#: P2-CA677788
 Starting Material Purity: 99.9995%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9985 ± 30 µg/mL
Density: 1.039 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	9976 ± 43 µg/mL ICP Assay NIST SRM 3109a Lot Number: 130213
Assay Method #2	9965 ± 25 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #3	10008 ± 26 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/WM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char i})^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an UPLA-Filtered Clean Room. An UPLA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.002500	M Eu < 0.001300	M Na < 0.008214	O Se < 0.022000	O Zn < 0.001158
O Al < 0.030000	O Fe < 0.002316	M Nb < 0.001300	O Si < 0.022000	M Zr < 0.006200
O As < 0.025000	M Ga < 0.002500	M Nd < 0.001300	M Sm < 0.001300	
M Au < 0.013000	M Gd < 0.001300	O Ni < 0.005300	O Sn < 0.013000	
O B < 0.006900	O Ge < 0.018000	M Os < 0.002500	M Sr < 0.115847	
M Ba < 0.000905	M Hf < 0.002500	O P < 0.027000	M Ta < 0.008600	
O Be < 0.000270	M Hg < 0.001300	M Pb < 0.001685	M Tb < 0.001300	
M Bi < 0.002500	M Ho < 0.001300	M Pd < 0.006200	O Te < 0.045000	
s Ca < 0.002500	M In < 0.001300	M Pr < 0.001300	M Th < 0.001300	
O Cd < 0.000540	M Ir < 0.001300	M Pt < 0.001300	O Ti < 0.004200	
M Ce < 0.001300	O K < 0.015797	M Rb < 0.014000	M Tl < 0.001300	
O Co < 0.000558	M La < 0.001300	M Re < 0.001300	M Tm < 0.001300	
O Cr < 0.006000	O Li < 0.006900	M Rh < 0.002500	M U < 0.001300	
M Cs < 0.001300	M Lu < 0.001300	M Ru < 0.003800	O V < 0.002200	
M Cu < 0.002500	O Mg < 0.002843	n S < 0.007400	M W < 0.012000	
M Dy < 0.001300	O Mn < 0.000115	M Sb < 0.007400	M Y < 0.001300	
M Er < 0.001300	M Mo < 0.002527	O Sc < 0.006100	M Yb < 0.001300	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 40.08 +2 6 Ca(H₂O)₆+2

Chemical Compatibility - Soluble in HCl and HNO₃. Avoid H₂SO₄, HF, H₃PO₄ and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate, and tungstate in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO₃ / LDPE container.

Ca Containing Samples (Preparation and Solution) -Metal (best dissolved in diluted HNO₃); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (dry ash and dissolution in dilute HCl. Do not heat when dissolving to avoid precipitation of SiO₂). The oxide, hydroxide, carbonate, phosphate, and fluoride of calcium are soluble in % levels of HCl or HNO₃. The sulfates (gypsum, anhydrite, etc.), certain silicates, and complex compounds require fusion with Na₂CO₃ followed by HCl / water dissolution. Note that contamination is a very real problem when analyzing for trace levels.

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 44 amu	1200 ppt	n/a	16O212C, 28Si16O, 88Sr
ICP-OES 393.366 nm	0.0002 / 0.00004 µg/mL	1	U, Ce
ICP-OES 396.847 nm	0.0005 / 0.00006 µg/mL	1	Th
ICP-OES 422.673 nm	0.01 / 0.001 µg/mL	1	Ge

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 09, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **November 09, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGCD10
Lot Number: P2-CD685077
Matrix: 3% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Cadmium
Starting Material: Cd Shot
Starting Material Lot#: 1954
Starting Material Purity: 99.9996%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9954 ± 30 µg/mL
Density: 1.029 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **9956 ± 54 µg/mL**
ICP Assay NIST SRM 3108 Lot Number: 130116

Assay Method #2 **9953 ± 32 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char i})^2]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Ag < 0.006348	M Eu < 0.010622	O Na < 0.004020	M Se < 0.008116	O Zn < 0.002152
O Al < 0.011566	M Fe < 0.003011	M Nb < 0.000405	O Si < 0.005480	M Zr < 0.000405
M As < 0.001623	M Ga < 0.000405	M Nd < 0.000405	M Sm < 0.000405	
M Au < 0.000405	M Gd < 0.000405	M Ni < 0.002840	M Sn < 0.001217	
M B < 0.004463	M Ge < 0.000405	M Os < 0.000405	M Sr < 0.000405	
O Ba < 0.000968	M Hf < 0.000405	O P < 0.045730	M Ta < 0.000405	
M Be < 0.000405	O Hg < 0.002152	M Pb < 0.002434	M Tb < 0.000405	
M Bi < 0.000405	M Ho < 0.000405	M Pd < 0.000405	M Te < 0.016636	
O Ca < 0.002946	O In < 0.021520	M Pr < 0.000405	M Th < 0.000405	
s Cd < 0.000405	M Ir < 0.000405	M Pt < 0.000405	M Ti < 0.001217	
M Ce < 0.000405	O K < 0.008179	M Rb < 0.000405	M Tl < 0.004495	
M Co < 0.000405	M La < 0.000405	M Re < 0.000405	M Tm < 0.000405	
M Cr < 0.002907	M Li < 0.000405	M Rh < 0.000405	M U < 0.000405	
M Cs < 0.002374	M Lu < 0.000405	M Ru < 0.000405	M V < 0.003179	
M Cu < 0.002434	O Mg < 0.000137	O S < 0.037660	M W < 0.000405	
M Dy < 0.000405	M Mn < 0.001623	M Sb < 0.004057	M Y < 0.000405	
M Er < 0.000405	M Mo < 0.000811	M Sc < 0.001623	M Yb < 0.000811	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 112.41 +2 4 Cd₂(OH)(aq)₃+ and Cd(OH)(aq)

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, and HF. Avoid basic media forming insoluble carbonate and hydroxide.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO₃ / LDPE container.

Cd Containing Samples (Preparation and Solution) -Metal (soluble in HNO₃); Oxides (soluble in HCl or HNO₃); Ores (dissolve in HCl /HNO₃ then take to fumes with H₂SO₄. The silica and lead sulfate are filtered off after the addition of water); Organic based (dry ash at 450°C and dissolve ash in HCl), (sulfuric / peroxide acid digestion).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 111 amu	11 ppt	n/a	95Mo16O
ICP-OES 214.438 nm	0.003 / 0.0003 µg/mL	1	Pt, Ir
ICP-OES 226.502 nm	0.003 / 0.0003 µg/mL	1	Ir
ICP-OES 228.802 nm	0.003 / 0.0003 µg/mL	1	Co, Ir, As, Pt

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 08, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- November 08, 2023

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGCO10
Lot Number: N2-CO671028
Matrix: 3% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Cobalt
Starting Material: COBALT
Starting Material Lot#: 1749
Starting Material Purity: 99.9978%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9988 ± 34 µg/mL
Density: 1.057 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	9973 ± 32 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #2	10024 ± 50 µg/mL ICP Assay NIST SRM traceable to 3113 Lot Number: M2-CO661665

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Ag	0.022956	M	Eu <	0.000422	O Na	0.008125	M	Se <	0.009290	M	Zn	0.007197	
O Al	0.013621	O	Fe	0.048700	M	Nb <	0.000422	O	Si	0.017539	M	Zr <	0.014357
i As <		M	Ga <	0.000844	M	Nd <	0.017735	M	Sm <	0.001689			
M Au <	0.000583	M	Gd	0.003247	O	Ni <	0.043642	M	Sn <	0.005067			
M B <	0.013512	M	Ge <	0.004645	M	Os <	0.000583	O	Sr	0.000841			
O Ba	0.071210	M	Hf <	0.000422	n	P <		M	Ta <	0.000422			
O Be <	0.001771	M	Hg <	0.002334	M	Pb	0.010094	M	Tb <	0.001689			
M Bi	0.000614	M	Ho <	0.000422	M	Pd <	0.000422	M	Te <	0.008445			
O Ca	0.025034	M	In <	0.003378	M	Pr <	0.006756	M	Th <	0.000422			
M Cd <	0.000844	M	Ir <	0.000583	M	Pt <	0.000422	M	Ti <	0.002533			
M Ce	0.002721	O	K	0.005785	M	Rb <	0.001689	M	Tl <	0.000422			
s Co <		M	La	0.000877	M	Re	0.016853	M	Tm <	0.000422			
M Cr <	0.020269	O	Li	0.000262	M	Rh <	0.000422	M	U <	0.000422			
M Cs	0.000877	M	Lu <	0.000422	M	Ru <	0.000583	M	V <	0.001689			
M Cu	0.007197	O	Mg	0.003444	n	S <		M	W <	0.000844			
M Dy <	0.000422	O	Mn <	0.006072	M	Sb <	0.005911	M	Y	0.001228			
M Er <	0.000422	M	Mo <	0.005911	M	Sc <	0.001689	M	Yb <	0.003378			

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.93 +2 6 Co(H₂O)₆²⁺

Chemical Compatibility - Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Co Containing Samples (Preparation and Solution) - Metal (soluble in HNO₃); Oxides (Soluble in HCl); Ores (dissolve in HCl / HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 59 amu	2 ppt	n/a	42Ca16O1H , 40Ar18O1H , 36Ar23Na, 43Ca16O, 24Mg35Cl
ICP-OES 228.616 nm	0.01/0.001 µg/mL	1	
ICP-OES 237.862 nm	0.01/0.002 µg/mL	1	W, Re, Al, Ta
ICP-OES 238.892 nm	0.01/0.002 µg/mL	1	Fe, W, Ta

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 15, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- January 15, 2023

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Supervisor, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGCR(3)10
Lot Number: R2-CR691013
Matrix: 10% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Chromium
Starting Material: Cr METAL
Starting Material Lot#: 2077
Starting Material Purity: 99.9942%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10044 ± 40 µg/mL
Density: 1.082 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **10057 ± 58 µg/mL**
ICP Assay NIST SRM 3112a Lot Number: 170630

Assay Method #2 **10035 ± 50 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/(u_{char j}^2)))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char i}^2))]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an UPLA-Filtered Clean Room. An UPLA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.000540	M Eu < 0.003200	O Na < 0.130091	M Se < 0.012000	O Zn < 0.002700
O Al < 0.016634	O Fe < 0.202602	M Nb < 0.022000	n Si <	M Zr < 0.020000
M As < 0.003838	O Ga < 0.031000	M Nd < 0.000540	M Sm < 0.035000	
M Au < 0.000540	M Gd < 0.000540	O Ni < 0.009170	M Sn < 0.004051	
M B < 0.049000	M Ge < 0.005400	M Os < 0.088000	O Sr < 0.000250	
O Ba < 0.002000	M Hf < 0.000540	i P <	M Ta < 0.000540	
O Be < 0.000250	M Hg < 0.001600	M Pb < 0.002559	M Tb < 0.000540	
M Bi < 0.008956	M Ho < 0.000540	M Pd < 0.001100	M Te < 0.004800	
O Ca < 0.074642	M In < 0.001100	M Pr < 0.000540	M Th < 0.000540	
M Cd < 0.000540	M Ir < 0.000540	M Pt < 0.000540	O Ti < 0.013435	
M Ce < 0.000540	O K < 0.034122	i Rb <	M Tl < 0.001100	
O Co < 0.002900	M La < 0.001100	M Re < 0.002700	O Tm < 0.001800	
s Cr <	O Li < 0.000130	M Rh < 0.032000	M U < 0.001100	
M Cs < 0.019000	M Lu < 0.000540	M Ru < 0.094000	O V < 0.159949	
O Cu < 0.010023	O Mg < 0.001450	i S <	M W < 0.028000	
M Dy < 0.000540	O Mn < 0.014000	M Sb < 0.008600	M Y < 0.001100	
M Er < 0.016000	O Mo < 0.013000	O Sc < 0.001400	M Yb < 0.000540	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 52.00 +3 6 Cr(H₂O)₆³⁺

Chemical Compatibility - Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Cr₃ Containing Samples (Preparation and Solution) - Metal (soluble in HCl); Oxides/Ores (Chromite ore/oxides are very difficult to dissolve. The following procedures [A-D] are commonly used: A. Fusion with KHSO₄ and extraction with hot KCl. The residue fused with Na₂CO₃ and KClO₃, 3:1. B. Fusion with NaKSO₄ and NaF 2:1, C. Fusion with magnesia or lime and sodium or potassium carbonates, 4:1. D. Fusion with Na₂O₂ or NaOH and KNO₃ or NaOH and Na₂O₂. Nickel, iron, copper, or silver crucibles should be used for D. Platinum may be used for A, B, C); Organic Matrices (ash at 450°C followed by one of the fusion methods above or sulfuric/hydrogen peroxide acid digestions may be applicable to non oxide containing samples).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 52 amu	40 ppt	N/A	36S ¹⁶ O, 36Ar ¹⁶ O - The 50Cr, 53Cr, 54Cr lines suffer from many more potential interferences from sulfur, chlorine and argon compounds of oxygen, nitrogen and carbon.
ICP-OES 205.552 nm	0.006/0.0008 µg/mL	1	Os
ICP-OES 276.654 nm	0.01/0.001 µg/mL	1	Cu, Ta, V
ICP-OES 284.325 nm	0.008/0.0007 µg/mL	1	

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 25, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **March 25, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGCU10
 Lot Number: R2-CU693370
 Matrix: 3% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Copper
 Starting Material: Cu Metal
 Starting Material Lot#: 2095
 Starting Material Purity: 99.9996%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10016 ± 30 µg/mL
Density: 1.033 g/mL (measured at 20 ± 4 °C)

Assay Information:

- Assay Method #1** **10010 ± 55 µg/mL**
 ICP Assay NIST SRM 3114 Lot Number: 121207

- Assay Method #2** **10017 ± 26 µg/mL**
 EDTA NIST SRM 928 Lot Number: 928

- Assay Method #3** **10015 ± 25 µg/mL**
 Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char i}^2))]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an UPLA-Filtered Clean Room. An UPLA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.007542	M Eu < 0.000942	O Na < 0.001434	M Se < 0.016971	M Zn < 0.005657
O Al < 0.000609	O Fe < 0.008698	M Nb < 0.000942	O Si < 0.003052	M Zr < 0.000942
M As < 0.010371	M Ga < 0.000942	M Nd < 0.000942	M Sm < 0.000942	
M Au < 0.001885	M Gd < 0.000942	M Ni < 0.003780	M Sn < 0.005657	
O B < 0.003662	M Ge < 0.005657	M Os < 0.000942	M Sr < 0.000942	
M Ba < 0.004252	M Hf < 0.000942	O P < 0.031668	M Ta < 0.000942	
M Be < 0.000942	O Hg < 0.007064	M Pb < 0.005788	M Tb < 0.000942	
M Bi < 0.000942	M Ho < 0.000942	M Pd < 0.000942	M Te < 0.004714	
O Ca < 0.002304	M In < 0.000942	M Pr < 0.000942	M Th < 0.000942	
M Cd < 0.000942	M Ir < 0.000942	M Pt < 0.000942	O Ti < 0.002801	
M Ce < 0.000942	O K < 0.000762	M Rb < 0.000942	M Tl < 0.000942	
M Co < 0.001890	M La < 0.000942	M Re < 0.000942	M Tm < 0.000942	
M Cr < 0.005657	O Li < 0.000243	i Rh <	M U < 0.000942	
M Cs < 0.000942	M Lu < 0.000942	M Ru < 0.039588	M V < 0.003771	
s Cu <	O Mg < 0.000320	O S < 0.007172	M W < 0.005657	
M Dy < 0.000942	O Mn < 0.000793	M Sb < 0.001885	M Y < 0.000942	
M Er < 0.000942	M Mo < 0.005657	M Sc < 0.000942	M Yb < 0.000942	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 63.55 +2 6 Cu(H₂O)₆²⁺

Chemical Compatibility - Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Cu Containing Samples (Preparation and Solution) - Metal (soluble in HNO₃); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 63 amu	10 ppt	n/a	40Ar23Na 47Ti16O, 14N12C37Cl, 16O12C35Cl, 23Na40Ca
ICP-OES 219.958 nm	0.01/0.02 µg/mL	1	Th, Ta, Nb, U, Hf
ICP-OES 224.700 nm	0.01/0.01 µg/mL	1	Pb, Ir, Ni, W
ICP-OES 324.754 nm	0.06/0.01 µg/mL		Nb, U, Th, Mo, Hf

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 05, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **June 05, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



4.1 Thermometer Calibration

OT 6 (< & %): & (& % # % N* + E (% \$ & # G & (< %) 9 F (< & %): & (& % (< # (% & \$ # 0 G # (& G Q # 5 # \$ \$ % ! (& \$ # 0 G # (!) 5 # G) % #) % Q

4.2 Balance Calibration

OT 6 # 5 # 0 ! \$ # 6 G # 6 # 5 \$ & # % \$ # 0 G # (& G Q # 5 # \$ \$ % ! (& \$ # 0 G # (!) 5 # G) % #) % Q # 5' > % \$ & 9 % E < & ` & I F (< " 9' & ;) % & " (! 5 F # % & # 5 5 9 # 0 Q \$): > # % & () : # " (& % & I F (< " # 5' # % & (% \$ & # G & () N* + E I

4.3 Glassware Calibration

OT 5 ! 5 G) 9" & > % \$ & 9 % ! " 9" & () \$ # 0 G # (& # 6 = # " " T F # " " ` # % & 9" & ! 5 (< & : # 5 9 ; # \$ (9 % 5 F # 5' 8 9 # 0 (Q \$) 5 (% 6) ; = 7 ? A ? " !

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

NAT

6.0 INTENDED USE

O ^) % < & \$ # 0 G # (!) 5) ; # 5 # 0 ! \$ # 6 ! 5 " (% : & 5 (" # 5' X # 0 # (!) 5) ; # 5 # 0 ! \$ # 6 : & (<) " # " # > > %) % # (&

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

O + () % & G (` & & 5 # > %) % ! : # (& 0 1 d 0) / d = ` < ! & ! 5 " & # & E = E G # F I

O e < ! & " () % & ! 5 (< & " & # & E = E G # F 2 (% 5) > ! % (!) 5) ; (< ! " = 7 ? A ? ! " 5 & F 0 F ! G & T ; (& %) > & 5 ! 5 F (< & " & # & E = E G # F (% 5) > ! % (!) 5) ; (< & = 7 ? A ? ` ! 0) \$ \$ 9 % 2 % & 9 0 ! 5 F ! 5 # F % # 9 # 6 ! 5 \$ % & # " & ! 5 (< & # 5 # 0 Q & \$) 5 \$ & 5 (% (!) 5 L " P I * (! " (< & % " >) 5 " ! G 0 (Q) ; (< & 9" & %) (# \$ \$) 9 5 (;) % < ! " & ; & \$ (l e < & 5 (< & G) ((& ! " ` & I F < & G) (< & G ;) % & # 5' # ; (& % G & ! 5 F > # \$ & ! 5 " () % F & 2 (< & : # " " ' ! ; & % & 5 \$ &) G' & % & & ` ! 0 G & # : & # " 9 % & ;) ; (% 5) > ! % (!) 5 : # " " 0 " " !

OT ; (& %) > & 5 ! 5 F (< & " & # & E = E G # F 2 a & & > \$ # > (! F (< (Q " & # & ` < & 5) (! 5 9" & # 5' ") % & G (` & & 5 1 d 0 1 d = () : ! 5 ! : ! f & (< & & ; & \$ ") ; (% 5) > ! % (!) 5 l g " & # (C ' d [1 d = () : ! 5 ! : ! f & X) 0 : & (% \$ ' ! 0 (!) 5 & %) % < & 5 9" ! 5 F (< & % >) % & ' & 5 " ! (Q _) 5) (> ! & (& ; % : (< & \$) 5 (# ! 5 & % _) 5) (% (9 % % & :) X & # 0 8 9) (") \$) 5 (# ! 5 & %

O ^) %) % ! 5 ;) % : # (!) 5 2 X" ! (www.inorganicventures.com/TCT

8.0 HAZARDOUS INFORMATION

O 0 # " & % & %) ((< & + # ; & (Q _ # (# + < & & (;) % 8 5 ;) % : # (!) 5 % F # % ! 5 F (< ! " = 7 ? A ? !

9.0 HOMOGENEITY

O E < ! " ") 0 (!) 5 ` # " : ! V & # \$ \$) % ! 5 F () # 5 ! 5 G) 9" & > % \$ & 9 % # 5' ! " F 9 # % 5 (& & () G & < :) F & 5 &) 9" ! Y :) F & 5 & ! (Q ' # (# ! 5' ! \$ # (< # ((< & & 5' 9" & % <) 9 6 (# a & # : ! 5 ! : 9 : " # : > & " ! f &) ; / ! C : H () # " " 9 % < :) F & 5 & ! (Q

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

OM + 7 = & % ! (! \$ # (& N 9 : G & % M + 7 0 / 0 1

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

O = < & : ! \$ # 6 E X " (! 5 F OT \$ \$ % ! (& ' A T C H T = & % ! (! \$ # (& N 9 : G & % R R 0 // -

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

O 7 & ; & % & 5 \$? # (& % # 6 @) % 9 \$ & % OT \$ \$ % ! (& ' A T C H T = & % ! (! \$ # (& N 9 : G & % R R 0 // C

! " % % ! & 0) ! + # - . / 0 0 (1 * 2 ! 3 * \$ 4 / 5 # 6 . (7 2 8 & % 4 8 . # 0) % & ; 0 < / . (= > ? @ * 3 A 2 ! " B C 0 0 D D E D < E @ : 0 F C F 9 0 / 0 . (G % H F : 0 F C F 9 0 ! : @ ! " % \$! & 6 ! + # - 9 " J @ K L & ! " % \$! & 6 ! + # - 9 " J

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

@ # F & C) ; 0

11.1 Certification Issue Date

T>%6C/ 2C/ C-

OE<& \$%#(!\$#(!) 5 !" X#6 ` !(<15 (<&: &#" 9%&: &5(95\$&#%#15(Q">&\$!;!&' >%X' &' (<&=7 ? A ? !" ") %&' #5' <#5' &' !5 #\$\$) %5\$& ` !(< 15" (%\$(!) 5" FIX&5 !5 + &\$. 1- 1 E<! " \$%#(!\$#(!) 5 !" 59&.!&' !; !5" (%\$(!) 5" !5 + &\$. 1- #5) (;) & ` & `) %& ; (<&=7 ? A ? !" ' #: #F&' 2\$) 5(#: !5#(& 2) %& (<&%!" &:)' !;!&' !

11.2 Lot Expiration Date

OApril 20, 2025

OE<&' #(& #; (&% <!\$< (<!" =7 ? A ? " <) 96 5) (G& 9" &' !

OE<& 0 (&\>!%(!) 5 ' #(& %& &\$(" (<& >&%&') ; (!: & (<#((<&" (#G0(Q); # =7 ? A ? \$5 G&" 9>>) %&' GQ0 5F (&%: "(#G0(Q)" (9' !&" \$) 5' 9\$(&') 5 >%>&%Q") %&' #5' <#5' &' =7 ? A ? " I H) (&\>!%(!) 5 !" 0: !(&' >% #%GQ GQ (%5">!%(!) 5 L0 "") ; ` #(&% %& (<&") 0(!) 5P#5' 15;%89&5(0QQ\$<& !#\$6" (#G0(Q

11.3 Period of Validity

O+ &#& E= E U#F , >&5 _#(&Shhhhhhhhhhhhhhhhhhhhhhhhhhhhhhh

OE<!" =7 ? A ? " <) 96 5) (G& 9" &' 0 5F&%<#5) 5& Q#%4) %&' IV:) 5(< " 15 (<& \$#" &) ; # 0/ : H G) ((P ; % (<& ' #(&) ;) >&5!5F (<& #0: !5!f &' G#F) %#; (&%< &' #(& FIX&5 !5 + &\$! -- 1C2' <!\$<&X&%\$) : &" ; !%(I E<!" !" \$) 5(15F&5(9>) 5 (<&=7 ? A ? G&15F ") %&' #5' <#5' &' !5 #\$\$) %5\$& ` !(< (<& 15" (%\$(!) 5" FIX&5 !5 + &\$! . 1- 1

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

? !\$<#&6U)) (< _!%&\$() %2M9#0(Q=) 5(%6

Certifying Officer:

@#964 #!5&" = <#!%:#5 A+ &5!) %E&\$<5!\$#6_ !%&\$() %

@#F&0) ; 0

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is an ISO 9001:2015 certified company, ISO 17025:2017 certified laboratory, and ISO 14001:2015 certified environmental management system. We are also a member of the International Laboratory Accreditation Cooperation (ILAC) and the International Federation of Pure and Applied Chemistry (IFAC).



2.0 PRODUCT DESCRIPTION

Product Name: **15F T5#6**
 Description: **4% & + 0.15**
 Material: **4 U- /**
 Container: **H) (N9: 3%**
 Quantity: **? (#%S**
 Location: **CW LXPYN, 0**
 Reference: **J#6 AT5#6" PS**
 Method: **- / / / / ZFA H#S**
 Unit: **@ (" " !9:**
 Status: **+(#%F ? (#%#6 UN, 0**
 Condition: **+(#%F ? (#%#6H) (S 00- 0**
 Notes: **+(#%F ? (#%#6@%CS KKIKK - W**

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: - / - \] 0/ ZFA H
Density: - / / CDFA HL: &#"9%& # (C /] 1 ^=P

Assay Information:

Assay Method #1	10018 ± 54 µg/mL *=@T"#QN*+E+7? 0- 1- # H) (N9: 3%- 1/ R- 0
Assay Method #2	10016 ± 24 µg/mL 4 %X: &(%\$ N*+E+7? H) (N9: 3%+ && +&\$! 11C
Assay Method #3	10014 ± 45 µg/mL =#\$96#& N*+E+7? H) (N9: 3%+ && +&\$! 11C

OE<&=#696#(& J#6&! # X#6&\$#696#(& ;%: (<& _&f<()); # "(#%15F : #(&#%6(<#(<#" 3&&5 \$&&1!& ' !%&\$(&X" I # N#!) 5#6*5" (!9(&); +(#5' #'%" #5' E&\$<5) 6 FQLN*+EP+7 ? A ? I +&& +&\$ 11C;) %G#65\$& (%\$&#G6(Q

E<& ;) 66) !5F &&9#(!) 5" #%&9" & 15 (<& \$#696#(!) 5); (<& \$&&1!& X#6& #5' (<& 95\$&(Q 7 &>) %& 95\$&(!& %&>)& &5 (&v>#5' & 95\$&(!& &v>%&" & # (#>>%v: #(&Q(<& KDW \$) 5;! &5\$& 6&&69" !5F # \$) X&#F& ;#\$() %&; ` a C

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char i}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k(u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i^2)(u_{char i}^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a)(u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k(u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

OE<!" >% ' 9\$(!" (%\$&#G& () N*+E X# #5 95G` &5 \$<#15) ; \$) : >#%") 5" I E<& 95\$(!& ;) %&#< \$!& X#9& #%& %&>) %& 2 # 15F !5() #\$\$) 95((<& +7 ? A ? 95\$(Q&%)%#5' (<& : &#" 9%& &5(2_&F<15F #5' X) @ : &' !@(!) 5 &%)%& *5 %%& \$#" &" _<&& 5) N*+E +7 ? A ? #%& #X#1@G&2 (<& (& : 15G) 9" &" (!b" ">&\$!;!&'

4.1 Thermometer Calibration

OT6(<&%) : &(&% #& N*+E (%\$&#G& (<%9F< (<&%) : &(&% (<# (#% \$#0G#(& GQ#5 #\$\$%& !(& \$#0G#(!) 5 (#G) %() %Q

4.2 Balance Calibration

OT6#5#Q!\$#6G#6#5\$&" #%& \$#0G#(& GQ#5 #\$\$%& !(& \$#0G#(!) 5 (#G) %() %Q#5' >% \$& 9%& E<& _&F<(" 9" & ;) %& (!5F #& #559#6Q\$) : >%& () : #" (&% _&F<(" #5' #& (%\$&#G& () N*+E

4.3 Glassware Calibration

OT5 !5G) 9" & >% \$& 9%& !" 9" & () \$#0G#(& #6=6#" " T F6#" " _#& 9" & !5 (<& : #59;#\$(9%5F #5' 89#0(Q \$) 5(%6) ; =7 ? A ? " !

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

=7 ? A ? " #& (& (& ;) % (#& : &(#6\$! : >9%1&" GQTV:#6*=@ B+ #5' *=@?+I E<& %& 96 : (<& :) (" &5" !(X& : (<) ' ;) %&#< &6: &5(2" %&>) %& G&_1 +) @(!) 5" (& (& GQ*=@?+ _&#& #5#Q&' !5 #5 dH@ @!6&9& =6#5 7)) : ! T5 dH@ @!6&9& " KKKKRDW &;;!\$1&5(;) %<& %& () X#6) ; >%#%& " ') _5 () / IO Z: I

? TF f // / - // ? B9 f // / // / , N# // C1 // / ? +& f // / . K // , k5 // / - . // /
, T6 // / - // / , e& // / DR // ? NG f // / // / , +! // / - C // / , k% f // / - // /
? T" f // / D // / ? 4 # f // / // / ? N' f // / // / ? +: f // / // /
? T9 f // / C // / ? 4' f // / // / , N! f // / 1K // ? +5 f // / // /
, g f // / D // / ? 4 & f // / C // / ? , " f // / 00 // , +% // / // DD
, g# f // / R // / ? Y; f // / // / , @ f // / 0C // ? E# f // / // /
, g& f // / RC ? YF f // / C // ? @G f // / 0 // ? EG f // / // /
? g! f // / // / ? Y) f // / // / ? @ f // / // / ? E& f // / - . // /
, =# // / 0 - // / ? *5 f // / // / ? @% f // / // / ? E< f // / // /
, =' f // / 1D ? *% f // / // / ? @ f // / C // ? E! f // / // /
? =& f // / // / " U f // / // / ? 7G // 11R // / ? E6 f // / // /
, =) f // / . R ? H# f // / // / ? 7& f // / // / ? E: f // / // /
, =% // / // D // / , H f // / // R // ? 7< f // / // / ? d f // / // /
? =" f // / // / ? H9 f // / // / ? 79 f // / // / , J f // / - - // /
? =9 f // / C // / , ? F // / \ 0 // / , + // / CR // ? i f // / // /
? hQ f // / // / , ? 5 // / // 1R ? +G f // / // / ? j f // / // /
? B% f // / // / ? ?) f // / // / , +\$ f // / // 01 // , j G f // / // C //

? O=<&\$' & GQ*=@?+ , O=<&\$' & GQ*=@ B+ !O+&\$(%6*5(&#&5\$& 5 ON) (= <&\$' & e) % " O+) 6Q!) 5 + (#5' #% B6& &5

6.0 INTENDED USE

Oe) %<& \$#0G#(!) 5) ; #5#Q!\$#6!5" (%& &5" #5' X#0 #(!) 5) ; #5#Q!\$#6: &(<) " # " #>>%>%#(&

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

Open to air, store in a dry, cool place. Do not use if the container is damaged or the seal is broken.

Keep away from heat and open flame. Do not use if the container is damaged or the seal is broken. Do not use if the container is damaged or the seal is broken.

Do not use if the container is damaged or the seal is broken. Do not use if the container is damaged or the seal is broken.

For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 0Kl- / m l P Unl#8P

Chemical Compatibility - +) @G& l5 Y= QYN, 02 YC+, 1 #5' Ye #89&) 9" : #(%\$& l TX)! 9" &); Y= 6 1' 9& () l5") @G& (Q); (<& > & % < 0 % (& l + (#G& _ l (< #G: & (#6 #5' l5) % #5! \$ #5!) 5" & \ \$ & > (= 6 10l

Stability - CQ // >> G& X&6 " (#G& ;) %) 5 (< " l5 - W YN, 0 Ah @B \$) 5 (#! 5& % - G / 2 // >>: ") @ (!) 5" \$ < &: ! \$ # 6 " (#G& ;) % C # % l5 - DW YN, 0 Ah @B \$) 5 (#! 5& %

K Containing Samples (Preparation and Solution) - ? & (#6lh!"") @& X& Q % > ! Q l5 _ (#& P n % " L+) ' l9: \$ % 6) 5 # (& ; 9") l5 @ (;) @ _ & : C Q Y = 6 ' ! " ") @ (!) 5 C # 5 ' @ X & 6) ; U l5 ") ' l9: \$ % 6) 5 # (& \$ % ! \$ # P n % # 5 ! \$? # (% \$ & " L+ 9 6 9 % \$ & % V ! & ' ! F & " () l5 P

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences
*=@0+ 0K #: 9	- / >> (5#	0RT%Y20N#- \ , 2 . R+ & d2 = &
*=@OB+ 1/ 1l. C- 5:	- l- A / l / DZFA H	-	C5') % & % # % ! # (!) 5 ; % : 7 l B l ") 5 ") : &) > (! \$ # 6 ' & " ! F 5 "
*=@OB+ . \ \ 11K/ 5:	/ l l A / l / - ZFA H	-	C5') % & % # % ! # (!) 5 ; % : 7 l B l ") 5 ") : &) > (! \$ # 6 ' & " ! F 5 "
*=@OB+ . . . - lD0- 5:	- l / A / l / 0 ZFA H	-	C5') % & % # % ! # (!) 5 ; % : 7 l B l ") 5 ") : &) > (! \$ # 6 ' & " ! F 5 "

8.0 HAZARDOUS INFORMATION

Open to air, store in a dry, cool place. Do not use if the container is damaged or the seal is broken.

9.0 HOMOGENEITY

Open to air, store in a dry, cool place. Do not use if the container is damaged or the seal is broken.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

OM+7 = & % l ! \$ # (& N9: G& % M+7 G / 01

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

O= < &: ! \$ # 6 E & " (! 5 F OT \$ \$ % ! ! (& ' A TCHT = & % l ! \$ # (& N9: G& % R R O l / -

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

O7 & ; & % 5 \$ & ? # (& % # 6 @ %) 9 \$ & % OT \$ \$ % ! ! (& ' A TCHT = & % l ! \$ # (& N9: G& % R R O l / C

! " # % & ! 0 " ! + # - . / 00 (! * 2 ! 3 " \$ 4 ! 5 # 6 . 7 2 8 & % 9 ! 8 . # . 0) % 0 ; 0 < / . (= ? @ * 3 " A 2 ! " ! B C 0 D D D D D < E @ ; 0 F C F 9 0 / 0 . (G % H F : 0 F C F 9 0 ! @ ! " # % & ! 6 " ! + # - 9 " J @ K L & ! " # % & ! 6 " ! + # - 9 " J

@#F&0); 1

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

e&G9#%Q/\ 2C/ C-

OE<& \$&%d(!\$#(!) 5 !" X#6' _!(<!5 (<&: &# 9%&: &5(95\$&%#5(Q">&\$;!&' >%X' &' (<&=7 ? A? ? !" ") %&' #5' <#5' &' !5 #\$\$) %5\$&_!(<!5" (%\$(!) 5" F!X&5 !5 +&\$. I- I E<!" \$&%d(!\$#(!) 5 !" 59&;!&' !; !5" (%\$(!) 5" !5 +&\$. I- #%&5) (;) &') %d; (<&=7 ? A? ? !" ' #: #F&' 2\$) 5(#: !5#(&' 2) %d (<&%_!" &:) ' !;!&' I

11.2 Lot Expiration Date

February 06, 2025

OE<&' #(&#;(&%_<\$< (<" =7 ? A? ? "<) 96 5) (G&9" &' I

OE<& 0 (&\>!%(!) 5 ' #(&%&Q\$(" (<&>&%) '); (!: & (<#((<&" (#G0(Q); # =7 ? A? ? \$5 G&" 9>>) %&' GQ0 5F (&%: "#G0(Q)" (9' !&" \$) 5' 9\$(&') 5 >%>&9&Q" () %&' #5' <#5' &' =7 ? A? ? "I H) (&\>!%(!) 5 !" 0: !(&' >% #%&Q&Q (%5">!%(!) 5 l0 ""); _#(&%)% (<&") 0(!) 5P#5' !5;%89&5(Q&Q\$<&: !5#6" (#G0(Q

11.3 Period of Validity

O+ &#&' E= E g#F , >&5 h#(&Soooooooooooooooooooooooooooo

OE<" =7 ? A? ? "<) 96 5) (G&9" &' 0 5F&%<#5) 5& Q&#%4) %' !V:) 5(<" !5 (<&\$#&' &); # 0/ : HG) ((P ;% (<&' #(&);) >&5!5F (<& #0: !5!c&' G#F) %#;(&%<&' #(& F!X&5 !5 +&\$! -- IC2_<\$<&X&9&6) : &" ;!%(I E<!" !" \$) 5(!5F&5(9>) 5 (<&=7 ? A? ? G&!5F ") %&' #5' <#5' &' !5 #\$\$) %5\$&_!(< (<&!5" (%\$(!) 5" F!X&5 !5 +&\$! . I- I

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

? !\$<#&6g) (< h! %&\$() %2M9#0(Q=) 5(%6



Certifying Officer:

@#964 #!5&" =<#!%:#5 A+ &5!) %E&\$<5!\$#6h !%&\$() %



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGMG10
 Lot Number: R2-MG695748
 Matrix: 2% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Magnesium
 Starting Material: Magnesium Metal
 Starting Material Lot#: 2168
 Starting Material Purity: 99.9984%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10044 ± 30 µg/mL
Density: 1.053 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10055 ± 26 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #2	10042 ± 57 µg/mL ICP Assay NIST SRM 3131a Lot Number: 140110
Assay Method #3	10033 ± 26 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/WM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i) (X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/(u_{char i}^2)))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char i}^2))]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an UPLA-Filtered Clean Room. An UPLA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Ag	0.002104	M	Eu <	0.000910	O Na	0.071011	O Se <	0.048000	O Zn	0.003296
M Al	0.003550	M	Fe	0.002536	M Nb <	0.000460	O Si <	0.032000	O Zr <	0.002700
M As <	0.001400	M	Ga <	0.000460	M Nd <	0.000910	M Sm <	0.000460		
M Au <	0.001400	M	Gd <	0.000460	O Ni <	0.001600	M Sn <	0.002300		
O B	0.006847	M	Ge <	0.001400	M Os <	0.000460	O Sr	0.000278		
O Ba	0.000963	M	Hf <	0.000460	O P	0.015216	M Ta <	0.000460		
O Be <	0.000120	M	Hg <	0.000460	M Pb <	0.000460	M Tb <	0.000460		
M Bi <	0.000460	M	Ho <	0.000460	M Pd <	0.003200	M Te <	0.007300		
O Ca	0.053258	M	In <	0.000460	M Pr <	0.000460	M Th <	0.000460		
O Cd <	0.000360	M	Ir <	0.000460	M Pt <	0.001900	O Ti <	0.001700		
M Ce <	0.002300	M	K	0.048186	M Rb	0.002409	M Tl	0.003043		
M Co <	0.000910	M	La <	0.002800	M Re <	0.000460	M Tm <	0.000460		
M Cr <	0.002300	O	Li	0.027897	M Rh <	0.000460	M U <	0.000460		
M Cs	0.001039	M	Lu <	0.000460	M Ru <	0.000460	M V <	0.000460		
O Cu <	0.003000	s	Mg <		O S <	0.190000	M W <	0.000460		
M Dy <	0.000460	O	Mn	0.015216	M Sb	0.020796	O Y <	0.000720		
M Er <	0.000460	M	Mo <	0.000910	O Sc <	0.000480	M Yb <	0.000460		

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 24.31 +2 6 Mg(H₂O)₆+2

Chemical Compatibility -Soluble in HCl, HNO₃, and H₂SO₄ avoid HF, H₃PO₄ and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicates, carbonates, hydroxides, oxides, and tungstates in neutral and slightly acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO₃ / LDPE container.

Mg Containing Samples (Preparation and Solution) -Metal (Best dissolved in diluted HNO₃); Oxide (Readily soluble in above compatible aqueous acidic solutions); Ores (Carbonate fusion in Pt₀ followed by HCl dissolution); Organic Matrices (Sulfuric / peroxide digestion or nitric / sulfuric / perchloric acid decomposition, or dry ash and dissolution in dilute HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 24 amu	42 ppt	n/a	7Li17O, 48Ti+2 , 48Ca+2
ICP-OES 279.553 nm	0.0002 / 0.00003 µg/mL	1	Th
ICP-OES 280.270 nm	0.0003 / 0.00005 µg/mL	1	U, V
ICP-OES 285.213 nm	0.002 / 0.00003 µg/mL	1	U, Hf, Cr, Zr

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 01, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **September 01, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGMN10
 Lot Number: P2-MN687536
 Matrix: 3% (v/v) HNO₃
 Value / Analyte(s): 10 000 µg/mL ea:
 Manganese
 Starting Material: Mn Metal
 Starting Material Lot#: 2275
 Starting Material Purity: 99.9909%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10046 ± 30 µg/mL
Density: 1.035 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10045 ± 25 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #2	10083 ± 68 µg/mL ICP Assay NIST SRM 3132 Lot Number: 050429
Assay Method #3	10031 ± 47 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.001500	M Eu < 0.000730	O Na 0.176713	M Se < 0.006600	M Zn 0.009960
O Al 0.004337	M Fe < 0.650000	M Nb < 0.000730	O Si 0.097995	M Zr < 0.000730
M As < 0.008000	M Ga 0.004337	M Nd < 0.001500	M Sm < 0.000730	
M Au < 0.000730	M Gd < 0.000730	M Ni 0.024097	M Sn < 0.002200	
M B 0.069078	M Ge < 0.004400	M Os < 0.000730	O Sr 0.000931	
M Ba < 0.001500	M Hf < 0.000730	i P <	M Ta < 0.000730	
M Be < 0.000730	M Hg < 0.002200	M Pb 0.007389	M Tb < 0.000730	
M Bi < 0.003000	M Ho < 0.000730	M Pd < 0.000730	M Te < 0.019000	
O Ca 0.062652	M In < 0.003000	M Pr < 0.000730	M Th < 0.000730	
M Cd < 0.001500	M Ir < 0.000730	M Pt < 0.000730	O Ti < 0.006500	
M Ce < 0.007300	O K 0.006425	M Rb < 0.006600	M Tl < 0.000730	
O Co 0.014779	M La < 0.003000	M Re < 0.000730	M Tm < 0.000730	
O Cr 0.273102	O Li 0.000417	M Rh < 0.003000	M U < 0.001500	
M Cs < 0.000730	M Lu < 0.000730	M Ru < 0.004400	M V < 0.000730	
O Cu 0.007711	O Mg 0.321297	i S <	M W < 0.004400	
M Dy < 0.001500	s Mn <	M Sb < 0.021000	O Y 0.001365	
M Er < 0.001500	M Mo 0.010281	O Sc < 0.004100	M Yb < 0.000730	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 54.94 +2 6 Mn(H₂O)₆2+

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO₃/LDPE container.

Mn Containing Samples (Preparation and Solution) -Metal (Soluble in dilute acids); Oxides (Soluble in dilute acids); Ores (Dissolve with HCl. If silica is present add HF and then fume off silica by adding H₂SO₄ and heat to SO₃ fumes - dense white fumes).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 55 amu	10 ppt	n/a	40Ar14N1H,39K16 O,37Cl18O,40Ar15 N,38Ar17O,36Ar18O 1H ,38Ar16O1H,37Cl17 O1H,23Na32S
ICP-OES 257.610 nm	0.0014 / 0.00002 µg/mL	1	Ce, W, Re
ICP-OES 259.373 nm	0.0016 / 0.00002 µg/mL	1	U, Ta, Mo, Fe, Nb
ICP-OES 260.569 nm	0.0021 / 0.00002 µg/mL	1	Co

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 05, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- January 05, 2024

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGMO10
Lot Number: R2-MO693167
Matrix: tr. NH₄OH
H₂O
Value / Analyte(s): 10 000 µg/mL ea:
Molybdenum
Starting Material: Ammonium Molybdate
Starting Material Lot#: 2257
Starting Material Purity: 99.9914%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10013 ± 35 µg/mL
Density: 1.011 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **10035 ± 67 µg/mL**
ICP Assay NIST SRM 3134 Lot Number: 130418

Assay Method #2 **10005 ± 40 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/WRM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char i})^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an UPLA-Filtered Clean Room. An UPLA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.001826	M Eu < 0.000300	M Na < 0.008750	M Se < 0.007480	M Zn < 0.002553
M Al < 0.004455	M Fe < 0.002093	M Nb < 0.015030	i Si < 0.000300	M Zr < 0.005393
M As < 0.003006	M Ga < 0.000300	i Nd < 0.000300	M Sm < 0.000300	
M Au < 0.006012	M Gd < 0.000300	M Ni < 0.004828	M Sn < 0.001004	
M B < 0.035184	M Ge < 0.000903	M Os < 0.003006	M Sr < 0.001903	
O Ba < 0.015613	M Hf < 0.000896	i P < 0.000300	M Ta < 0.000300	
M Be < 0.003006	M Hg < 0.003006	M Pb < 0.000409	M Tb < 0.000300	
M Bi < 0.000401	M Ho < 0.000300	M Pd < 0.001114	M Te < 0.060122	
O Ca < 0.032589	M In < 0.015030	M Pr < 0.090184	M Th < 0.000786	
O Cd < 0.051800	M Ir < 0.007483	M Pt < 0.000388	O Ti < 0.093240	
M Ce < 0.015030	M K < 1.114508	M Rb < 0.040641	M Tl < 0.013140	
M Co < 0.004032	M La < 0.000300	M Re < 0.000300	M Tm < 0.000300	
M Cr < 0.005931	O Li < 0.000215	M Rh < 0.000300	M U < 0.000937	
M Cs < 0.002812	M Lu < 0.000300	M Ru < 0.003006	M V < 0.000759	
M Cu < 0.005172	M Mg < 0.005212	i S < 0.000300	M W < 0.592427	
M Dy < 0.000300	M Mn < 0.000952	M Sb < 0.003147	M Y < 0.000300	
M Er < 0.000300	s Mo < 0.000300	M Sc < 0.009019	M Yb < 0.000300	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 95.94 +6 6,7,8,9 [MoO4]

-2(chemical form as received)

Chemical Compatibility -Mo is received in a NH4OH matrix giving the operator the option of using HCl or HF to stabilize acidic solutions. The [MoO4]-2 is soluble in concentrated HCl [MoOCl5]-2, dilute HF / HNO3 [MoOF5]-2 and basic media [MoO4]-2. Stable at ppm levels with some metals provided it is fluorinated. Do not mix with Alkaline or Rare Earths when HF is present. Stable with most inorganic anions provided it is in the [MoO4]-2 chemical form.

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the [MoOF5]-2 for months in 1% HNO3 / LDPE container. 1-10,000 ppm single element solutions as the [MoO4]-2 chemically stable for years in 1% NH4OH in a LDPE container.

Mo Containing Samples (Preparation and Solution) -Metal (Soluble in HF / HNO3 or hot dilute HCl); Oxide (soluble in HF or NH4OH); Organic Matrices (Dry ash at 450EC in Pt0 and dissolve oxide with HF or HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 95 amu	3 ppt	n/a	40Ar39K16O,79Br1 60,190Os2+,190Pt 2+
ICP-OES 202.030 nm	0.008 / 0.0002 µg/mL	1	Os, Hf
ICP-OES 203.844 nm	0.012 / 0.002 µg/mL	1	
ICP-OES 204.598 nm	0.012 / 0.001 µg/mL	1	Ir, Ta

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

May 28, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **May 28, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is an ISO 17025 Accredited laboratory. We are currently accredited for the analysis of pharmaceuticals, biologics, and food products. Our accreditation is held by the International Laboratory Accreditation Cooperation (ILAC) and the United Kingdom Accreditation Service (UKAS). We are also a member of the International Association of Analytical Chemists (IAAC).



2.0 PRODUCT DESCRIPTION

Product Name: [REDACTED]
 Lot Number: [REDACTED]
 Container: [REDACTED]
 Quantity: [REDACTED]
 Sample Description: [REDACTED]

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: [REDACTED]
Density: [REDACTED]
Assay Information:

Assay Method #1	10070 ± 26 µg/mL
4% V/V & (% N*+E+7? H) (N9: G%\$+ && +&\$! 11C	
Assay Method #2	10012 ± 31 µg/mL
=@T""#QN+E+7? 0-DC# H) (N9: G%- C' . - D	
Assay Method #3	10059 ± 20 µg/mL
=#\$96#&' N*+E+7? H) (N9: G%\$+ && +&\$! 11C	

OE<&=#\$96#(&' J#&&'! # V#&&\$#\$96#(&' ;%: (<& ^ &f<()); # "(#%15F : #(&#%6(<#(<#" G&&5 \$&%11&' ' !&\$\$(QW! # N#!) 5#6*5" (!9(&); +(#5' #'%" #5' E&\$<5) 6 FQLN*+EP+7? A? I +&& +&\$ 11C;) %G#65\$& (%\$&#G6(Q
 E<& ;) 66) !5F &&9#(!) 5" #& 9" &' !5 (<& \$#\$96#(!) 5); (<& \$&%11&' V#6& #5' (<& 95\$&%#15(Q 7 &>) %&' 95\$&%#15(!&' %&>&' &5 (&L>#5' &' 95\$&%#15(!&' &L>%&" &' #(&#>>)%L: #(&Q(<& KDV \$) 5;! &5\$& 6&169"!5F # \$) V&#F& ;#\$() %& ; _ ` C

@#F&-); 1

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i) (X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char i}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i^2) (u_{char i}^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

OE<!" >% ' 9\$(!" (%\$&#G& () N*+E V# #5 95G)_ &5 \$<#15) ; \$) : >#%") 5" I E<& 95\$(!& ;) %&#< \$!& V#9& #%& %&>) %& 2 #_15F !5() #\$\$) 95((<& +7 ? A ? 95\$(Q&%)%#5' (<& : &#" 9%& : &5(2^ &F<15F #5' V#9 : & ' !9(!) 5 &%)%#1 *5 %%& \$#" & ^ <& & 5) N*+E +7 ? A ? #%& #V#19#G&2 (<& (& : &5G) 9" & " (!a" ">&\$!;!& ' I

4.1 Thermometer Calibration

OT6(<&%) : & (& % #& N*+E (%\$&#G& (<%)9F< (<&%) : & (& (<# (#& \$#0G# (& GQ#5 #\$\$\$& !(& \$#0G#(!) 5 #G) %) %Q

4.2 Balance Calibration

OT6#5#Q!\$#6G#6#5\$& " #& \$#0G# (& GQ#5 #\$\$\$& !(& \$#0G#(!) 5 #G) %) %Q#5' >% \$& 9%& E<& ^ &F<(" 9" & ;) %& (!5F #& #559#6Q\$) : >%& () : #" (& % &F<(" #5' #& (%\$&#G& () N*+E I

4.3 Glassware Calibration

OT5 !5G) 9" & >% \$& 9%& !" 9" & () \$#0G# (& #6= # " T F# " " ^ #& 9" & !5 (<& : #59;#\$(9%5F #5' 89#0(Q \$) 5(%6) ; =7 ? A ? " I

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

=7 ? A ? " #& (& (& ;) % (#& : & (#6\$! : >9%1& " GQTU#6*=@ B+ #5' *=@?+I E<& %& 96 ; % : (<& :) " (" &5" !(!V& : & (<) ' ;) %&#< &6 : &5(2" %&>) %& G&G ^ I +) 9(!) 5" (& (& GQ*=@?+ ^ & & #5#0b& !5 #5 c H@ Q!6&9& =6#5 7)) : I T5 c H@ Q!6&9& " KKKKRDV & ; !1&5 (;) % (& % :) V#6) ; >% \$&6 " ') ^ 5 () / IO Y : I

, TF e // // QD ? B9 e // // R1/ " N# e // // // , +& e // // 1. // , k5 // // QD
, T6 // // 0\ RR , d& // // - D / , NG e // // - 0 // , +! // // 1K\ 1R , k% // // \ R
, T" e // // \ K / ? 4 # e // // R1/ ? N' e // // R1/ ? +: e // // R1/
? T9 e // // R1/ ? 4' e // // R1/ , N! e // // QD ? +5 e // // - . //
, f // // K0 ? 4 & e // // 01 // ? , " e // // R1/ , +% // // QDD
, f # // // QK ? X; e // // R1/ , @ // // \ DDD ? E# e // // 1Q /
, f & e // // - 0 / ? XF e // // - . // ? @G e // // R1/ ? EG e // // R1/
, f! e // // R- // ? X) e // // R1/ ? @ e // // R1/ , E& e // // 1R /
, =# // // RD- C ? *5 e // // R1/ ? @% e // // R1/ ? E< e // // QD /
, =' e // // QD ? *% e // // R1/ ? @ e // // R1/ , E! // // DDD
? =& e // // - . // , h - // // 1K - R ? 7G e // // 01 // ? E6 e // // R1/
, =) e // // 0. / ? H# e // // R1/ ? 7& e // // R1/ ? E: e // // R1/
, =% e // // - 1 // , H // // \ K ? 7< e // // R1/ ? c e // // R1/
? =" e // // 01 // ? H9 e // // R1/ ? 79 e // // - . // , J e // // - \ //
, =9 e // // - 1 // , ? F // // CR0. / , + // // 1R00 / , i e // // D / //
? gQ e // // R1/ , ? 5 // // - 0K ? +G e // // - . // , j e // // . 0 /
? B% e // // R1/ , ?) e // // 1R / , +\$ e // // 0. / , j G e // // - 0 /

? O=<&\$_& GQ*=@?+ , O=<&\$_& GQ*=@ B+ !O+&\$(%6*5(& & 5\$& 5 ON) (= <&\$_& d) % " O+) 6Q!) 5 + (#5' #% B6& &5

6.0 INTENDED USE

Od) % (<& \$#0G#(!) 5) ; #5#Q!\$#6!5" (9 : &5(" #5' V#0 #(!) 5) ; #5#Q!\$#6: & (<) " # " #>>%>%#(&

@#F&C) ; 1

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

Open to air, store in a cool, dry place. Do not use if the container is damaged or the seal is broken.

Keep away from heat, open flame, and sources of ignition. Do not breathe dust. Avoid contact with eyes, skin, and clothing. If contact occurs, wash thoroughly with water. Do not eat, drink, or smoke while using this material.

Do not use if the container is damaged or the seal is broken. Do not use if the material is contaminated or if the color has changed. Do not use if the material has a strong odor.

For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - Coordination number: 6. Chemical form in solution: $[Co(H_2O)_6]^{2+}$

Chemical Compatibility - Compatible with water, dilute acids, and dilute alkalis. Incompatible with strong oxidizing agents and strong reducing agents.

Stability - Stable in air and water. Stable in dilute acids and dilute alkalis. Decomposes at high temperatures.

Na Containing Samples (Preparation and Solution) - Prepare a 1% solution in water. Add a few drops of 10% sodium hydroxide solution to adjust the pH to 8-9. The solution should be clear and colorless.

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences
*=@0+ 00 #: 9	0- / >>(5#	1\ ElmC21\ = #nC
*=@0B+ 00/ 100. 5:	Cl/ A/ I/ K YFA H	-	@ 2 k5
*=@0B+ DRRKDKD 5:	/ / 0 A/ I/ \ \ YFA H	-	C5') %&%#%!(!) 5 ; %: 7 IBI") 5 ") : &) >(!\$#6' &" !F5"
*=@0B+ DRKDKD 5:	/ / . A/ I/ / / / K YFA H	-	C5') %&%#%!(!) 5 ; %: 7 IBI") 5 ") : &) >(!\$#6' &" !F5"

8.0 HAZARDOUS INFORMATION

Caution: Irritant. Causes skin and eye irritation. May cause respiratory irritation.

9.0 HOMOGENEITY

Homogeneous. The material is uniform in composition and appearance throughout the container.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

ISO 9001:2015 certified.

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

ISO/IEC 17025:2017 certified.

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

ISO 17034:2016 certified.

For more information, visit www.inorganicventures.com/TCT

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

o#59#%QCD2C/ C-

OE<& \$&%d(!\$#(!) 5 !" V#6' ^ !(<!5 (<&: &# 9%&: &5(95\$&%#5(Q">&\$;!&' >%VW &' (<&=7 ? A' ? !" ") %&' #5' <#5' &' !5 #\$\$) %5\$& ^ !(<!5" (%\$(!) 5" F!V&5 !5 +&\$. 1-1 E<!" \$&%d(!\$#(!) 5 !" 59&;!&' !; !5" (%\$(!) 5" !5 +&\$. 1- #%&5) (;) &' ^ &') %d; (<&=7 ? A' ? !" ' #: #F&' 2\$) 5(#: !5#(&' 2) %q (<&%!" &:) ' !;!&' !

11.2 Lot Expiration Date

QJanuary 25, 2025

OE<&' #(&#;(&%& <!\$< (<" =7 ? A' ? " <) 96 5) (G&9" &' !

OE<& q (&L>!%(!) 5 ' #(&%&Q\$(" (<&>&%')); (!: & (<#((<&" (#G&Q); # =7 ? A' ? \$5 G&" 9>>) %&' GQq 5F (&%: "#G&Q)" (9' !&" \$) 5' 9\$(&') 5 >%>&%Q" () %&' #5' <#5' &' =7 ? A' ? " ! H) (&L>!%(!) 5 !" &: !(&' >% #%Q&Q (%5">!%(!) 5 Lq ""); ^ #(&%)% (<&") Q(!) 5P#5' !5;%89&5(Q&Q\$<&: !5#6" (#G&Q

11.3 Period of Validity

O+ &#&' E= E f #F , >&5 g #(&Spoooooooooooooooooooooooooooo

OE<" =7 ? A' ? " <) 96 5) (G&9" &' q 5F&%<#5) 5& Q&#%L) %' !U:) 5(<" !5 (<&\$#" &); # 0/ : HG) ((P ;% (<&' #(&);) >&5!5F (<& #Q: !5!b&' G#F) %#;(&%<&' #(& F!V&5 !5 +&\$! -- 1C2^ <!\$<&V&%\$) : &" ;!%(! E<!" !" \$) 5(!5F&5(9>) 5 (<&=7 ? A' ? G&!5F ") %&' #5' <#5' &' !5 #\$\$) %5\$& ^ !(< (<&!5" (%\$(!) 5" F!V&5 !5 +&\$! . 1-1

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

? !\$<#&6f)) (< g! %&\$() %2M9#&Q(=) 5(%6



Certifying Officer:

@#964 #!5&" =<#!%:#5 A+ &5!) %E&\$<5!\$#6g !%&\$() %



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGNI10
 Lot Number: P2-NI686384
 Matrix: 3% (v/v) HNO₃
 Value / Analyte(s): 10 000 µg/mL ea:
 Nickel
 Starting Material: Ni Metal
 Starting Material Lot#: 2277 and 2282
 Starting Material Purity: 99.9992%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9979 ± 30 µg/mL
Density: 1.038 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	9971 ± 54 µg/mL ICP Assay NIST SRM 3136 Lot Number: 120619
Assay Method #2	9970 ± 32 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #3	9993 ± 33 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag	0.002606	M Eu	<	0.001100	O Na	0.004965	O Se	<	0.067000	M Zn	0.006578	
M Al	<	0.013000	O Fe	0.018618	M Nb	<	0.001100	O Si	0.010923	M Zr	<	0.001100
O As	<	0.067000	M Ga	<	0.001100	M Nd	<	0.001100	M Sm	<	0.001100	
M Au	<	0.002100	M Gd	<	0.001100	s Ni	<		M Sn	<	0.016000	
M B	<	0.017000	M Ge	<	0.004200	M Os	0.002110	O Sr	<	0.000940		
M Ba	<	0.001100	M Hf	<	0.001100	i P	<		M Ta	<	0.001100	
O Be	<	0.000410	M Hg	0.014895	M Pb	0.006578	M Tb	<	0.001100			
M Bi	<	0.004200	M Ho	<	0.001100	M Pd	<	0.001100	M Te	<	0.015000	
O Ca	0.003351	M In	<	0.001100	M Pr	<	0.001100	M Th	<	0.001100		
M Cd	0.001365	M Ir	0.004716	M Pt	<	0.001100	M Ti	<	0.004200			
M Ce	<	0.001100	O K	0.004716	M Rb	<	0.001100	M Tl	<	0.001100		
O Co	0.017377	M La	<	0.001100	M Re	0.001737	M Tm	<	0.001100			
O Cr	<	0.006700	O Li	<	0.000140	M Rh	<	0.006300	M U	<	0.001100	
M Cs	<	0.007300	M Lu	<	0.001100	M Ru	<	0.019000	M V	<	0.002100	
M Cu	0.004096	O Mg	0.000372	i S	<			M W	<	0.006300		
M Dy	<	0.001100	O Mn	<	0.001900	M Sb	0.005833	O Y	<	0.000540		
M Er	<	0.001100	M Mo	<	0.008400	M Sc	<	0.002100	M Yb	<	0.001100	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.69 +2 6 Ni(H₂O)₆²⁺

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Ni Containing Samples (Preparation and Solution) -Metal (Soluble in HNO₃); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 60 amu	100 ppt	n/a	43Ca16O1H , 44Ca16O, 23Na37Cl
ICP-OES 221.647 nm	0.01 / 0.0009 µg/mL	1	Si
ICP-OES 231.604 nm	0.02 / 0.002 µg/mL	1	Sb, Ta, Co
ICP-OES 232.003 nm	0.02 / 0.006 µg/mL	1	Cr, Re, Os, Nb, Ag, Pt, Fe

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 02, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- December 02, 2023

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGPB10
Lot Number: P2-PB686383
Matrix: 0.5% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Lead
Starting Material: Lead Nitrate
Starting Material Lot#: 2299
Starting Material Purity: 99.9974%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10031 ± 30 µg/mL
Density: 1.015 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10060 ± 63 µg/mL ICP Assay NIST SRM 3128 Lot Number: 101026
Assay Method #2	10048 ± 32 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #3	10007 ± 32 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag	0.000850	M Eu <	0.000310	O Na	0.005780	M Se <	0.004600	M Zn	0.005440
O Al	0.234602	O Fe	0.023460	M Nb <	0.000310	O Si	0.047600	M Zr <	0.000610
M As <	0.001900	M Ga <	0.000310	M Nd <	0.000310	M Sm <	0.000310		
M Au <	0.002200	M Gd <	0.004300	M Ni <	0.001600	M Sn <	0.000610		
O B <	0.005200	M Ge <	0.000610	M Os <	0.000310	O Sr	0.000442		
O Ba	0.001530	M Hf <	0.000310	O P <	0.052000	M Ta <	0.000310		
O Be <	0.000630	M Hg <	0.001600	s Pb <		M Tb <	0.000310		
O Bi	0.021080	M Ho <	0.000610	M Pd <	0.000310	M Te <	0.004300		
O Ca	0.037400	M In <	0.000310	M Pr <	0.000310	M Th <	0.000310		
M Cd <	0.000610	M Ir <	0.000310	M Pt <	0.000310	M Ti	0.002992		
M Ce <	0.000910	O K	0.008840	M Rb <	0.000610	M Tl	0.037400		
M Co <	0.000610	M La <	0.000610	M Re <	0.000310	M Tm <	0.000610		
M Cr <	0.003400	O Li	0.000108	O Rh <	0.006300	M U <	0.000310		
M Cs	0.002686	M Lu <	0.000310	M Ru <	0.000310	M V <	0.000310		
M Cu <	0.002500	O Mg	0.004760	O S <	0.052000	M W <	0.002200		
M Dy <	0.000310	M Mn <	0.000310	M Sb <	0.001300	M Y <	0.000310		
M Er <	0.000310	O Mo <	0.005400	M Sc <	0.000310	M Yb <	0.000310		

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 207.20 +2 6 Pb(H₂O)₆+2

Chemical Compatibility - Soluble in HCl, HF and HNO₃. Avoid H₂SO₄. Stable with most metals and inorganic anions forming insoluble carbonate, borate, sulfate, sulfite, sulfide, phosphate, oxalate, chromate, tannate, iodate, and cyanide in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO₃ / LDPE container.

Pb Containing Samples (Preparation and Solution) -Metal (Best dissolved in 1:1 H₂O / HNO₃); Oxides (The many different Pb oxides are soluble in HNO₃ with the exception of PbO₂ which is soluble in HCl or HF); Ores and Alloys (Best attacked using 1:1 H₂O / HNO₃); Organic Matrices (Dry ash and dissolve in dilute HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 208 amu	5 ppt	n/a	192Pt16O, 192Os16O
ICP-OES 168.215 nm	0.03 / 0.003 µg/mL	1	Co
ICP-OES 217.000 nm	0.09 / 0.03 µg/mL	1	W, Ir, Hf, Sb, Th
ICP-OES 220.353 nm	0.04 / 0.006 µg/mL	1	Bi, Nb

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 02, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- December 02, 2023

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGSB10
 Lot Number: R2-SB688559
 Matrix: 3% (v/v) HNO3
 3% (w/v) tartaric acid
 Value / Analyte(s): 10 000 µg/mL ea:
 Antimony
 Starting Material: Antimony Metal
 Starting Material Lot#: 1857
 Starting Material Purity: 99.9894%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10003 ± 47 µg/mL
Density: 1.061 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 10003 ± 41 µg/mL
 ICP Assay NIST SRM 3102a Lot Number: 140911

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i) (X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$
 w_i = the weighting factors for each method calculated using the inverse square of the variance:
 $w_i = (1/u_{char i})^2 / (\sum(1/(u_{char i})^2))$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2
 $u_{char} = [\sum((w_i)^2 (u_{char i})^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with
 $u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2
 $u_{char a}$ = the errors from characterization
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag <	0.000200	M Eu <	0.000300	O Na	0.140000	M Se <	0.007300	O Zn	0.005000
M Al	0.003200	O Fe	0.060000	M Nb <	0.000100	O Si	0.150000	O Zr <	0.006300
M As <	0.004400	M Ga <	0.000400	M Nd <	0.000100	M Sm <	0.000100		
M Au <	0.000210	M Gd <	0.000100	O Ni	0.004800	M Sn <	0.001800		
M B <	0.011000	M Ge <	0.000600	M Os <	0.000110	O Sr	0.000750		
O Ba <	0.004900	M Hf <	0.000100	O P	0.540000	M Ta	0.003300		
M Be <	0.000400	M Hg <	0.000110	M Pb <	0.000400	M Tb <	0.000100		
M Bi <	0.000200	M Ho <	0.000100	M Pd <	0.000210	M Te <	0.000600		
O Ca	0.110000	M In <	0.000100	M Pr <	0.001600	M Th <	0.000100		
M Cd <	0.000200	M Ir <	0.000110	M Pt <	0.000600	M Ti <	0.002800		
M Ce	0.006500	O K	0.020000	M Rb <	0.001000	M Tl <	0.000100		
M Co <	0.000200	O La <	0.016000	M Re <	0.000100	M Tm <	0.000100		
M Cr	0.006900	O Li <	0.000430	M Rh <	0.000300	M U <	0.000100		
M Cs <	0.000200	M Lu <	0.000100	M Ru <	0.000310	M V <	0.000800		
M Cu <	0.000600	O Mg	0.021000	n S <		M W <	0.000200		
M Dy <	0.000100	O Mn	0.001900	s Sb <		M Y <	0.000100		
M Er <	0.000100	M Mo <	0.000500	O Sc <	0.002300	M Yb <	0.000100		

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 121.75 +3 6 Sb(O)C4H4O6-1

Chemical Compatibility -Stable in conc. HCl, dilute or conc. HF. Stable in dilute HNO3 as the fluoride or tartrate complex. Avoid basic media. Stable with most metals and inorganic anions in acidic media as the tartrate provided the acidity is not too high or the acid is oxidizing causing loss of the stabilizing tartrate ion. The fluoride complex of antimony is stable in strong acid but you should only mix with other metals that are fluorinated.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-2% HNO3 / LDPE container.

Sb Containing Samples (Preparation and Solution) -Metal and alloys (Soluble in H2O / HF / HNO3 mixture); Oxides (Soluble in HCl and tartaric acid or H2O / HF / HNO3 mixtures); Ores (fusion with Na2CO3 in Pt0 followed by dissolving the fuseate in a H2O / HF / HNO3 mixture); Organic based (sulfuric acid / hydrogen peroxide digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 121 amu	5 ppt	N/A	105Pd16O, 89Y16O2
ICP-OES 206.833 nm	0.03/0.003 µg/mL	1	Ta, Cr, Ge, Hf
ICP-OES 217.581 nm	0.05/0.005 µg/mL	1	Nb, W, Re, Fe
ICP-OES 231.147 nm	0.06/0.006 µg/mL	1	Ni, Co, Pt

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

April 30, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **April 30, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGSE10
Lot Number: P2-SE684206
Matrix: 3% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Selenium
Starting Material: Se Metal
Starting Material Lot#: 1962
Starting Material Purity: 99.9991%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9992 ± 61 µg/mL
Density: 1.035 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **9993 ± 67 µg/mL**
ICP Assay NIST SRM 3149 Lot Number: 100901

Assay Method #2 **9992 ± 73 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.002242	M Eu < 0.000373	O Na 0.013700	s Se <	O Zn 0.002382
M Al 0.004465	M Fe 0.008506	O Nb < 0.002975	O Si 0.006270	M Zr < 0.001868
O As < 0.022040	M Ga < 0.000373	M Nd < 0.000373	M Sm < 0.000373	
M Au < 0.000373	M Gd < 0.000373	O Ni 0.001849	M Sn 0.000850	
O B < 0.007714	M Ge < 0.002616	M Os < 0.000373	M Sr < 0.001121	
M Ba < 0.001495	M Hf < 0.000373	O P < 0.022040	M Ta < 0.000373	
M Be < 0.001495	M Hg < 0.002240	M Pb 0.006379	M Tb < 0.006353	
M Bi < 0.000373	M Ho < 0.000373	M Pd < 0.000373	M Te < 0.012707	
O Ca 0.006552	M In < 0.000373	M Pr < 0.001495	M Th < 0.002990	
M Cd 0.001169	M Ir < 0.000373	M Pt < 0.000373	M Ti < 0.003363	
M Ce < 0.000373	O K 0.002006	M Rb < 0.001868	M Tl 0.008613	
M Co < 0.000373	M La < 0.001121	M Re < 0.000373	M Tm < 0.000373	
M Cr 0.002870	O Li 0.000062	M Rh < 0.000373	M U < 0.000373	
M Cs < 0.001121	M Lu < 0.000373	M Ru < 0.001493	M V < 0.000747	
M Cu < 0.000747	O Mg 0.001159	O S 0.024674	M W < 0.002242	
M Dy < 0.000373	M Mn < 0.000373	M Sb < 0.002242	M Y < 0.000373	
M Er < 0.000373	O Mo < 0.003195	M Sc < 0.001121	M Yb < 0.000373	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 78.96 +4 6 H₂SeO₃

Chemical Compatibility -Soluble in HCl, HNO₃,H₃PO₄, H₂SO₄ and HF aqueous matrices and water. It is stable with most inorganic anions but many cationic metals form the insoluble selenites under pH neutral conditions. When fluorinated and/or under acidic conditions precipitation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Se Containing Samples (Preparation and Solution) -Metal (soluble in HNO₃); Oxides (readily soluble in water); Minerals and alloys (acid digestion with HNO₃or HNO₃ / HF); Organic Matrices (acid digestion with hot concentrated H₂SO₄ accompanied by the careful dropwise addition of H₂O₂ until clear).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 82 amu	200 ppt	N/A	12C35Cl2
ICP-OES 196.026 nm	0.08/0.006 µg/mL	1	Fe
ICP-OES 203.985 nm	0.2/0.05 µg/mL	1	Sb, Ir, Cr, Ta
ICP-OES 206.279 nm	0.3/0.16 µg/mL	1	Cr, Pt

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 13, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **September 13, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGTL10
Lot Number: R2-TL691937
Matrix: 5% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Thallium
Starting Material: TINO₃
Starting Material Lot#: 2118
Starting Material Purity: 99.9998%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9987 ± 49 µg/mL
Density: 1.035 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **9968 ± 68 µg/mL**
ICP Assay NIST SRM 3158 Lot Number: 151215

Assay Method #2 **10001 ± 58 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/(u_{char i}^2)))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char i}^2))]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an UPLA-Filtered Clean Room. An UPLA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.000200	M Eu < 0.000200	O Na < 0.002479	M Se < 0.011019	O Zn < 0.002288
O Al < 0.004184	O Fe < 0.002824	M Nb < 0.000200	O Si < 0.003744	M Zr < 0.000200
M As < 0.002003	M Ga < 0.000200	M Nd < 0.000200	M Sm < 0.000200	
O Au < 0.002824	M Gd < 0.000200	M Ni < 0.001717	M Sn < 0.000601	
O B < 0.004184	M Ge < 0.000801	M Os < 0.000198	O Sr < 0.000313	
M Ba < 0.000400	M Hf < 0.000200	O P < 0.010460	M Ta < 0.000200	
O Be < 0.000104	M Hg < 0.000794	M Pb < 0.000807	M Tb < 0.000200	
M Bi < 0.005209	M Ho < 0.000200	M Pd < 0.000400	M Te < 0.005008	
O Ca < 0.002426	M In < 0.000200	M Pr < 0.000200	M Th < 0.000200	
M Cd < 0.001312	M Ir < 0.000198	M Pt < 0.000801	O Ti < 0.001255	
M Ce < 0.000200	O K < 0.006150	M Rb < 0.000200	s Tl <	
M Co < 0.000601	M La < 0.000200	M Re < 0.000200	M Tm < 0.000200	
M Cr < 0.000801	O Li < 0.000177	M Rh < 0.000200	M U < 0.000200	
M Cs < 0.003606	M Lu < 0.000200	M Ru < 0.000397	M V < 0.002203	
M Cu < 0.001001	O Mg < 0.000527	O S < 0.015690	M W < 0.000601	
M Dy < 0.000200	M Mn < 0.000801	M Sb < 0.000400	M Y < 0.000200	
M Er < 0.000200	M Mo < 0.001202	O Sc < 0.000711	M Yb < 0.000200	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 204.38 +1 6 Ti(H₂O)₆³⁺

Chemical Compatibility - Soluble in HCl, HNO₃, and H₂SO₄. Stable with most metals and inorganic anions. The sulfite, thiocyanate and oxalate are moderately soluble; the phosphate and arsenite are slightly soluble and the sulfide is insoluble.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO₃ / LDPE container.

Ti Containing Samples (Preparation and Solution) -Metal (Best dissolved in HNO₃ which forms chiefly the Ti³⁺ ion.); Oxide (The thallos oxide is readily soluble in water. The thallic oxide requires high levels of acid); Ores (Carbonate fusion in PtO followed by HCl dissolution); Organic Matrices (Sulfuric/peroxide digestion or dry ash and dissolution in HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 205 amu	2 ppt	N/A	189Os 16O
ICP-OES 190.864 nm	0.04 / 0.004 µg/mL	1	V, Ti
ICP-OES 276.787 nm	0.1 / 0.01 µg/mL	1	Ta, V, Fe, Cr
ICP-OES 351.924 nm	0.2 / 0.02 µg/mL	1	Th, Ce, Zr

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

April 08, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **April 08, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGV10
Lot Number: R2-V688296
Matrix: 7% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Vanadium
Starting Material: Vanadium pentoxide
Starting Material Lot#: 1782
Starting Material Purity: 99.9907%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10026 ± 30 µg/mL
Density: 1.105 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **10025 ± 56 µg/mL**
ICP Assay NIST SRM 3165 Lot Number: 160906

Assay Method #2 **10027 ± 30 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char i}^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.000510	M Eu < 0.000110	M Na < 0.095000	M Se < 0.002300	M Zn < 0.008900
O Al < 0.051000	O Fe < 0.350000	M Nb < 0.000710	O Si < 0.260000	M Zr < 0.002500
M As < 0.000410	M Ga < 0.007100	M Nd < 0.000210	M Sm < 0.000110	
M Au < 0.000410	M Gd < 0.000110	M Ni < 0.011000	M Sn < 0.003300	
M B < 0.006000	M Ge < 0.000110	M Os < 0.000410	M Sr < 0.001400	
M Ba < 0.001800	M Hf < 0.000110	O P < 0.120000	M Ta < 0.000110	
M Be < 0.000110	M Hg < 0.000310	M Pb < 0.002300	M Tb < 0.000110	
M Bi < 0.000610	M Ho < 0.000110	M Pd < 0.000610	M Te < 0.000610	
M Ca < 0.180000	M In < 0.000110	M Pr < 0.000110	M Th < 0.000210	
M Cd < 0.000410	M Ir < 0.000110	M Pt < 0.000410	M Ti < 0.021000	
M Ce < 0.000310	M K < 0.400000	M Rb < 0.000410	M Tl < 0.000110	
M Co < 0.001100	M La < 0.000110	M Re < 0.000110	M Tm < 0.000110	
O Cr < 0.190000	M Li < 0.001400	M Rh < 0.000110	M U < 0.000310	
M Cs < 0.005700	M Lu < 0.000110	M Ru < 0.000410	s V <	
M Cu < 0.001800	M Mg < 0.009200	n S <	M W < 0.003100	
M Dy < 0.000110	M Mn < 0.008700	M Sb < 0.076000	M Y < 0.000110	
M Er < 0.000110	M Mo < 0.086000	M Sc < 0.000310	M Yb < 0.000110	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 50.94 +5 6 H₂V10O₂₈-

Chemical Compatibility -Soluble in HCl, HNO₃, H₂SO₄, HF, H₃PO₄ and strong basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

V Containing Samples (Preparation and Solution) -Metal (Fusion with NaOH or KOH in NiO or Na₂CO₃ / KNO₃); Oxides (V₂O₃ - use HCl, V₂O₄ - use HCl or HNO₃, V₂O₅ - use concentrated acids); Ores (Na₂CO₃ / KNO₃ in PtO caution - nitrates attack Pto followed by water extraction of fuseate); Organic Matrices (Ash at 450 EC followed by dissolving according to V₂O₅ above).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 51 amu	4 ppt	N/A	34S16O1H, 35Cl16O, 38Ar13C, 36Ar15N, 36Ar14N1H, 37Cl14N,36S15N, 33S18O, 34S17O, 102Ru+2,02Pd+2
ICP-OES 290.882 nm	0.008 / 0.0008 µg/mL	1	Hf, Nb
ICP-OES 292.402 nm	0.006 / 0.001 µg/mL	1	Th
ICP-OES 309.311 nm	0.005 / 0.001 µg/mL	1	Mg, U, Th

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 01, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **March 01, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGZN10
 Lot Number: P2-ZN686137
 Matrix: 2% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Zinc
 Starting Material: Zn Shot
 Starting Material Lot#: 2201
 Starting Material Purity: 99.9993%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10040 ± 30 µg/mL
Density: 1.033 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10009 ± 54 µg/mL ICP Assay NIST SRM 3168a Lot Number: 120629
Assay Method #2	10049 ± 33 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #3	10041 ± 28 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

u_{char} = $[\sum((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.003057	M Eu < 0.000509	O Na < 0.001874	M Se < 0.023441	s Zn <
O Al < 0.005720	O Fe < 0.006348	M Nb < 0.000509	O Si < 0.057200	M Zr < 0.000509
M As < 0.003057	M Ga < 0.007134	M Nd < 0.000509	M Sm < 0.000509	
M Au < 0.000510	M Gd < 0.000509	M Ni < 0.000509	M Sn < 0.000509	
O B < 0.017160	M Ge < 0.003057	M Os < 0.000510	M Sr < 0.000509	
M Ba < 0.000509	M Hf < 0.000509	O P < 0.057200	M Ta < 0.000509	
M Be < 0.000509	M Hg < 0.001021	O Pb < 0.023870	M Tb < 0.000509	
M Bi < 0.005095	M Ho < 0.000509	M Pd < 0.002038	M Te < 0.023441	
O Ca < 0.033793	M In < 0.000509	M Pr < 0.000509	M Th < 0.000509	
O Cd < 0.003924	M Ir < 0.000510	M Pt < 0.000509	M Ti < 0.000509	
M Ce < 0.000509	O K < 0.001499	M Rb < 0.002038	M Tl < 0.009172	
M Co < 0.000509	M La < 0.000509	M Re < 0.000509	M Tm < 0.000509	
O Cr < 0.001549	O Li < 0.000457	M Rh < 0.000509	M U < 0.000509	
M Cs < 0.000509	M Lu < 0.000509	M Ru < 0.006129	M V < 0.000509	
O Cu < 0.010296	O Mg < 0.000349	O S < 0.034320	M W < 0.001019	
M Dy < 0.000509	M Mn < 0.000509	M Sb < 0.001019	M Y < 0.000509	
M Er < 0.000509	M Mo < 0.000509	M Sc < 0.000509	M Yb < 0.000509	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 65.39 +2 4 Zn(OH)(aq)1+

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media forming insoluble carbonate and hydroxide. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Zn Containing Samples (Preparation and Solution) -Metal (soluble in HNO₃); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO₃); Organic based (dry ash at 4500C and dissolve ash in HCl) (sulfuric/peroxide acid digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 66 amu	7 ppt	N/A	50Ti16O,50Cr16O, 50V16O, 34S16O2, 32S16O18O, 32S17O2, 33S16O17O, 32S34S, 33S2
ICP-OES 202.548 nm	0.004/0.0002 µg/mL	1	Nb, Cu, Co, Hf
ICP-OES 206.200 nm	0.006/0.0006 µg/mL	1	Sb, Ta, Bi, Os
ICP-OES 213.856 nm	0.002/0.0004 µg/mL	1	Ni, Cu, V

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 05, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **December 05, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director





Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B
Total Metals

MW-28_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-01 D SDG: 21I0294

Sampled: 09/20/21 10:10 Prepared: 10/06/21 13:56 File ID: XDT_m1211007-185

% Solids: 0.00 Preparation: REN EPA 600/4-79-020.4.1.4.HNO3 Analyzed: 10/08/21 03:52
matrix

Batch: BJJ0158 Sequence: SJJ0139 Initial/Final: 25 mL / 25 mL

Instrument: ICPMS1 Calibration: EJ00031

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron-54	17100	1	18.2	36.0	



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B
Dissolved Metals

MW-28_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-02 A SDG: 21I0294

Sampled: 09/20/21 10:10 Prepared: 10/07/21 11:34 File ID: XDT_m1211012-138

% Solids: 0.00 Preparation: REN EPA 600/4-79-020.4.1.4.HNO3 Analyzed: 10/13/21 02:52
matrix

Batch: BJJ0192 Sequence: SJJ0168 Initial/Final: 25 mL / 25 mL

Instrument: ICPMS1 Calibration: EJ00039

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron-54, Dissolved	17300	1	18.2	36.0	
7439-92-1	Lead-208, Dissolved	<0.100	1	0.0513	0.100	U



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B
Total Metals

MW-24_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-03 D SDG: 21I0294

Sampled: 09/20/21 11:11 Prepared: 10/06/21 13:56 File ID: XDT_m1211007-186

% Solids: 0.00 Preparation: REN EPA 600/4-79-020.4.1.4.HNO3 Analyzed: 10/08/21 03:57
matrix

Batch: BJJ0158 Sequence: SJJ0139 Initial/Final: 25 mL / 25 mL

Instrument: ICPMS1 Calibration: EJ00031

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron-54	5850	1	18.2	36.0	



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B
Dissolved Metals

MW-24_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-04 A SDG: 21I0294

Sampled: 09/20/21 11:11 Prepared: 10/07/21 11:34 File ID: XDT_m1211012-153

% Solids: 0.00 Preparation: REN EPA 600/4-79-020.4.1.4.HNO3 Analyzed: 10/13/21 04:18
matrix

Batch: BJJ0192 Sequence: SJJ0168 Initial/Final: 25 mL / 25 mL

Instrument: ICPMS1 Calibration: EJ00039

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron-54, Dissolved	5930	1	18.2	36.0	
7439-92-1	Lead-208, Dissolved	<0.100	1	0.0513	0.100	U



Form I
INORGANIC ANALYSIS DATA SHEET

MW-60_092021

EPA 6020B

Total Metals

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-05 D SDG: 21I0294

Sampled: 09/20/21 11:30 Prepared: 10/06/21 13:56 File ID: XDT_m1211012-154

% Solids: 0.00 Preparation: REN EPA 600/4-79-020.4.1.4.HNO3 Analyzed: 10/13/21 04:22

Batch: BJJ0158 Sequence: SJJ0168 Initial/Final: 25 mL / 25 mL

Instrument: ICPMS1 Calibration: EJ00039

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron-54	6360	10	182	360	D



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B
Dissolved Metals

MW-60_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-06 A SDG: 21I0294

Sampled: 09/20/21 11:30 Prepared: 10/07/21 11:34 File ID: XDT_m1211012-165

% Solids: 0.00 Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 Analyzed: 10/13/21 05:23
matrix

Batch: BJJ0192 Sequence: SJJ0168 Initial/Final: 25 mL / 25 mL

Instrument: ICPMS1 Calibration: EJ00039

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron-54, Dissolved	6510	10	182	360	D
7439-92-1	Lead-208, Dissolved	<1.00	10	0.513	1.00	U



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B
Total Metals

MW-55_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-07 D SDG: 21I0294
Sampled: 09/20/21 12:29 Prepared: 10/06/21 13:56 File ID: XDT_m1211012-166
% Solids: 0.00 Preparation: REN EPA 600/4-79-020.4.1.4.HNO3 Analyzed: 10/13/21 05:27
Batch: BJJ0158 Sequence: SJJ0168 Initial/Final: 25 mL / 25 mL
Instrument: ICPMS1 Calibration: EJ00039

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron-54	<360	10	182	360	U



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B
Dissolved Metals

MW-55_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-08 A SDG: 21I0294

Sampled: 09/20/21 12:29 Prepared: 10/07/21 11:34 File ID: XDT_m1211012-167

% Solids: 0.00 Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 Analyzed: 10/13/21 05:32
matrix

Batch: BJJ0192 Sequence: SJJ0168 Initial/Final: 25 mL / 25 mL

Instrument: ICPMS1 Calibration: EJ00039

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron-54, Dissolved	<360	10	182	360	U
7439-92-1	Lead-208, Dissolved	<1.00	10	0.513	1.00	U



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B
Total Metals

MW-42_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-09 D SDG: 21I0294

Sampled: 09/20/21 12:35 Prepared: 10/06/21 13:56 File ID: XDT_m1211012-168

% Solids: 0.00 Preparation: REN EPA 600/4-79-020.4.1.4.HNO3 Analyzed: 10/13/21 05:37
matrix

Batch: BJJ0158 Sequence: SJJ0168 Initial/Final: 25 mL / 25 mL

Instrument: ICPMS1 Calibration: EJ00039

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron-54	<360	10	182	360	U



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B
Dissolved Metals

MW-42_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-10 A SDG: 21I0294

Sampled: 09/20/21 12:35 Prepared: 10/07/21 11:34 File ID: XDT_m1211012-170

% Solids: 0.00 Preparation: REN EPA 600/4-79-020.4.1.4.HNO3 Analyzed: 10/13/21 05:48
matrix

Batch: BJJ0192 Sequence: SJJ0168 Initial/Final: 25 mL / 25 mL

Instrument: ICPMS1 Calibration: EJ00039

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron-54, Dissolved	<360	10	182	360	U
7439-92-1	Lead-208, Dissolved	<1.00	10	0.513	1.00	U



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 6020B
Total Metals

MW-54_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-11 D SDG: 21I0294

Sampled: 09/20/21 13:54 Prepared: 10/06/21 13:56 File ID: XDT_m1211012-171

% Solids: 0.00 Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 Analyzed: 10/13/21 05:52
matrix

Batch: BJJ0158 Sequence: SJJ0168 Initial/Final: 25 mL / 25 mL

Instrument: ICPMS1 Calibration: EJ00039

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron-54	253	10	182	360	J, D



Form I
INORGANIC ANALYSIS DATA SHEET

MW-54_092021

EPA 6020B

Dissolved Metals

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-12 A SDG: 21I0294

Sampled: 09/20/21 13:54 Prepared: 10/07/21 11:34 File ID: XDT_m1211012-172

% Solids: 0.00 Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 Analyzed: 10/13/21 05:57

Batch: BJJ0192 Sequence: SJJ0168 Initial/Final: 25 mL / 25 mL

Instrument: ICPMS1 Calibration: EJ00039

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron-54, Dissolved	249	10	182	360	J, D
7439-92-1	Lead-208, Dissolved	<1.00	10	0.513	1.00	U



PREPARATION BATCH SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Batch: BJJ0158

Batch Matrix: Water

Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

SAMPLE NAME	LAB SAMPLE ID	LAB FILE ID	DATE PREPARED	OBSERVATIONS
MW-28_092021	21I0294-01	XDT_m1211007-185	10/06/21 13:56	
MW-24_092021	21I0294-03	XDT_m1211007-186	10/06/21 13:56	
MW-60_092021	21I0294-05	XDT_m1211012-154	10/06/21 13:56	
MW-55_092021	21I0294-07	XDT_m1211012-166	10/06/21 13:56	
MW-42_092021	21I0294-09	XDT_m1211012-168	10/06/21 13:56	
MW-54_092021	21I0294-11	XDT_m1211012-171	10/06/21 13:56	
Blank	BJJ0158-BLK1	XDT_m1211007-116	10/06/21 13:56	
LCS	BJJ0158-BS1	XDT_m1211007-117	10/06/21 13:56	



PREPARATION BATCH SUMMARY

EPA 6020B

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Batch:	<u>BJJ0192</u>	Batch Matrix:	<u>Water</u>
		Preparation:	<u>REN EPA 600/4-79-020 4.1.4 HNO3 matrix</u>

SAMPLE NAME	LAB SAMPLE ID	LAB FILE ID	DATE PREPARED	OBSERVATIONS
MW-28_092021	21I0294-02	XDT_m1211012-138	10/07/21 11:34	
MW-24_092021	21I0294-04	XDT_m1211012-153	10/07/21 11:34	
MW-60_092021	21I0294-06	XDT_m1211012-165	10/07/21 11:34	
MW-55_092021	21I0294-08	XDT_m1211012-167	10/07/21 11:34	
MW-42_092021	21I0294-10	XDT_m1211012-170	10/07/21 11:34	
MW-54_092021	21I0294-12	XDT_m1211012-172	10/07/21 11:34	
Blank	BJJ0192-BLK1	XDT_m1211011-095	10/07/21 11:34	
LCS	BJJ0192-BS1	XDT_m1211011-096	10/07/21 11:34	
MW-28_092021	BJJ0192-DUP3	XDT_m1211012-139	10/07/21 11:34	Added 10/13/2021 by MCB
MW-28_092021	BJJ0192-MS3	XDT_m1211012-140	10/07/21 11:34	Added 10/13/2021 by MCB
MW-28_092021	BJJ0192-MSD3	XDT_m1211012-141	10/07/21 11:34	Added 10/13/2021 by MCB



Form I
METHOD BLANK DATA SHEET
EPA 6020B
Total Metals

Blank

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Batch: BJJ0158

Laboratory ID: BJJ0158-BLK1

Prepared: 10/06/21 13:56

Matrix: Water

Preparation: REN EPA 600/4-79-020 4

Analyzed: 10/07/21 22:15

Sequence: SJJ0139

Calibration: EJ00031

Instrument: ICPMS1

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron-54	ND	1	18.2	36.0	U
7439-89-6	Iron-57	ND	1	6.63	36.0	U



Form I
METHOD BLANK DATA SHEET
EPA 6020B
Dissolved Metals

Blank

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Batch: BJJ0192

Laboratory ID: BJJ0192-BLK1

Prepared: 10/07/21 11:34

Matrix: Water

Preparation: REN EPA 600/4-79-020 4

Analyzed: 10/12/21 00:05

Sequence: SJJ0155

Calibration: EJ00033

Instrument: ICPMS1

CAS NO.	Analyte	Concentration (ug/L)	Dilution Factor	MDL	MRL	Q
7439-89-6	Iron-54	ND	1	18.2	36.0	U
7439-89-6	Iron-57	ND	1	6.63	20.0	U
7439-92-1	Lead-208	ND	1	0.0513	0.100	U



LCS / LCS DUPLICATE RECOVERY

EPA 6020B

Total Metals

Laboratory: Analytical Resources, LLC SDG: 21I0294
Client: GeoEngineers Project: South State Street PRDI
Matrix: Water Analyzed: 10/07/21 22:19
Batch: BJJ0158 Laboratory ID: BJJ0158-BS1
Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 matrix Sequence Name: LCS
Initial/Final: 25 mL / 25 mL

COMPOUND	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	Q	LCS % REC. #	QC LIMITS REC.
Iron-54	5000	5050		101	80 - 120
Iron-57	5000	5010		100	80 - 120

* Indicates values outside of QC limits



LCS / LCS DUPLICATE RECOVERY

EPA 6020B

Dissolved Metals

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>10/12/21 00:09</u>
Batch:	<u>BJJ0192</u>	Laboratory ID:	<u>BJJ0192-BS1</u>
Preparation:	<u>REN EPA 600/4-79-020 4.1.4 HNO3 matrix</u>	Sequence Name:	<u>LCS</u>
Initial/Final:	<u>25 mL / 25 mL</u>		

COMPOUND	SPIKE ADDED (ug/L)	LCS CONCENTRATION (ug/L)	Q	LCS % REC. #	QC LIMITS REC.
Iron-54 (dissolved)	5000	5170		103	80 - 120
Iron-57 (dissolved)	5000	5200		104	80 - 120
Lead-208 (dissolved)	25.0	26.2		105	80 - 120

* Indicates values outside of QC limits



DUPLICATES

EPA 6020B

Dissolved Metals

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: BJJ0192-DUP3

Batch: BJJ0192

Lab Source ID: 21I0294-02

Preparation: REN EPA 600/4-79-020 4.1.4 HNO3 matrix

Initial/Final: 25 mL / 25 mL

Source Sample Name: MW-28_092021

% Solids:

ANALYTE	CONTROL LIMIT	SAMPLE CONCENTRATION (ug/L)	C	DUPLICATE CONCENTRATION (ug/L)	C	RPD %	Q
Iron-54 (dissolved)	20	17300		17400		0.367	
Lead-208 (dissolved)	20	ND	U	ND	U		

*: Values outside of QC limits

L: Analyte concentration is <=5 times the reporting limit and the replicate control limit defaults to Dup = +/-RL instead of 20% RPD



MS / MS DUPLICATE RECOVERY
EPA 6020B
Dissolved Metals

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>10/13/21 03:02</u>
Batch:	<u>BJJ0192</u>	Laboratory ID:	<u>BJJ0192-MS3</u>
Preparation:	<u>REN EPA 600/4-79-020 4.1.4 HNO3 matrix</u>	Sequence Name:	<u>Matrix Spike</u>
Initial/Final:	<u>25 mL / 25 mL</u>	Source Sample:	<u>MW-28_092021</u>

COMPOUND	SPIKE ADDED (ug/L)	SAMPLE CONCENTRATION (ug/L)	Q	MS CONCENTRATION (ug/L)	Q	MS % REC. #	QC LIMITS REC.
Iron-54 (dissolved)	5000	17300		21000	HC	73.7 *	75 - 125
Lead-208 (dissolved)	25.0	ND	U	23.8		95.3	75 - 125

* Values outside of QC limits



MS / MS DUPLICATE RECOVERY
EPA 6020B
Dissolved Metals

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>21I0294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>10/13/21 03:08</u>
Batch:	<u>BJJ0192</u>	Laboratory ID:	<u>BJJ0192-MSD3</u>
Preparation:	<u>REN EPA 600/4-79-020 4.1.4 HNO3 matrix</u>	Sequence Name:	<u>Matrix Spike Dup</u>
Initial/Final:	<u>25 mL / 25 mL</u>	Source Sample:	<u>MW-28_092021</u>

COMPOUND	SPIKE ADDED (ug/L)	MSD CONCENTRATION (ug/L)	Q	MSD % REC. #	% RPD #	QC LIMITS	
						RPD	REC.
Iron-54 (dissolved)	5000	21200		76.1	0.578	20	75 - 125
Lead-208 (dissolved)	25.0	24.1		96.5	1.26	20	75 - 125

* Values outside of QC limits



INITIAL CALIBRATION DATA

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00031

Instrument: ICPMS1

Calibration Date: 10/07/2021 13:01

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
		RF		RF		RF		RF		RF		RF
Iron-54	0	0	36	6591.528	1000	3168.536	2000	3112.615	5000	3037.556	10000	2921.799
Iron-57	0	0	36	2404.194	1000	1342.077	2000	1309.514	5000	1277.838	10000	1247.693



INITIAL CALIBRATION DATA

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00033

Instrument: ICPMS1

Calibration Date: 10/11/2021 13:20

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
		RF		RF		RF		RF		RF		RF
Iron-54, Dissolved	0	0	36	4969.389	1000	2388.366	2000	2304.296	5000	2238.86	10000	2161.386
Iron-57, Dissolved	0	0	36	1734.306	1000	966.716	2000	943.944	5000	926.3338	10000	904.8272
Lead-208, Dissolved	0	0	0.1	126000	10	115327.6	20	114093.7	50	112727.1	100	109218.7



INITIAL CALIBRATION DATA

EPA 6020B

Laboratory: Analytical Resources, LLC SDG: 2110294
Client: GeoEngineers Project: South State Street PRDI
Calibration: EJ00033 Instrument: ICPMS1
Calibration Date: 10/11/2021 13:20

COMPOUND	Mean RF	RF RSD	Linear COD	Quad COD	COD Limit	Q
Iron-54, Dissolved	2343.716	67.3	0.9997		0.998	
Iron-57, Dissolved	912.6878	60.3	0.9999		0.998	
Lead-208, Dissolved	96227.84	49.3	0.9997		0.998	



INITIAL CALIBRATION DATA

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00039

Instrument: ICPMS1

Calibration Date: 10/12/2021 15:04

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
		RF		RF		RF		RF		RF		RF
Iron-54	0	0	36	5159.556	1000	2686.998	2000	2556.046	5000	2463.926	10000	2403.505
Iron-57	0	0	36	1848	1000	1046.135	2000	1060.62	5000	1009.581	10000	988.9398
Iron-54, Dissolved	0	0	36	5159.556	1000	2686.998	2000	2556.046	5000	2463.926	10000	2403.505
Iron-57, Dissolved	0	0	36	1848	1000	1046.135	2000	1060.62	5000	1009.581	10000	988.9398
Lead-208, Dissolved	0	0	0.1	132030	10	117508.3	20	116865	50	114952.6	100	112760.7



INITIAL CALIBRATION DATA

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00039

Instrument: ICPMS1

Calibration Date: 10/12/2021 15:04

COMPOUND	Mean RF	RF RSD	Linear COD	Quad COD	COD Limit	Q
Iron-54	2545.005	64.2	0.9998		0.998	
Iron-57	992.2126	59.2	0.9998		0.998	
Iron-54, Dissolved	2545.005	64.2	0.9998		0.998	
Iron-57, Dissolved	992.2126	59.2	0.9998		0.998	
Lead-208, Dissolved	99019.42	49.5	0.9999		0.998	



**INITIAL AND CONTINUING
CALIBRATION CHECK
EPA 6020B**

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00031

Control Limit: +/- 10.00%

Sequence: SJJ0139

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SJJ0139-ICV1	Iron-54	5000.0	5040	101	ug/L	EPA 6020B
	Iron-57	5000.0	4920	98.5	ug/L	EPA 6020B
SJJ0139-CCV1	Iron-54	5000.0	5070	101	ug/L	EPA 6020B
	Iron-57	5000.0	4990	99.7	ug/L	EPA 6020B
SJJ0139-CCV2	Iron-54	5000.0	5100	102	ug/L	EPA 6020B
	Iron-57	5000.0	5020	100	ug/L	EPA 6020B
SJJ0139-CCV3	Iron-54	5000.0	5060	101	ug/L	EPA 6020B
	Iron-57	5000.0	5010	100	ug/L	EPA 6020B
SJJ0139-CCV4	Iron-54	5000.0	5060	101	ug/L	EPA 6020B
	Iron-57	5000.0	5050	101	ug/L	EPA 6020B
SJJ0139-CCV5	Iron-54	5000.0	5040	101	ug/L	EPA 6020B
	Iron-57	5000.0	4990	99.7	ug/L	EPA 6020B
SJJ0139-CCV6	Iron-54	5000.0	5080	102	ug/L	EPA 6020B
	Iron-57	5000.0	4970	99.4	ug/L	EPA 6020B
SJJ0139-CCV7	Iron-54	5000.0	5090	102	ug/L	EPA 6020B
	Iron-57	5000.0	4990	99.9	ug/L	EPA 6020B
SJJ0139-CCV8	Iron-54	5000.0	5030	101	ug/L	EPA 6020B
	Iron-57	5000.0	4940	98.8	ug/L	EPA 6020B
SJJ0139-CCV9	Iron-54	5000.0	5050	101	ug/L	EPA 6020B
	Iron-57	5000.0	5030	101	ug/L	EPA 6020B
SJJ0139-CCVA	Iron-54	5000.0	5060	101	ug/L	EPA 6020B
	Iron-57	5000.0	5000	100	ug/L	EPA 6020B
SJJ0139-CCVB	Iron-54	5000.0	5060	101	ug/L	EPA 6020B
	Iron-57	5000.0	5010	100	ug/L	EPA 6020B
SJJ0139-CCVC	Iron-54	5000.0	5080	102	ug/L	EPA 6020B
	Iron-57	5000.0	5010	100	ug/L	EPA 6020B
SJJ0139-CCVD	Iron-54	5000.0	5080	102	ug/L	EPA 6020B
	Iron-57	5000.0	5040	101	ug/L	EPA 6020B
SJJ0139-CCVE	Iron-54	5000.0	5160	103	ug/L	EPA 6020B
	Iron-57	5000.0	5150	103	ug/L	EPA 6020B
SJJ0139-CCVF	Iron-54	5000.0	5100	102	ug/L	EPA 6020B
	Iron-57	5000.0	5040	101	ug/L	EPA 6020B
SJJ0139-CCVG	Iron-54	5000.0	5010	100	ug/L	EPA 6020B
	Iron-57	5000.0	4890	97.8	ug/L	EPA 6020B



INITIAL AND CONTINUING CALIBRATION CHECK

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00031

Control Limit: +/- 10.00%

Sequence: SJJ0139

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SJJ0139-CCVH	Iron-54	5000.0	4940	98.8	ug/L	EPA 6020B
	Iron-57	5000.0	4870	97.4	ug/L	EPA 6020B
SJJ0139-CCVI	Iron-54	5000.0	4940	98.8	ug/L	EPA 6020B
	Iron-57	5000.0	4860	97.2	ug/L	EPA 6020B
SJJ0139-CCVJ	Iron-54	5000.0	5180	104	ug/L	EPA 6020B
	Iron-57	5000.0	5050	101	ug/L	EPA 6020B
SJJ0139-CCVK	Iron-54	5000.0	5390	108	ug/L	EPA 6020B
	Iron-57	5000.0	5250	105	ug/L	EPA 6020B

* Values outside of QC limits



**INITIAL AND CONTINUING
CALIBRATION CHECK
EPA 6020B**

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00033

Control Limit: +/- 10.00%

Sequence: SJJ0155

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SJJ0155-ICV1	Iron-54 (dissolved)	5000.0	5110	102	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5050	101	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	50.4	101	ug/L	EPA 6020B
SJJ0155-CCV1	Iron-54 (dissolved)	5000.0	5060	101	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5050	101	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	51.2	102	ug/L	EPA 6020B
SJJ0155-CCV2	Iron-54 (dissolved)	5000.0	5050	101	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	4980	99.6	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	50.7	101	ug/L	EPA 6020B
SJJ0155-CCV3	Iron-54 (dissolved)	5000.0	5530	111	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5540	111	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	55.9	112	ug/L	EPA 6020B
SJJ0155-CCV4	Iron-54 (dissolved)	5000.0	5400	108	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5410	108	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	53.6	107	ug/L	EPA 6020B
SJJ0155-CCV5	Iron-54 (dissolved)	5000.0	5490	110	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5530	111	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	54.4	109	ug/L	EPA 6020B
SJJ0155-CCV6	Iron-54 (dissolved)	5000.0	5440	109	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5360	107	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	54.1	108	ug/L	EPA 6020B
SJJ0155-CCV7	Iron-54 (dissolved)	5000.0	5600	112	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5500	110	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	54.6	109	ug/L	EPA 6020B
SJJ0155-CCV9	Iron-54 (dissolved)	5000.0	5220	104	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5230	105	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	52.5	105	ug/L	EPA 6020B
SJJ0155-CCVA	Iron-54 (dissolved)	5000.0	5370	107	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5370	107	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	54.9	110	ug/L	EPA 6020B
SJJ0155-CCVB	Iron-54 (dissolved)	5000.0	5650	113	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5620	112	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	56.6	113	ug/L	EPA 6020B
SJJ0155-CCVC	Iron-54 (dissolved)	5000.0	5460	109	ug/L	EPA 6020B



INITIAL AND CONTINUING CALIBRATION CHECK

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00033

Control Limit: +/- 10.00%

Sequence: SJJ0155

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SJJ0155-CCVC	Iron-57 (dissolved)	5000.0	5420	108	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	55.6	111	ug/L	EPA 6020B
SJJ0155-CCVD	Iron-54 (dissolved)	5000.0	5460	109	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5430	109	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	55.8	112	ug/L	EPA 6020B
SJJ0155-CCVE	Iron-54 (dissolved)	5000.0	5490	110	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5490	110	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	55.9	112	ug/L	EPA 6020B
SJJ0155-CCVF	Iron-54 (dissolved)	5000.0	5640	113	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5620	112	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	56.8	114	ug/L	EPA 6020B
SJJ0155-CCVG	Iron-54 (dissolved)	5000.0	5570	111	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5590	112	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	57.6	115	ug/L	EPA 6020B
SJJ0155-CCVH	Iron-54 (dissolved)	5000.0	5640	113	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5670	113	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	59.4	119	ug/L	EPA 6020B
SJJ0155-CCVI	Iron-54 (dissolved)	5000.0	5430	109	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5350	107	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	50.3	101	ug/L	EPA 6020B

* Values outside of QC limits



**INITIAL AND CONTINUING
CALIBRATION CHECK
EPA 6020B**

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Control Limit: +/- 10.00%

Sequence: SJJ0168

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SJJ0168-ICV1	Iron-54	5000.0	5060	101	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	5060	101	ug/L	EPA 6020B
	Iron-57	5000.0	5020	100	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5020	100	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	51.1	102	ug/L	EPA 6020B
SJJ0168-CCV1	Iron-54	5000.0	4950	99.0	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	4950	99.0	ug/L	EPA 6020B
	Iron-57	5000.0	4910	98.3	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	4910	98.3	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	49.3	98.5	ug/L	EPA 6020B
SJJ0168-CCV2	Iron-54	5000.0	4910	98.2	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	4910	98.2	ug/L	EPA 6020B
	Iron-57	5000.0	4900	98.0	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	4900	98.0	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	50.3	101	ug/L	EPA 6020B
SJJ0168-CCV3	Iron-54	5000.0	4960	99.2	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	4960	99.2	ug/L	EPA 6020B
	Iron-57	5000.0	4950	99.0	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	4950	99.0	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	50.6	101	ug/L	EPA 6020B
SJJ0168-CCV4	Iron-54	5000.0	4980	99.6	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	4980	99.6	ug/L	EPA 6020B
	Iron-57	5000.0	4940	98.8	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	4940	98.8	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	51.3	103	ug/L	EPA 6020B
SJJ0168-CCV5	Iron-54	5000.0	4890	97.8	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	4890	97.8	ug/L	EPA 6020B
	Iron-57	5000.0	4860	97.3	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	4860	97.3	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	51.9	104	ug/L	EPA 6020B
SJJ0168-CCV6	Iron-54	5000.0	4940	98.8	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	4940	98.8	ug/L	EPA 6020B
	Iron-57	5000.0	4990	99.7	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	4990	99.7	ug/L	EPA 6020B



**INITIAL AND CONTINUING
CALIBRATION CHECK
EPA 6020B**

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Control Limit: +/- 10.00%

Sequence: SJJ0168

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SJJ0168-CCV6	Lead-208 (dissolved)	50.000	52.0	104	ug/L	EPA 6020B
SJJ0168-CCV7	Iron-54	5000.0	4910	98.2	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	4910	98.2	ug/L	EPA 6020B
	Iron-57	5000.0	4950	99.0	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	4950	99.0	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	50.9	102	ug/L	EPA 6020B
SJJ0168-CCV8	Iron-54	5000.0	4910	98.3	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	4910	98.3	ug/L	EPA 6020B
	Iron-57	5000.0	4920	98.5	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	4920	98.5	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	52.9	106	ug/L	EPA 6020B
SJJ0168-CCV9	Iron-54	5000.0	4830	96.6	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	4830	96.6	ug/L	EPA 6020B
	Iron-57	5000.0	4810	96.2	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	4810	96.2	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	52.0	104	ug/L	EPA 6020B
SJJ0168-CCVA	Iron-54	5000.0	4940	98.8	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	4940	98.8	ug/L	EPA 6020B
	Iron-57	5000.0	4890	97.7	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	4890	97.7	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	51.8	104	ug/L	EPA 6020B
SJJ0168-CCVB	Iron-54	5000.0	5020	100	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	5020	100	ug/L	EPA 6020B
	Iron-57	5000.0	5000	100	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5000	100	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	52.6	105	ug/L	EPA 6020B
SJJ0168-CCVC	Iron-54	5000.0	4990	99.7	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	4990	99.7	ug/L	EPA 6020B
	Iron-57	5000.0	4970	99.4	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	4970	99.4	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	53.3	107	ug/L	EPA 6020B
SJJ0168-CCVD	Iron-54	5000.0	4930	98.6	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	4930	98.6	ug/L	EPA 6020B
	Iron-57	5000.0	4910	98.3	ug/L	EPA 6020B



**INITIAL AND CONTINUING
CALIBRATION CHECK
EPA 6020B**

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Control Limit: +/- 10.00%

Sequence: SJJ0168

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SJJ0168-CCVD	Iron-57 (dissolved)	5000.0	4910	98.3	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	52.1	104	ug/L	EPA 6020B
SJJ0168-CCVE	Iron-54	5000.0	4930	98.6	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	4930	98.6	ug/L	EPA 6020B
	Iron-57	5000.0	4940	98.8	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	4940	98.8	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	51.8	104	ug/L	EPA 6020B
SJJ0168-CCVF	Iron-54	5000.0	4990	99.8	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	4990	99.8	ug/L	EPA 6020B
	Iron-57	5000.0	5010	100	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5010	100	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	52.7	105	ug/L	EPA 6020B
SJJ0168-CCVG	Iron-54	5000.0	5040	101	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	5040	101	ug/L	EPA 6020B
	Iron-57	5000.0	5060	101	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5060	101	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	47.0	94.0	ug/L	EPA 6020B
SJJ0168-CCVH	Iron-54	5000.0	4970	99.5	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	4970	99.5	ug/L	EPA 6020B
	Iron-57	5000.0	4970	99.5	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	4970	99.5	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	46.4	92.8	ug/L	EPA 6020B
SJJ0168-CCVI	Iron-54	5000.0	5030	101	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	5030	101	ug/L	EPA 6020B
	Iron-57	5000.0	5040	101	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5040	101	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	47.0	94.0	ug/L	EPA 6020B
SJJ0168-CCVJ	Iron-54	5000.0	4920	98.4	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	4920	98.4	ug/L	EPA 6020B
	Iron-57	5000.0	4950	99.0	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	4950	99.0	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	51.2	102	ug/L	EPA 6020B
SJJ0168-CCVK	Iron-54	5000.0	5000	100	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	5000	100	ug/L	EPA 6020B



INITIAL AND CONTINUING CALIBRATION CHECK

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Control Limit: +/- 10.00%

Sequence: SJJ0168

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SJJ0168-CCVK	Iron-57	5000.0	5030	101	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5030	101	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	55.3	111 *	ug/L	EPA 6020B
SJJ0168-CCVL	Iron-54	5000.0	5050	101	ug/L	EPA 6020B
	Iron-54 (dissolved)	5000.0	5050	101	ug/L	EPA 6020B
	Iron-57	5000.0	5100	102	ug/L	EPA 6020B
	Iron-57 (dissolved)	5000.0	5100	102	ug/L	EPA 6020B
	Lead-208 (dissolved)	50.000	53.2	106	ug/L	EPA 6020B

* Values outside of QC limits



INSTRUMENT BLANKS EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00031

Sequence: SJJ0139

Date Analyzed: 10/07/21 13:32

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0139-IBL1	Iron-54	1.02	18.2	36.0	ug/L	
SJJ0139-IBL1	Iron-57	0.584	6.63	36.0	ug/L	
SJJ0139-ICB1	Iron-54	0.064	18.2	36.0	ug/L	
SJJ0139-ICB1	Iron-57	1.04	6.63	36.0	ug/L	
SJJ0139-CCB1	Iron-54	-0.186	18.2	36.0	ug/L	
SJJ0139-CCB1	Iron-57	0.714	6.63	36.0	ug/L	
SJJ0139-IBL2	Iron-54	9.66	18.2	36.0	ug/L	
SJJ0139-IBL2	Iron-57	6.52	6.63	36.0	ug/L	
SJJ0139-IBL3	Iron-54	3.30	18.2	36.0	ug/L	
SJJ0139-IBL3	Iron-57	1.50	6.63	36.0	ug/L	
SJJ0139-CCB2	Iron-54	0.362	18.2	36.0	ug/L	
SJJ0139-CCB2	Iron-57	0.322	6.63	36.0	ug/L	
SJJ0139-IBL4	Iron-54	0.898	18.2	36.0	ug/L	
SJJ0139-IBL4	Iron-57	-2.53	6.63	36.0	ug/L	
SJJ0139-CCB3	Iron-54	0.357	18.2	36.0	ug/L	
SJJ0139-CCB3	Iron-57	0.783	6.63	36.0	ug/L	
SJJ0139-IBL5	Iron-54	1.11	18.2	36.0	ug/L	
SJJ0139-IBL5	Iron-57	-1.15	6.63	36.0	ug/L	
SJJ0139-CCB4	Iron-54	0.613	18.2	36.0	ug/L	
SJJ0139-CCB4	Iron-57	1.12	6.63	36.0	ug/L	
SJJ0139-IBL6	Iron-54	0.719	18.2	36.0	ug/L	
SJJ0139-IBL6	Iron-57	-3.87	6.63	36.0	ug/L	
SJJ0139-CCB5	Iron-54	3.39	18.2	36.0	ug/L	
SJJ0139-CCB5	Iron-57	1.79	6.63	36.0	ug/L	
SJJ0139-IBL7	Iron-54	1.50	18.2	36.0	ug/L	
SJJ0139-IBL7	Iron-57	-2.24	6.63	36.0	ug/L	
SJJ0139-CCB6	Iron-54	0.925	18.2	36.0	ug/L	
SJJ0139-CCB6	Iron-57	0.047	6.63	36.0	ug/L	
SJJ0139-CCB7	Iron-54	0.772	18.2	36.0	ug/L	
SJJ0139-CCB7	Iron-57	0.506	6.63	36.0	ug/L	
SJJ0139-IBL8	Iron-54	1.04	18.2	36.0	ug/L	
SJJ0139-IBL8	Iron-57	-3.50	6.63	36.0	ug/L	
SJJ0139-CCB8	Iron-54	0.561	18.2	36.0	ug/L	
SJJ0139-CCB8	Iron-57	-2.20	6.63	36.0	ug/L	



INSTRUMENT BLANKS EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00031

Sequence: SJJ0139

Date Analyzed: 10/07/21 20:49

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0139-IBL9	Iron-54	3.00	18.2	36.0	ug/L	
SJJ0139-IBL9	Iron-57	3.14	6.63	36.0	ug/L	
SJJ0139-CCB9	Iron-54	0.372	18.2	36.0	ug/L	
SJJ0139-CCB9	Iron-57	0.056	6.63	36.0	ug/L	
SJJ0139-IBLA	Iron-54	1.42	18.2	36.0	ug/L	
SJJ0139-IBLA	Iron-57	1.38	6.63	36.0	ug/L	
SJJ0139-CCBA	Iron-54	1.05	18.2	36.0	ug/L	
SJJ0139-CCBA	Iron-57	0.837	6.63	36.0	ug/L	
SJJ0139-IBLB	Iron-54	1.92	18.2	36.0	ug/L	
SJJ0139-IBLB	Iron-57	1.92	6.63	36.0	ug/L	
SJJ0139-CCBB	Iron-54	0.099	18.2	36.0	ug/L	
SJJ0139-CCBB	Iron-57	-0.451	6.63	36.0	ug/L	
SJJ0139-IBLC	Iron-54	1.19	18.2	36.0	ug/L	
SJJ0139-IBLC	Iron-57	-2.79	6.63	36.0	ug/L	
SJJ0139-CCBC	Iron-54	0.490	18.2	36.0	ug/L	
SJJ0139-CCBC	Iron-57	-1.16	6.63	36.0	ug/L	
SJJ0139-CCBD	Iron-54	0.439	18.2	36.0	ug/L	
SJJ0139-CCBD	Iron-57	0.128	6.63	36.0	ug/L	
SJJ0139-IBLD	Iron-54	1.16	18.2	36.0	ug/L	
SJJ0139-IBLD	Iron-57	2.70	6.63	36.0	ug/L	
SJJ0139-CCBE	Iron-54	0.458	18.2	36.0	ug/L	
SJJ0139-CCBE	Iron-57	1.10	6.63	36.0	ug/L	
SJJ0139-IBLE	Iron-54	0.774	18.2	36.0	ug/L	
SJJ0139-IBLE	Iron-57	-3.29	6.63	36.0	ug/L	
SJJ0139-CCBF	Iron-54	-0.344	18.2	36.0	ug/L	
SJJ0139-CCBF	Iron-57	-3.28	6.63	36.0	ug/L	
SJJ0139-IBLF	Iron-54	0.183	18.2	36.0	ug/L	
SJJ0139-IBLF	Iron-57	-1.31	6.63	36.0	ug/L	
SJJ0139-IBLG	Iron-54	-0.723	18.2	36.0	ug/L	
SJJ0139-IBLG	Iron-57	-5.70	6.63	36.0	ug/L	
SJJ0139-CCBG	Iron-54	-0.682	18.2	36.0	ug/L	
SJJ0139-CCBG	Iron-57	-3.62	6.63	36.0	ug/L	
SJJ0139-CCBH	Iron-54	0.379	18.2	36.0	ug/L	
SJJ0139-CCBH	Iron-57	0.589	6.63	36.0	ug/L	



INSTRUMENT BLANKS EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00031

Sequence: SJJ0139

Date Analyzed: 10/08/21 03:48

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0139-IBLH	Iron-54	0.654	18.2	36.0	ug/L	
SJJ0139-IBLH	Iron-57	-1.29	6.63	36.0	ug/L	
SJJ0139-IBLI	Iron-54	1.87	18.2	36.0	ug/L	
SJJ0139-IBLI	Iron-57	16.7	6.63	36.0	ug/L	
SJJ0139-CCBI	Iron-54	1.42	18.2	36.0	ug/L	
SJJ0139-CCBI	Iron-57	5.09	6.63	36.0	ug/L	
SJJ0139-IBLJ	Iron-54	4.37	18.2	36.0	ug/L	
SJJ0139-IBLJ	Iron-57	4.21	6.63	36.0	ug/L	
SJJ0139-CCBJ	Iron-54	5.65	18.2	36.0	ug/L	
SJJ0139-CCBJ	Iron-57	4.62	6.63	36.0	ug/L	
SJJ0139-IBLK	Iron-54	8.05	18.2	36.0	ug/L	
SJJ0139-IBLK	Iron-57	3.74	6.63	36.0	ug/L	
SJJ0139-CCBK	Iron-54	8.12	18.2	36.0	ug/L	
SJJ0139-CCBK	Iron-57	3.98	6.63	36.0	ug/L	



INSTRUMENT BLANKS EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00033

Sequence: SJJ0155

Date Analyzed: 10/11/21 13:54

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0155-IBL1	Iron-54 (dissolved)	0.717	18.2	36.0	ug/L	
SJJ0155-IBL1	Iron-57 (dissolved)	0.344	18.2	36.0	ug/L	
SJJ0155-IBL1	Lead-208 (dissolved)	-0.00200	0.0513	0.100	ug/L	
SJJ0155-ICB1	Iron-54 (dissolved)	0.017	18.2	36.0	ug/L	
SJJ0155-ICB1	Iron-57 (dissolved)	-0.034	18.2	36.0	ug/L	
SJJ0155-ICB1	Lead-208 (dissolved)	0.00400	0.0513	0.100	ug/L	
SJJ0155-CCB1	Iron-54 (dissolved)	-0.533	18.2	36.0	ug/L	
SJJ0155-CCB1	Iron-57 (dissolved)	-0.429	18.2	36.0	ug/L	
SJJ0155-CCB1	Lead-208 (dissolved)	0.00	0.0513	0.100	ug/L	
SJJ0155-IBL2	Iron-54 (dissolved)	2.66	18.2	36.0	ug/L	
SJJ0155-IBL2	Iron-57 (dissolved)	1.48	18.2	36.0	ug/L	
SJJ0155-IBL2	Lead-208 (dissolved)	0.0230	0.0513	0.100	ug/L	
SJJ0155-IBL3	Iron-54 (dissolved)	2.21	18.2	36.0	ug/L	
SJJ0155-IBL3	Iron-57 (dissolved)	1.46	18.2	36.0	ug/L	
SJJ0155-IBL3	Lead-208 (dissolved)	0.0170	0.0513	0.100	ug/L	
SJJ0155-IBL4	Iron-54 (dissolved)	0.157	18.2	36.0	ug/L	
SJJ0155-IBL4	Iron-57 (dissolved)	-0.562	18.2	36.0	ug/L	
SJJ0155-IBL4	Lead-208 (dissolved)	0.0100	0.0513	0.100	ug/L	
SJJ0155-CCB2	Iron-54 (dissolved)	2.71	18.2	36.0	ug/L	
SJJ0155-CCB2	Iron-57 (dissolved)	2.13	18.2	36.0	ug/L	
SJJ0155-CCB2	Lead-208 (dissolved)	0.0350	0.0513	0.100	ug/L	
SJJ0155-IBL5	Iron-54 (dissolved)	-0.514	18.2	36.0	ug/L	
SJJ0155-IBL5	Iron-57 (dissolved)	15.4	18.2	36.0	ug/L	
SJJ0155-IBL5	Lead-208 (dissolved)	0.00300	0.0513	0.100	ug/L	
SJJ0155-CCB3	Iron-54 (dissolved)	-1.22	18.2	36.0	ug/L	
SJJ0155-CCB3	Iron-57 (dissolved)	3.59	18.2	36.0	ug/L	
SJJ0155-CCB3	Lead-208 (dissolved)	0.00100	0.0513	0.100	ug/L	
SJJ0155-CCB4	Iron-54 (dissolved)	0.143	18.2	36.0	ug/L	
SJJ0155-CCB4	Iron-57 (dissolved)	-1.89	18.2	36.0	ug/L	
SJJ0155-CCB4	Lead-208 (dissolved)	0.00	0.0513	0.100	ug/L	
SJJ0155-IBL6	Iron-54 (dissolved)	2.34	18.2	36.0	ug/L	
SJJ0155-IBL6	Iron-57 (dissolved)	7.34	18.2	36.0	ug/L	
SJJ0155-IBL6	Lead-208 (dissolved)	0.00400	0.0513	0.100	ug/L	
SJJ0155-CCB5	Iron-54 (dissolved)	1.00	18.2	36.0	ug/L	



INSTRUMENT BLANKS EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00033

Sequence: SJJ0155

Date Analyzed: 10/11/21 18:29

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0155-CCB5	Iron-57 (dissolved)	-2.32	18.2	36.0	ug/L	
SJJ0155-CCB5	Lead-208 (dissolved)	0.00100	0.0513	0.100	ug/L	
SJJ0155-IBL7	Iron-54 (dissolved)	2.23	18.2	36.0	ug/L	
SJJ0155-IBL7	Iron-57 (dissolved)	-4.91	18.2	36.0	ug/L	
SJJ0155-IBL7	Lead-208 (dissolved)	0.00400	0.0513	0.100	ug/L	
SJJ0155-CCB6	Iron-54 (dissolved)	0.135	18.2	36.0	ug/L	
SJJ0155-CCB6	Iron-57 (dissolved)	-5.28	18.2	36.0	ug/L	
SJJ0155-CCB6	Lead-208 (dissolved)	0.00	0.0513	0.100	ug/L	
SJJ0155-IBL8	Iron-54 (dissolved)	2.06	18.2	36.0	ug/L	
SJJ0155-IBL8	Iron-57 (dissolved)	-5.94	18.2	36.0	ug/L	
SJJ0155-IBL8	Lead-208 (dissolved)	0.00400	0.0513	0.100	ug/L	
SJJ0155-CCB7	Iron-54 (dissolved)	0.482	18.2	36.0	ug/L	
SJJ0155-CCB7	Iron-57 (dissolved)	-5.33	18.2	36.0	ug/L	
SJJ0155-CCB7	Lead-208 (dissolved)	0.00100	0.0513	0.100	ug/L	
SJJ0155-CCB9	Iron-54 (dissolved)	1.24	18.2	36.0	ug/L	
SJJ0155-CCB9	Iron-57 (dissolved)	0.031	18.2	36.0	ug/L	
SJJ0155-CCB9	Lead-208 (dissolved)	0.00	0.0513	0.100	ug/L	
SJJ0155-IBLA	Iron-54 (dissolved)	1.33	18.2	36.0	ug/L	
SJJ0155-IBLA	Iron-57 (dissolved)	-1.42	18.2	36.0	ug/L	
SJJ0155-IBLA	Lead-208 (dissolved)	0.00	0.0513	0.100	ug/L	
SJJ0155-CCBA	Iron-54 (dissolved)	1.25	18.2	36.0	ug/L	
SJJ0155-CCBA	Iron-57 (dissolved)	-1.16	18.2	36.0	ug/L	
SJJ0155-CCBA	Lead-208 (dissolved)	0.00100	0.0513	0.100	ug/L	
SJJ0155-IBLB	Iron-54 (dissolved)	1.42	18.2	36.0	ug/L	
SJJ0155-IBLB	Iron-57 (dissolved)	-0.648	18.2	36.0	ug/L	
SJJ0155-IBLB	Lead-208 (dissolved)	-0.00300	0.0513	0.100	ug/L	
SJJ0155-CCBB	Iron-54 (dissolved)	0.292	18.2	36.0	ug/L	
SJJ0155-CCBB	Iron-57 (dissolved)	-1.29	18.2	36.0	ug/L	
SJJ0155-CCBB	Lead-208 (dissolved)	-0.00100	0.0513	0.100	ug/L	
SJJ0155-IBLC	Iron-54 (dissolved)	3.44	18.2	36.0	ug/L	
SJJ0155-IBLC	Iron-57 (dissolved)	19.2	18.2	36.0	ug/L	
SJJ0155-IBLC	Lead-208 (dissolved)	0.0870	0.0513	0.100	ug/L	
SJJ0155-CCBC	Iron-54 (dissolved)	1.25	18.2	36.0	ug/L	
SJJ0155-CCBC	Iron-57 (dissolved)	2.27	18.2	36.0	ug/L	



INSTRUMENT BLANKS EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00033

Sequence: SJJ0155

Date Analyzed: 10/12/21 03:06

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0155-CCBC	Lead-208 (dissolved)	0.0440	0.0513	0.100	ug/L	
SJJ0155-IBLD	Iron-54 (dissolved)	1.94	18.2	36.0	ug/L	
SJJ0155-IBLD	Iron-57 (dissolved)	-0.808	18.2	36.0	ug/L	
SJJ0155-IBLD	Lead-208 (dissolved)	0.00300	0.0513	0.100	ug/L	
SJJ0155-CCBD	Iron-54 (dissolved)	1.48	18.2	36.0	ug/L	
SJJ0155-CCBD	Iron-57 (dissolved)	0.842	18.2	36.0	ug/L	
SJJ0155-CCBD	Lead-208 (dissolved)	0.00400	0.0513	0.100	ug/L	
SJJ0155-CCBE	Iron-54 (dissolved)	-2.98	18.2	36.0	ug/L	
SJJ0155-CCBE	Iron-57 (dissolved)	-1.51	18.2	36.0	ug/L	
SJJ0155-CCBE	Lead-208 (dissolved)	-0.0100	0.0513	0.100	ug/L	
SJJ0155-IBLE	Iron-54 (dissolved)	-2.77	18.2	36.0	ug/L	
SJJ0155-IBLE	Iron-57 (dissolved)	-0.430	18.2	36.0	ug/L	
SJJ0155-IBLE	Lead-208 (dissolved)	-0.0110	0.0513	0.100	ug/L	
SJJ0155-IBLF	Iron-54 (dissolved)	-0.689	18.2	36.0	ug/L	
SJJ0155-IBLF	Iron-57 (dissolved)	-2.13	18.2	36.0	ug/L	
SJJ0155-IBLF	Lead-208 (dissolved)	-0.00700	0.0513	0.100	ug/L	
SJJ0155-CCBF	Iron-54 (dissolved)	-2.39	18.2	36.0	ug/L	
SJJ0155-CCBF	Iron-57 (dissolved)	-3.84	18.2	36.0	ug/L	
SJJ0155-CCBF	Lead-208 (dissolved)	-0.0100	0.0513	0.100	ug/L	
SJJ0155-IBLG	Iron-54 (dissolved)	34.3	18.2	36.0	ug/L	
SJJ0155-IBLG	Iron-57 (dissolved)	-27.2	18.2	36.0	ug/L	
SJJ0155-IBLG	Lead-208 (dissolved)	-0.00300	0.0513	0.100	ug/L	
SJJ0155-IBLH	Iron-54 (dissolved)	-3.35	18.2	36.0	ug/L	
SJJ0155-IBLH	Iron-57 (dissolved)	-3.85	18.2	36.0	ug/L	
SJJ0155-IBLH	Lead-208 (dissolved)	0.0190	0.0513	0.100	ug/L	
SJJ0155-CCBG	Iron-54 (dissolved)	-2.87	18.2	36.0	ug/L	
SJJ0155-CCBG	Iron-57 (dissolved)	-3.60	18.2	36.0	ug/L	
SJJ0155-CCBG	Lead-208 (dissolved)	-0.00800	0.0513	0.100	ug/L	
SJJ0155-IBLI	Iron-54 (dissolved)	-3.78	18.2	36.0	ug/L	
SJJ0155-IBLI	Iron-57 (dissolved)	-2.93	18.2	36.0	ug/L	
SJJ0155-IBLI	Lead-208 (dissolved)	0.0110	0.0513	0.100	ug/L	
SJJ0155-IBLJ	Iron-54 (dissolved)	-4.25	18.2	36.0	ug/L	
SJJ0155-IBLJ	Iron-57 (dissolved)	-4.28	18.2	36.0	ug/L	
SJJ0155-IBLJ	Lead-208 (dissolved)	0.0290	0.0513	0.100	ug/L	



INSTRUMENT BLANKS EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00033

Sequence: SJJ0155

Date Analyzed: 10/12/21 07:25

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0155-CCBH	Iron-54 (dissolved)	-3.89	18.2	36.0	ug/L	
SJJ0155-CCBH	Iron-57 (dissolved)	-3.08	18.2	36.0	ug/L	
SJJ0155-CCBH	Lead-208 (dissolved)	0.00	0.0513	0.100	ug/L	
SJJ0155-IBLK	Iron-54 (dissolved)	-3.45	18.2	36.0	ug/L	
SJJ0155-IBLK	Iron-57 (dissolved)	1.35	18.2	36.0	ug/L	
SJJ0155-IBLK	Lead-208 (dissolved)	0.0340	0.0513	0.100	ug/L	
SJJ0155-IBLL	Iron-54 (dissolved)	-3.74	18.2	36.0	ug/L	
SJJ0155-IBLL	Iron-57 (dissolved)	-1.83	18.2	36.0	ug/L	
SJJ0155-IBLL	Lead-208 (dissolved)	0.0400	0.0513	0.100	ug/L	
SJJ0155-CCBI	Iron-54 (dissolved)	-3.65	18.2	36.0	ug/L	
SJJ0155-CCBI	Iron-57 (dissolved)	-2.10	18.2	36.0	ug/L	
SJJ0155-CCBI	Lead-208 (dissolved)	0.0260	0.0513	0.100	ug/L	



INSTRUMENT BLANKS EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Sequence: SJJ0168

Date Analyzed: 10/12/21 15:39

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0168-IBL1	Iron-54	0.944	18.2	36.0	ug/L	
SJJ0168-IBL1	Iron-54 (dissolved)	0.944	18.2	36.0	ug/L	
SJJ0168-IBL1	Iron-57	0.759	6.63	36.0	ug/L	
SJJ0168-IBL1	Iron-57 (dissolved)	0.759	18.2	36.0	ug/L	
SJJ0168-IBL1	Lead-208 (dissolved)	0.00	0.0513	0.100	ug/L	
SJJ0168-ICB1	Iron-54 (dissolved)	1.37	18.2	36.0	ug/L	
SJJ0168-ICB1	Iron-54	1.37	18.2	36.0	ug/L	
SJJ0168-ICB1	Iron-57	0.850	6.63	36.0	ug/L	
SJJ0168-ICB1	Iron-57 (dissolved)	0.850	18.2	36.0	ug/L	
SJJ0168-ICB1	Lead-208 (dissolved)	0.00700	0.0513	0.100	ug/L	
SJJ0168-CCB1	Iron-54	-0.058	18.2	36.0	ug/L	
SJJ0168-CCB1	Iron-54 (dissolved)	-0.058	18.2	36.0	ug/L	
SJJ0168-CCB1	Iron-57	0.763	6.63	36.0	ug/L	
SJJ0168-CCB1	Iron-57 (dissolved)	0.763	18.2	36.0	ug/L	
SJJ0168-CCB1	Lead-208 (dissolved)	0.00	0.0513	0.100	ug/L	
SJJ0168-IBL2	Iron-54 (dissolved)	3.33	18.2	36.0	ug/L	
SJJ0168-IBL2	Iron-54	3.33	18.2	36.0	ug/L	
SJJ0168-IBL2	Iron-57 (dissolved)	2.44	18.2	36.0	ug/L	
SJJ0168-IBL2	Iron-57	2.44	6.63	36.0	ug/L	
SJJ0168-IBL2	Lead-208 (dissolved)	0.0320	0.0513	0.100	ug/L	
SJJ0168-IBL3	Iron-54	1.48	18.2	36.0	ug/L	
SJJ0168-IBL3	Iron-54 (dissolved)	1.48	18.2	36.0	ug/L	
SJJ0168-IBL3	Iron-57 (dissolved)	1.19	18.2	36.0	ug/L	
SJJ0168-IBL3	Iron-57	1.19	6.63	36.0	ug/L	
SJJ0168-IBL3	Lead-208 (dissolved)	0.00800	0.0513	0.100	ug/L	
SJJ0168-CCB2	Iron-54 (dissolved)	0.032	18.2	36.0	ug/L	
SJJ0168-CCB2	Iron-54	0.032	18.2	36.0	ug/L	
SJJ0168-CCB2	Iron-57 (dissolved)	0.792	18.2	36.0	ug/L	
SJJ0168-CCB2	Iron-57	0.792	6.63	36.0	ug/L	
SJJ0168-CCB2	Lead-208 (dissolved)	0.00300	0.0513	0.100	ug/L	
SJJ0168-IBL4	Iron-54	0.782	18.2	36.0	ug/L	
SJJ0168-IBL4	Iron-54 (dissolved)	0.782	18.2	36.0	ug/L	
SJJ0168-IBL4	Iron-57 (dissolved)	-1.43	18.2	36.0	ug/L	
SJJ0168-IBL4	Iron-57	-1.43	6.63	36.0	ug/L	



INSTRUMENT BLANKS
EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Sequence: SJJ0168

Date Analyzed: 10/12/21 17:58

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0168-IBL4	Lead-208 (dissolved)	0.00300	0.0513	0.100	ug/L	
SJJ0168-CCB3	Iron-54 (dissolved)	0.379	18.2	36.0	ug/L	
SJJ0168-CCB3	Iron-54	0.379	18.2	36.0	ug/L	
SJJ0168-CCB3	Iron-57 (dissolved)	0.265	18.2	36.0	ug/L	
SJJ0168-CCB3	Iron-57	0.265	6.63	36.0	ug/L	
SJJ0168-CCB3	Lead-208 (dissolved)	0.00100	0.0513	0.100	ug/L	
SJJ0168-IBL5	Iron-54 (dissolved)	1.03	18.2	36.0	ug/L	
SJJ0168-IBL5	Iron-54	1.03	18.2	36.0	ug/L	
SJJ0168-IBL5	Iron-57 (dissolved)	-0.946	18.2	36.0	ug/L	
SJJ0168-IBL5	Iron-57	-0.946	6.63	36.0	ug/L	
SJJ0168-IBL5	Lead-208 (dissolved)	0.00400	0.0513	0.100	ug/L	
SJJ0168-CCB4	Iron-54 (dissolved)	0.423	18.2	36.0	ug/L	
SJJ0168-CCB4	Iron-54	0.423	18.2	36.0	ug/L	
SJJ0168-CCB4	Iron-57 (dissolved)	-1.76	18.2	36.0	ug/L	
SJJ0168-CCB4	Iron-57	-1.76	6.63	36.0	ug/L	
SJJ0168-CCB4	Lead-208 (dissolved)	0.00100	0.0513	0.100	ug/L	
SJJ0168-IBL6	Iron-54	0.835	18.2	36.0	ug/L	
SJJ0168-IBL6	Iron-54 (dissolved)	0.835	18.2	36.0	ug/L	
SJJ0168-IBL6	Iron-57	-2.13	6.63	36.0	ug/L	
SJJ0168-IBL6	Iron-57 (dissolved)	-2.13	18.2	36.0	ug/L	
SJJ0168-IBL6	Lead-208 (dissolved)	0.00100	0.0513	0.100	ug/L	
SJJ0168-CCB5	Iron-54 (dissolved)	0.346	18.2	36.0	ug/L	
SJJ0168-CCB5	Iron-54	0.346	18.2	36.0	ug/L	
SJJ0168-CCB5	Iron-57 (dissolved)	-0.410	18.2	36.0	ug/L	
SJJ0168-CCB5	Iron-57	-0.410	6.63	36.0	ug/L	
SJJ0168-CCB5	Lead-208 (dissolved)	0.00100	0.0513	0.100	ug/L	
SJJ0168-CCB6	Iron-54	1.24	18.2	36.0	ug/L	
SJJ0168-CCB6	Iron-54 (dissolved)	1.24	18.2	36.0	ug/L	
SJJ0168-CCB6	Iron-57 (dissolved)	1.05	18.2	36.0	ug/L	
SJJ0168-CCB6	Iron-57	1.05	6.63	36.0	ug/L	
SJJ0168-CCB6	Lead-208 (dissolved)	0.00100	0.0513	0.100	ug/L	
SJJ0168-IBL7	Iron-54	1.84	18.2	36.0	ug/L	
SJJ0168-IBL7	Iron-54 (dissolved)	1.84	18.2	36.0	ug/L	
SJJ0168-IBL7	Iron-57	12.5	6.63	36.0	ug/L	



INSTRUMENT BLANKS EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Sequence: SJJ0168

Date Analyzed: 10/12/21 21:46

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0168-IBL7	Iron-57 (dissolved)	12.5	18.2	36.0	ug/L	
SJJ0168-IBL7	Lead-208 (dissolved)	0.0450	0.0513	0.100	ug/L	
SJJ0168-CCB7	Iron-54	1.47	18.2	36.0	ug/L	
SJJ0168-CCB7	Iron-54 (dissolved)	1.47	18.2	36.0	ug/L	
SJJ0168-CCB7	Iron-57 (dissolved)	3.60	18.2	36.0	ug/L	
SJJ0168-CCB7	Iron-57	3.60	6.63	36.0	ug/L	
SJJ0168-CCB7	Lead-208 (dissolved)	0.0260	0.0513	0.100	ug/L	
SJJ0168-IBL8	Iron-54	1.28	18.2	36.0	ug/L	
SJJ0168-IBL8	Iron-54 (dissolved)	1.28	18.2	36.0	ug/L	
SJJ0168-IBL8	Iron-57 (dissolved)	4.33	18.2	36.0	ug/L	
SJJ0168-IBL8	Iron-57	4.33	6.63	36.0	ug/L	
SJJ0168-IBL8	Lead-208 (dissolved)	0.00900	0.0513	0.100	ug/L	
SJJ0168-IBL9	Iron-54	0.794	18.2	36.0	ug/L	
SJJ0168-IBL9	Iron-54 (dissolved)	0.794	18.2	36.0	ug/L	
SJJ0168-IBL9	Iron-57	1.50	6.63	36.0	ug/L	
SJJ0168-IBL9	Iron-57 (dissolved)	1.50	18.2	36.0	ug/L	
SJJ0168-IBL9	Lead-208 (dissolved)	0.00300	0.0513	0.100	ug/L	
SJJ0168-CCB8	Iron-54	1.73	18.2	36.0	ug/L	
SJJ0168-CCB8	Iron-54 (dissolved)	1.73	18.2	36.0	ug/L	
SJJ0168-CCB8	Iron-57	1.81	6.63	36.0	ug/L	
SJJ0168-CCB8	Iron-57 (dissolved)	1.81	18.2	36.0	ug/L	
SJJ0168-CCB8	Lead-208 (dissolved)	0.00400	0.0513	0.100	ug/L	
SJJ0168-IBLA	Iron-54 (dissolved)	1.25	18.2	36.0	ug/L	
SJJ0168-IBLA	Iron-54	1.25	18.2	36.0	ug/L	
SJJ0168-IBLA	Iron-57 (dissolved)	8.67	18.2	36.0	ug/L	
SJJ0168-IBLA	Iron-57	8.67	6.63	36.0	ug/L	
SJJ0168-IBLA	Lead-208 (dissolved)	0.00200	0.0513	0.100	ug/L	
SJJ0168-IBLB	Iron-54 (dissolved)	1.46	18.2	36.0	ug/L	
SJJ0168-IBLB	Iron-54	1.46	18.2	36.0	ug/L	
SJJ0168-IBLB	Iron-57 (dissolved)	1.57	18.2	36.0	ug/L	
SJJ0168-IBLB	Iron-57	1.57	6.63	36.0	ug/L	
SJJ0168-IBLB	Lead-208 (dissolved)	0.0140	0.0513	0.100	ug/L	
SJJ0168-CCB9	Iron-54	1.65	18.2	36.0	ug/L	
SJJ0168-CCB9	Iron-54 (dissolved)	1.65	18.2	36.0	ug/L	



INSTRUMENT BLANKS
EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Sequence: SJJ0168

Date Analyzed: 10/13/21 00:14

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0168-CCB9	Iron-57	1.24	6.63	36.0	ug/L	
SJJ0168-CCB9	Iron-57 (dissolved)	1.24	18.2	36.0	ug/L	
SJJ0168-CCB9	Lead-208 (dissolved)	0.00100	0.0513	0.100	ug/L	
SJJ0168-CCBA	Iron-54	-0.302	18.2	36.0	ug/L	
SJJ0168-CCBA	Iron-54 (dissolved)	-0.302	18.2	36.0	ug/L	
SJJ0168-CCBA	Iron-57 (dissolved)	0.477	18.2	36.0	ug/L	
SJJ0168-CCBA	Iron-57	0.477	6.63	36.0	ug/L	
SJJ0168-CCBA	Lead-208 (dissolved)	-0.00200	0.0513	0.100	ug/L	
SJJ0168-IBLC	Iron-54 (dissolved)	0.264	18.2	36.0	ug/L	
SJJ0168-IBLC	Iron-54	0.264	18.2	36.0	ug/L	
SJJ0168-IBLC	Iron-57 (dissolved)	0.530	18.2	36.0	ug/L	
SJJ0168-IBLC	Iron-57	0.530	6.63	36.0	ug/L	
SJJ0168-IBLC	Lead-208 (dissolved)	0.0120	0.0513	0.100	ug/L	
SJJ0168-IBLD	Iron-54 (dissolved)	-0.389	18.2	36.0	ug/L	
SJJ0168-IBLD	Iron-54	-0.389	18.2	36.0	ug/L	
SJJ0168-IBLD	Iron-57 (dissolved)	-0.248	18.2	36.0	ug/L	
SJJ0168-IBLD	Iron-57	-0.248	6.63	36.0	ug/L	
SJJ0168-IBLD	Lead-208 (dissolved)	0.00200	0.0513	0.100	ug/L	
SJJ0168-CCBB	Iron-54 (dissolved)	0.249	18.2	36.0	ug/L	
SJJ0168-CCBB	Iron-54	0.249	18.2	36.0	ug/L	
SJJ0168-CCBB	Iron-57	0.692	6.63	36.0	ug/L	
SJJ0168-CCBB	Iron-57 (dissolved)	0.692	18.2	36.0	ug/L	
SJJ0168-CCBB	Lead-208 (dissolved)	-0.00200	0.0513	0.100	ug/L	
SJJ0168-IBLE	Iron-54	-0.229	18.2	36.0	ug/L	
SJJ0168-IBLE	Iron-54 (dissolved)	-0.229	18.2	36.0	ug/L	
SJJ0168-IBLE	Iron-57	1.31	6.63	36.0	ug/L	
SJJ0168-IBLE	Iron-57 (dissolved)	1.31	18.2	36.0	ug/L	
SJJ0168-IBLE	Lead-208 (dissolved)	0.00200	0.0513	0.100	ug/L	
SJJ0168-IBLF	Iron-54	-0.173	18.2	36.0	ug/L	
SJJ0168-IBLF	Iron-54 (dissolved)	-0.173	18.2	36.0	ug/L	
SJJ0168-IBLF	Iron-57 (dissolved)	0.299	18.2	36.0	ug/L	
SJJ0168-IBLF	Iron-57	0.299	6.63	36.0	ug/L	
SJJ0168-IBLF	Lead-208 (dissolved)	-0.00100	0.0513	0.100	ug/L	
SJJ0168-CCBC	Iron-54 (dissolved)	1.51	18.2	36.0	ug/L	



INSTRUMENT BLANKS EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Sequence: SJJ0168

Date Analyzed: 10/13/21 02:48

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0168-CCBC	Iron-54	1.51	18.2	36.0	ug/L	
SJJ0168-CCBC	Iron-57	2.90	6.63	36.0	ug/L	
SJJ0168-CCBC	Iron-57 (dissolved)	2.90	18.2	36.0	ug/L	
SJJ0168-CCBC	Lead-208 (dissolved)	-0.00200	0.0513	0.100	ug/L	
SJJ0168-IBLG	Iron-54	0.158	18.2	36.0	ug/L	
SJJ0168-IBLG	Iron-54 (dissolved)	0.158	18.2	36.0	ug/L	
SJJ0168-IBLG	Iron-57 (dissolved)	-0.032	18.2	36.0	ug/L	
SJJ0168-IBLG	Iron-57	-0.032	6.63	36.0	ug/L	
SJJ0168-IBLG	Lead-208 (dissolved)	0.00	0.0513	0.100	ug/L	
SJJ0168-IBLH	Iron-54	0.801	18.2	36.0	ug/L	
SJJ0168-IBLH	Iron-54 (dissolved)	0.801	18.2	36.0	ug/L	
SJJ0168-IBLH	Iron-57	2.57	6.63	36.0	ug/L	
SJJ0168-IBLH	Iron-57 (dissolved)	2.57	18.2	36.0	ug/L	
SJJ0168-IBLH	Lead-208 (dissolved)	0.0300	0.0513	0.100	ug/L	
SJJ0168-CCBD	Iron-54	-0.715	18.2	36.0	ug/L	
SJJ0168-CCBD	Iron-54 (dissolved)	-0.715	18.2	36.0	ug/L	
SJJ0168-CCBD	Iron-57 (dissolved)	-0.974	18.2	36.0	ug/L	
SJJ0168-CCBD	Iron-57	-0.974	6.63	36.0	ug/L	
SJJ0168-CCBD	Lead-208 (dissolved)	0.0100	0.0513	0.100	ug/L	
SJJ0168-CCBE	Iron-54 (dissolved)	0.040	18.2	36.0	ug/L	
SJJ0168-CCBE	Iron-54	0.040	18.2	36.0	ug/L	
SJJ0168-CCBE	Iron-57 (dissolved)	0.367	18.2	36.0	ug/L	
SJJ0168-CCBE	Iron-57	0.367	6.63	36.0	ug/L	
SJJ0168-CCBE	Lead-208 (dissolved)	-0.00600	0.0513	0.100	ug/L	
SJJ0168-IBLI	Iron-54	8.33	18.2	36.0	ug/L	
SJJ0168-IBLI	Iron-54 (dissolved)	8.33	18.2	36.0	ug/L	
SJJ0168-IBLI	Iron-57	7.50	6.63	36.0	ug/L	
SJJ0168-IBLI	Iron-57 (dissolved)	7.50	18.2	36.0	ug/L	
SJJ0168-IBLI	Lead-208 (dissolved)	0.0310	0.0513	0.100	ug/L	
SJJ0168-IBLJ	Iron-54 (dissolved)	0.854	18.2	36.0	ug/L	
SJJ0168-IBLJ	Iron-54	0.854	18.2	36.0	ug/L	
SJJ0168-IBLJ	Iron-57	9.31	6.63	36.0	ug/L	
SJJ0168-IBLJ	Iron-57 (dissolved)	9.31	18.2	36.0	ug/L	
SJJ0168-IBLJ	Lead-208 (dissolved)	0.0350	0.0513	0.100	ug/L	



INSTRUMENT BLANKS EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Sequence: SJJ0168

Date Analyzed: 10/13/21 05:18

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0168-CCBF	Iron-54	-0.281	18.2	36.0	ug/L	
SJJ0168-CCBF	Iron-54 (dissolved)	-0.281	18.2	36.0	ug/L	
SJJ0168-CCBF	Iron-57 (dissolved)	0.499	18.2	36.0	ug/L	
SJJ0168-CCBF	Iron-57	0.499	6.63	36.0	ug/L	
SJJ0168-CCBF	Lead-208 (dissolved)	0.0150	0.0513	0.100	ug/L	
SJJ0168-IBLK	Iron-54 (dissolved)	1.21	18.2	36.0	ug/L	
SJJ0168-IBLK	Iron-54	1.21	18.2	36.0	ug/L	
SJJ0168-IBLK	Iron-57 (dissolved)	19.2	18.2	36.0	ug/L	
SJJ0168-IBLK	Iron-57	19.2	6.63	36.0	ug/L	
SJJ0168-IBLK	Lead-208 (dissolved)	0.0530	0.0513	0.100	ug/L	
SJJ0168-IBLL	Iron-54 (dissolved)	1.20	18.2	36.0	ug/L	
SJJ0168-IBLL	Iron-54	1.20	18.2	36.0	ug/L	
SJJ0168-IBLL	Iron-57 (dissolved)	17.6	18.2	36.0	ug/L	
SJJ0168-IBLL	Iron-57	17.6	6.63	36.0	ug/L	
SJJ0168-IBLL	Lead-208 (dissolved)	0.0390	0.0513	0.100	ug/L	
SJJ0168-CCBG	Iron-54	1.13	18.2	36.0	ug/L	
SJJ0168-CCBG	Iron-54 (dissolved)	1.13	18.2	36.0	ug/L	
SJJ0168-CCBG	Iron-57	4.69	6.63	36.0	ug/L	
SJJ0168-CCBG	Iron-57 (dissolved)	4.69	18.2	36.0	ug/L	
SJJ0168-CCBG	Lead-208 (dissolved)	0.0260	0.0513	0.100	ug/L	
SJJ0168-IBLM	Iron-54	3.45	18.2	36.0	ug/L	
SJJ0168-IBLM	Iron-54 (dissolved)	3.45	18.2	36.0	ug/L	
SJJ0168-IBLM	Iron-57 (dissolved)	17.9	18.2	36.0	ug/L	
SJJ0168-IBLM	Iron-57	17.9	6.63	36.0	ug/L	
SJJ0168-IBLM	Lead-208 (dissolved)	0.0470	0.0513	0.100	ug/L	
SJJ0168-IBLN	Iron-54	1.49	18.2	36.0	ug/L	
SJJ0168-IBLN	Iron-54 (dissolved)	1.49	18.2	36.0	ug/L	
SJJ0168-IBLN	Iron-57	15.2	6.63	36.0	ug/L	
SJJ0168-IBLN	Iron-57 (dissolved)	15.2	18.2	36.0	ug/L	
SJJ0168-IBLN	Lead-208 (dissolved)	0.0230	0.0513	0.100	ug/L	
SJJ0168-CCBH	Iron-54	1.28	18.2	36.0	ug/L	
SJJ0168-CCBH	Iron-54 (dissolved)	1.28	18.2	36.0	ug/L	
SJJ0168-CCBH	Iron-57	3.75	6.63	36.0	ug/L	
SJJ0168-CCBH	Iron-57 (dissolved)	3.75	18.2	36.0	ug/L	



INSTRUMENT BLANKS
EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Sequence: SJJ0168

Date Analyzed: 10/13/21 07:28

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0168-CCBH	Lead-208 (dissolved)	0.0200	0.0513	0.100	ug/L	
SJJ0168-CCBI	Iron-54	0.240	18.2	36.0	ug/L	
SJJ0168-CCBI	Iron-54 (dissolved)	0.240	18.2	36.0	ug/L	
SJJ0168-CCBI	Iron-57	-1.03	6.63	36.0	ug/L	
SJJ0168-CCBI	Iron-57 (dissolved)	-1.03	18.2	36.0	ug/L	
SJJ0168-CCBI	Lead-208 (dissolved)	-0.0190	0.0513	0.100	ug/L	
SJJ0168-IBLO	Iron-54	0.299	18.2	36.0	ug/L	
SJJ0168-IBLO	Iron-54 (dissolved)	0.299	18.2	36.0	ug/L	
SJJ0168-IBLO	Iron-57	10.8	6.63	36.0	ug/L	
SJJ0168-IBLO	Iron-57 (dissolved)	10.8	18.2	36.0	ug/L	
SJJ0168-IBLO	Lead-208 (dissolved)	0.00800	0.0513	0.100	ug/L	
SJJ0168-IBLP	Iron-54 (dissolved)	7.88	18.2	36.0	ug/L	
SJJ0168-IBLP	Iron-54	7.88	18.2	36.0	ug/L	
SJJ0168-IBLP	Iron-57 (dissolved)	4.11	18.2	36.0	ug/L	
SJJ0168-IBLP	Iron-57	4.11	6.63	36.0	ug/L	
SJJ0168-IBLP	Lead-208 (dissolved)	-0.0110	0.0513	0.100	ug/L	
SJJ0168-CCBJ	Iron-54	-1.10	18.2	36.0	ug/L	
SJJ0168-CCBJ	Iron-54 (dissolved)	-1.10	18.2	36.0	ug/L	
SJJ0168-CCBJ	Iron-57	-0.222	6.63	36.0	ug/L	
SJJ0168-CCBJ	Iron-57 (dissolved)	-0.222	18.2	36.0	ug/L	
SJJ0168-CCBJ	Lead-208 (dissolved)	-0.0210	0.0513	0.100	ug/L	
SJJ0168-IBLQ	Iron-54	-2.05	18.2	36.0	ug/L	
SJJ0168-IBLQ	Iron-54 (dissolved)	-2.05	18.2	36.0	ug/L	
SJJ0168-IBLQ	Iron-57 (dissolved)	-1.10	18.2	36.0	ug/L	
SJJ0168-IBLQ	Iron-57	-1.10	6.63	36.0	ug/L	
SJJ0168-IBLQ	Lead-208 (dissolved)	-0.0310	0.0513	0.100	ug/L	
SJJ0168-CCBK	Iron-54 (dissolved)	-0.725	18.2	36.0	ug/L	
SJJ0168-CCBK	Iron-54	-0.725	18.2	36.0	ug/L	
SJJ0168-CCBK	Iron-57 (dissolved)	-2.54	18.2	36.0	ug/L	
SJJ0168-CCBK	Iron-57	-2.54	6.63	36.0	ug/L	
SJJ0168-CCBK	Lead-208 (dissolved)	-0.0310	0.0513	0.100	ug/L	
SJJ0168-IBLR	Iron-54 (dissolved)	-1.63	18.2	36.0	ug/L	
SJJ0168-IBLR	Iron-54	-1.63	18.2	36.0	ug/L	
SJJ0168-IBLR	Iron-57	-1.24	6.63	36.0	ug/L	



INSTRUMENT BLANKS EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Sequence: SJJ0168

Date Analyzed: 10/13/21 10:09

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0168-IBLR	Iron-57 (dissolved)	-1.24	18.2	36.0	ug/L	
SJJ0168-IBLR	Lead-208 (dissolved)	-0.0320	0.0513	0.100	ug/L	
SJJ0168-CCBL	Iron-54 (dissolved)	-1.27	18.2	36.0	ug/L	
SJJ0168-CCBL	Iron-54	-1.27	18.2	36.0	ug/L	
SJJ0168-CCBL	Iron-57 (dissolved)	-2.31	18.2	36.0	ug/L	
SJJ0168-CCBL	Iron-57	-2.31	6.63	36.0	ug/L	
SJJ0168-CCBL	Lead-208 (dissolved)	-0.0320	0.0513	0.100	ug/L	



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0139

Instrument: ICPMS1

Calibration: EJ00031

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
CAL 0	SJJ0139-CAL1	XDT_m1211007-006	NA	10/07/21 13:01
CAL 1 - LOW CHECK	SJJ0139-CAL2	XDT_m1211007-007	NA	10/07/21 13:06
CAL 2	SJJ0139-CAL3	XDT_m1211007-008	NA	10/07/21 13:10
CAL 3	SJJ0139-CAL4	XDT_m1211007-009	NA	10/07/21 13:14
CAL 4	SJJ0139-CAL5	XDT_m1211007-010	NA	10/07/21 13:19
CAL 5	SJJ0139-CAL6	XDT_m1211007-011	NA	10/07/21 13:25
RINSE	SJJ0139-IBL1	XDT_m1211007-012	NA	10/07/21 13:32
Initial Cal Check	SJJ0139-ICV1	XDT_m1211007-014	NA	10/07/21 13:38
Initial Cal Blank	SJJ0139-ICB1	XDT_m1211007-015	NA	10/07/21 13:45
Calibration Check	SJJ0139-CCV1	XDT_m1211007-016	NA	10/07/21 13:49
Calibration Blank	SJJ0139-CCB1	XDT_m1211007-017	NA	10/07/21 13:56
Instrument RL Check	SJJ0139-CRL1	XDT_m1211007-018	NA	10/07/21 14:00
Interference Check A	SJJ0139-IFA1	XDT_m1211007-019	NA	10/07/21 14:04
Interference Check B	SJJ0139-IFB1	XDT_m1211007-020	NA	10/07/21 14:09
LR200	SJJ0139-HCV1	XDT_m1211007-021	NA	10/07/21 14:17
LR300	SJJ0139-HCV2	XDT_m1211007-022	NA	10/07/21 14:21
Instrument Blank	SJJ0139-IBL2	XDT_m1211007-023	NA	10/07/21 14:28
Instrument Blank	SJJ0139-IBL3	XDT_m1211007-024	NA	10/07/21 14:34
Calibration Check	SJJ0139-CCV2	XDT_m1211007-025	NA	10/07/21 14:41
Calibration Blank	SJJ0139-CCB2	XDT_m1211007-027	NA	10/07/21 14:54
ZZZZZ	21I0261-33	XDT_m1211007-029	Water	10/07/21 15:06
ZZZZZ	21I0261-35	XDT_m1211007-030	Water	10/07/21 15:10
ZZZZZ	21I0261-37	XDT_m1211007-031	Water	10/07/21 15:14
ZZZZZ	21I0261-39	XDT_m1211007-033	Water	10/07/21 15:23
ZZZZZ	21I0261-40	XDT_m1211007-034	Water	10/07/21 15:27
ZZZZZ	21I0261-41	XDT_m1211007-035	Water	10/07/21 15:31
ZZZZZ	21I0261-42	XDT_m1211007-036	Water	10/07/21 15:37
Instrument Blank	SJJ0139-IBL4	XDT_m1211007-037	NA	10/07/21 15:45
Calibration Check	SJJ0139-CCV3	XDT_m1211007-038	NA	10/07/21 15:49



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0139

Instrument: ICPMS1

Calibration: EJ00031

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Calibration Blank	SJJ0139-CCB3	XDT_m1211007-039	NA	10/07/21 15:56
ZZZZZ	21I0261-30	XDT_m1211007-040	Water	10/07/21 16:05
ZZZZZ	21I0261-13	XDT_m1211007-044	Water	10/07/21 16:22
ZZZZZ	21I0261-32	XDT_m1211007-045	Water	10/07/21 16:26
Instrument Blank	SJJ0139-IBL5	XDT_m1211007-049	NA	10/07/21 16:48
Calibration Check	SJJ0139-CCV4	XDT_m1211007-050	NA	10/07/21 16:54
Calibration Blank	SJJ0139-CCB4	XDT_m1211007-051	NA	10/07/21 17:01
ZZZZZ	21I0273-02RE1	XDT_m1211007-052	Water	10/07/21 17:07
ZZZZZ	21I0261-05	XDT_m1211007-053	Water	10/07/21 17:11
ZZZZZ	21I0261-14	XDT_m1211007-054	Water	10/07/21 17:15
ZZZZZ	21I0261-20	XDT_m1211007-055	Water	10/07/21 17:19
ZZZZZ	21I0261-18	XDT_m1211007-056	Water	10/07/21 17:24
ZZZZZ	21I0279-04	XDT_m1211007-057	Water	10/07/21 17:28
Instrument Blank	SJJ0139-IBL6	XDT_m1211007-061	NA	10/07/21 17:46
Calibration Check	SJJ0139-CCV5	XDT_m1211007-062	NA	10/07/21 17:51
Calibration Blank	SJJ0139-CCB5	XDT_m1211007-063	NA	10/07/21 17:58
ZZZZZ	21I0261-38	XDT_m1211007-068	Water	10/07/21 18:20
ZZZZZ	21I0261-31	XDT_m1211007-070	Water	10/07/21 18:30
Instrument Blank	SJJ0139-IBL7	XDT_m1211007-071	NA	10/07/21 18:34
Calibration Check	SJJ0139-CCV6	XDT_m1211007-072	NA	10/07/21 18:40
Calibration Blank	SJJ0139-CCB6	XDT_m1211007-073	NA	10/07/21 18:47
Calibration Check	SJJ0139-CCV7	XDT_m1211007-075	NA	10/07/21 18:55
Calibration Blank	SJJ0139-CCB7	XDT_m1211007-076	NA	10/07/21 19:02
ZZZZZ	BJJ0194-BLK1	XDT_m1211007-079	Water	10/07/21 19:15
ZZZZZ	BJJ0194-BS1	XDT_m1211007-080	Water	10/07/21 19:19
Instrument Blank	SJJ0139-IBL8	XDT_m1211007-086	NA	10/07/21 19:54
Calibration Check	SJJ0139-CCV8	XDT_m1211007-087	NA	10/07/21 19:59
Calibration Blank	SJJ0139-CCB8	XDT_m1211007-088	NA	10/07/21 20:06
ZZZZZ	21I0325-01	XDT_m1211007-091	Solid	10/07/21 20:18



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0139

Instrument: ICPMS1

Calibration: EJ00031

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
ZZZZZ	21I0325-01	XDT_m1211007-091	Solid	10/07/21 20:18
ZZZZZ	21I0325-01	XDT_m1211007-091	Solid	10/07/21 20:18
ZZZZZ	21I0325-02	XDT_m1211007-092	Solid	10/07/21 20:22
ZZZZZ	21I0325-02	XDT_m1211007-092	Solid	10/07/21 20:22
ZZZZZ	21I0325-03	XDT_m1211007-093	Solid	10/07/21 20:26
ZZZZZ	21I0325-03	XDT_m1211007-093	Solid	10/07/21 20:26
ZZZZZ	21I0325-04	XDT_m1211007-094	Solid	10/07/21 20:30
ZZZZZ	21I0325-04	XDT_m1211007-094	Solid	10/07/21 20:30
ZZZZZ	21I0325-04	XDT_m1211007-094	Solid	10/07/21 20:30
ZZZZZ	21I0325-05	XDT_m1211007-095	Solid	10/07/21 20:34
ZZZZZ	21I0325-05	XDT_m1211007-095	Solid	10/07/21 20:34
ZZZZZ	21I0325-05	XDT_m1211007-095	Solid	10/07/21 20:34
ZZZZZ	21I0325-06	XDT_m1211007-096	Solid	10/07/21 20:39
ZZZZZ	21I0325-06	XDT_m1211007-096	Solid	10/07/21 20:39
ZZZZZ	21I0325-06	XDT_m1211007-096	Solid	10/07/21 20:39
ZZZZZ	21I0325-07	XDT_m1211007-097	Solid	10/07/21 20:43
Instrument Blank	SJJ0139-IBL9	XDT_m1211007-098	NA	10/07/21 20:49
Calibration Check	SJJ0139-CCV9	XDT_m1211007-099	NA	10/07/21 20:53
Calibration Blank	SJJ0139-CCB9	XDT_m1211007-100	NA	10/07/21 21:00
ZZZZZ	21I0325-08	XDT_m1211007-101	Solid	10/07/21 21:04
ZZZZZ	21I0325-09	XDT_m1211007-102	Solid	10/07/21 21:09
ZZZZZ	21I0325-09	XDT_m1211007-102	Solid	10/07/21 21:09
ZZZZZ	21I0325-10	XDT_m1211007-103	Solid	10/07/21 21:13
ZZZZZ	21I0325-10	XDT_m1211007-103	Solid	10/07/21 21:13
ZZZZZ	21I0325-11	XDT_m1211007-104	Solid	10/07/21 21:17
ZZZZZ	21I0325-12	XDT_m1211007-105	Solid	10/07/21 21:21
ZZZZZ	21I0325-12	XDT_m1211007-105	Solid	10/07/21 21:21
ZZZZZ	21I0325-13	XDT_m1211007-106	Solid	10/07/21 21:25
ZZZZZ	21I0325-13	XDT_m1211007-106	Solid	10/07/21 21:25



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0139

Instrument: ICPMS1

Calibration: EJ00031

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
ZZZZZ	21I0325-13	XDT_m1211007-106	Solid	10/07/21 21:25
Instrument Blank	SJJ0139-IBLA	XDT_m1211007-110	NA	10/07/21 21:47
Calibration Check	SJJ0139-CCVA	XDT_m1211007-111	NA	10/07/21 21:52
Calibration Blank	SJJ0139-CCBA	XDT_m1211007-112	NA	10/07/21 21:59
Blank	BJJ0158-BLK1	XDT_m1211007-116	Water	10/07/21 22:15
LCS	BJJ0158-BS1	XDT_m1211007-117	Water	10/07/21 22:19
ZZZZZ	21I0325-14	XDT_m1211007-120	Solid	10/07/21 22:33
ZZZZZ	21I0325-14	XDT_m1211007-120	Solid	10/07/21 22:33
ZZZZZ	21I0325-14	XDT_m1211007-120	Solid	10/07/21 22:33
ZZZZZ	21I0325-15	XDT_m1211007-121	Solid	10/07/21 22:37
ZZZZZ	21I0325-15	XDT_m1211007-121	Solid	10/07/21 22:37
Instrument Blank	SJJ0139-IBLB	XDT_m1211007-122	NA	10/07/21 22:43
Calibration Check	SJJ0139-CCVB	XDT_m1211007-123	NA	10/07/21 22:47
Calibration Blank	SJJ0139-CCBB	XDT_m1211007-124	NA	10/07/21 22:54
Instrument Blank	SJJ0139-IBLC	XDT_m1211007-134	NA	10/07/21 23:42
Calibration Check	SJJ0139-CCVC	XDT_m1211007-135	NA	10/07/21 23:46
Calibration Blank	SJJ0139-CCBC	XDT_m1211007-136	NA	10/07/21 23:53
Calibration Check	SJJ0139-CCVD	XDT_m1211007-138	NA	10/08/21 00:01
Calibration Blank	SJJ0139-CCBD	XDT_m1211007-139	NA	10/08/21 00:08
Instrument Blank	SJJ0139-IBLD	XDT_m1211007-149	NA	10/08/21 00:55
Calibration Check	SJJ0139-CCVE	XDT_m1211007-150	NA	10/08/21 00:59
Calibration Blank	SJJ0139-CCBE	XDT_m1211007-151	NA	10/08/21 01:06
ZZZZZ	21I0408-01	XDT_m1211007-158	Water	10/08/21 01:36
ZZZZZ	21I0408-01	XDT_m1211007-158	Water	10/08/21 01:36
Instrument Blank	SJJ0139-IBLE	XDT_m1211007-161	NA	10/08/21 01:53
Calibration Check	SJJ0139-CCVF	XDT_m1211007-162	NA	10/08/21 01:58
Calibration Blank	SJJ0139-CCBF	XDT_m1211007-163	NA	10/08/21 02:05
ZZZZZ	21I0273-01	XDT_m1211007-165	Water	10/08/21 02:13
ZZZZZ	21I0273-01	XDT_m1211007-165	Water	10/08/21 02:13



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0139

Instrument: ICPMS1

Calibration: EJ00031

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
ZZZZZ	21I0273-03	XDT_m1211007-166	Water	10/08/21 02:18
ZZZZZ	21I0273-02	XDT_m1211007-167	Water	10/08/21 02:22
ZZZZZ	21I0273-02	XDT_m1211007-167	Water	10/08/21 02:22
Instrument Blank	SJJ0139-IBLF	XDT_m1211007-168	NA	10/08/21 02:28
Instrument Blank	SJJ0139-IBLG	XDT_m1211007-173	NA	10/08/21 02:54
Calibration Check	SJJ0139-CCVG	XDT_m1211007-174	NA	10/08/21 02:58
Calibration Blank	SJJ0139-CCBG	XDT_m1211007-175	NA	10/08/21 03:05
Calibration Check	SJJ0139-CCVH	XDT_m1211007-177	NA	10/08/21 03:14
Calibration Blank	SJJ0139-CCBH	XDT_m1211007-178	NA	10/08/21 03:20
Instrument Blank	SJJ0139-IBLH	XDT_m1211007-184	NA	10/08/21 03:48
MW-28_092021	21I0294-01	XDT_m1211007-185	Water	10/08/21 03:52
MW-24_092021	21I0294-03	XDT_m1211007-186	Water	10/08/21 03:57
Instrument Blank	SJJ0139-IBLI	XDT_m1211007-188	NA	10/08/21 04:10
Calibration Check	SJJ0139-CCVI	XDT_m1211007-189	NA	10/08/21 04:15
Calibration Blank	SJJ0139-CCBI	XDT_m1211007-190	NA	10/08/21 04:21
ZZZZZ	21I0320-01	XDT_m1211007-194	Water	10/08/21 04:38
ZZZZZ	21I0320-03	XDT_m1211007-195	Water	10/08/21 04:42
Instrument Blank	SJJ0139-IBLJ	XDT_m1211007-200	NA	10/08/21 05:08
Calibration Check	SJJ0139-CCVJ	XDT_m1211007-201	NA	10/08/21 05:12
Calibration Blank	SJJ0139-CCBJ	XDT_m1211007-202	NA	10/08/21 05:19
ZZZZZ	21I0320-19	XDT_m1211007-209	Water	10/08/21 05:50
Instrument Blank	SJJ0139-IBLK	XDT_m1211007-210	NA	10/08/21 05:57
Calibration Check	SJJ0139-CCVK	XDT_m1211007-211	NA	10/08/21 06:02
Calibration Blank	SJJ0139-CCBK	XDT_m1211007-212	NA	10/08/21 06:09



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0155

Instrument: ICPMS1

Calibration: EJ00033

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
CAL 0	SJJ0155-CAL1	XDT_m1211011-006	NA	10/11/21 13:20
CAL 1 - LOW CHECK	SJJ0155-CAL2	XDT_m1211011-007	NA	10/11/21 13:25
CAL 2	SJJ0155-CAL3	XDT_m1211011-008	NA	10/11/21 13:30
CAL 3	SJJ0155-CAL4	XDT_m1211011-009	NA	10/11/21 13:35
CAL 4	SJJ0155-CAL5	XDT_m1211011-010	NA	10/11/21 13:40
CAL 5	SJJ0155-CAL6	XDT_m1211011-011	NA	10/11/21 13:47
RINSE	SJJ0155-IBL1	XDT_m1211011-012	NA	10/11/21 13:54
Initial Cal Check	SJJ0155-ICV1	XDT_m1211011-017	NA	10/11/21 14:23
Initial Cal Blank	SJJ0155-ICB1	XDT_m1211011-018	NA	10/11/21 14:31
Calibration Check	SJJ0155-CCV1	XDT_m1211011-019	NA	10/11/21 14:36
Calibration Blank	SJJ0155-CCB1	XDT_m1211011-020	NA	10/11/21 14:44
Instrument RL Check	SJJ0155-CRL1	XDT_m1211011-021	NA	10/11/21 14:48
Interference Check A	SJJ0155-IFA1	XDT_m1211011-022	NA	10/11/21 14:56
Interference Check B	SJJ0155-IFB1	XDT_m1211011-023	NA	10/11/21 15:00
LR300	SJJ0155-HCV2	XDT_m1211011-025	NA	10/11/21 15:10
Instrument Blank	SJJ0155-IBL2	XDT_m1211011-026	NA	10/11/21 15:17
LR200	SJJ0155-HCV1	XDT_m1211011-027	NA	10/11/21 15:24
Instrument Blank	SJJ0155-IBL3	XDT_m1211011-028	NA	10/11/21 15:29
Instrument Blank	SJJ0155-IBL4	XDT_m1211011-029	NA	10/11/21 15:35
Calibration Check	SJJ0155-CCV2	XDT_m1211011-030	NA	10/11/21 15:41
Calibration Blank	SJJ0155-CCB2	XDT_m1211011-031	NA	10/11/21 15:48
ZZZZZ	21J0025-01	XDT_m1211011-038	Water	10/11/21 16:29
ZZZZZ	21J0025-01	XDT_m1211011-038	Water	10/11/21 16:29
ZZZZZ	21J0025-01	XDT_m1211011-038	Water	10/11/21 16:29
ZZZZZ	21J0025-01	XDT_m1211011-038	Water	10/11/21 16:29
Instrument Blank	SJJ0155-IBL5	XDT_m1211011-041	NA	10/11/21 16:49
Calibration Check	SJJ0155-CCV3	XDT_m1211011-042	NA	10/11/21 16:55
Calibration Blank	SJJ0155-CCB3	XDT_m1211011-043	NA	10/11/21 17:04
Calibration Check	SJJ0155-CCV4	XDT_m1211011-045	NA	10/11/21 17:14



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0155

Instrument: ICPMS1

Calibration: EJ00033

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Calibration Blank	SJJ0155-CCB4	XDT_m1211011-046	NA	10/11/21 17:21
Instrument Blank	SJJ0155-IBL6	XDT_m1211011-055	NA	10/11/21 18:17
Calibration Check	SJJ0155-CCV5	XDT_m1211011-056	NA	10/11/21 18:22
Calibration Blank	SJJ0155-CCB5	XDT_m1211011-057	NA	10/11/21 18:29
Instrument Blank	SJJ0155-IBL7	XDT_m1211011-067	NA	10/11/21 19:25
Calibration Check	SJJ0155-CCV6	XDT_m1211011-068	NA	10/11/21 19:31
Calibration Blank	SJJ0155-CCB6	XDT_m1211011-070	NA	10/11/21 19:44
Instrument Blank	SJJ0155-IBL8	XDT_m1211011-080	NA	10/11/21 20:37
Calibration Check	SJJ0155-CCV7	XDT_m1211011-081	NA	10/11/21 20:42
Calibration Blank	SJJ0155-CCB7	XDT_m1211011-082	NA	10/11/21 20:49
Calibration Check	SJJ0155-CCV9	XDT_m1211011-093	NA	10/11/21 23:54
Calibration Blank	SJJ0155-CCB9	XDT_m1211011-094	NA	10/12/21 00:01
Blank	BJJ0192-BLK1	XDT_m1211011-095	Water	10/12/21 00:05
LCS	BJJ0192-BS1	XDT_m1211011-096	Water	10/12/21 00:09
ZZZZZ	21I0287-16	XDT_m1211011-100	Water	10/12/21 00:28
Instrument Blank	SJJ0155-IBLA	XDT_m1211011-104	NA	10/12/21 00:47
Calibration Check	SJJ0155-CCVA	XDT_m1211011-105	NA	10/12/21 00:53
Calibration Blank	SJJ0155-CCBA	XDT_m1211011-106	NA	10/12/21 01:00
Instrument Blank	SJJ0155-IBLB	XDT_m1211011-116	NA	10/12/21 01:53
Calibration Check	SJJ0155-CCVB	XDT_m1211011-117	NA	10/12/21 01:58
Calibration Blank	SJJ0155-CCBB	XDT_m1211011-118	NA	10/12/21 02:05
Instrument Blank	SJJ0155-IBLC	XDT_m1211011-128	NA	10/12/21 02:52
Calibration Check	SJJ0155-CCVC	XDT_m1211011-129	NA	10/12/21 02:58
Calibration Blank	SJJ0155-CCBC	XDT_m1211011-130	NA	10/12/21 03:06
Instrument Blank	SJJ0155-IBLD	XDT_m1211011-140	NA	10/12/21 03:53
Calibration Check	SJJ0155-CCVD	XDT_m1211011-141	NA	10/12/21 03:59
Calibration Blank	SJJ0155-CCBD	XDT_m1211011-142	NA	10/12/21 04:07
Calibration Check	SJJ0155-CCVE	XDT_m1211011-144	NA	10/12/21 04:16
Calibration Blank	SJJ0155-CCBE	XDT_m1211011-145	NA	10/12/21 04:24



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0155

Instrument: ICPMS1

Calibration: EJ00033

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Instrument Blank	SJJ0155-IBLE	XDT_m1211011-147	NA	10/12/21 04:33
ZZZZZ	21I0335-01	XDT_m1211011-148	Water	10/12/21 04:38
ZZZZZ	21I0335-03	XDT_m1211011-149	Water	10/12/21 04:42
ZZZZZ	21I0335-05	XDT_m1211011-150	Water	10/12/21 04:47
Instrument Blank	SJJ0155-IBLF	XDT_m1211011-155	NA	10/12/21 05:11
Calibration Check	SJJ0155-CCVF	XDT_m1211011-156	NA	10/12/21 05:17
Calibration Blank	SJJ0155-CCBF	XDT_m1211011-157	NA	10/12/21 05:24
Instrument Blank	SJJ0155-IBLG	XDT_m1211011-160	NA	10/12/21 05:38
ZZZZZ	21I0331-01	XDT_m1211011-163	Water	10/12/21 05:52
ZZZZZ	21I0331-01	XDT_m1211011-163	Water	10/12/21 05:52
Instrument Blank	SJJ0155-IBLH	XDT_m1211011-167	NA	10/12/21 06:11
Calibration Check	SJJ0155-CCVG	XDT_m1211011-168	NA	10/12/21 06:17
Calibration Blank	SJJ0155-CCBG	XDT_m1211011-169	NA	10/12/21 06:25
Instrument Blank	SJJ0155-IBLI	XDT_m1211011-176	NA	10/12/21 06:58
ZZZZZ	21I0326-01	XDT_m1211011-177	Water	10/12/21 07:03
ZZZZZ	21I0326-03	XDT_m1211011-178	Water	10/12/21 07:07
Instrument Blank	SJJ0155-IBLJ	XDT_m1211011-179	NA	10/12/21 07:12
Calibration Check	SJJ0155-CCVH	XDT_m1211011-180	NA	10/12/21 07:18
Calibration Blank	SJJ0155-CCBH	XDT_m1211011-181	NA	10/12/21 07:25
ZZZZZ	21I0326-02	XDT_m1211011-182	Water	10/12/21 07:30
ZZZZZ	21I0326-04	XDT_m1211011-183	Water	10/12/21 07:35
ZZZZZ	21I0326-05	XDT_m1211011-184	Water	10/12/21 07:39
ZZZZZ	21I0326-06	XDT_m1211011-185	Water	10/12/21 07:44
Instrument Blank	SJJ0155-IBLK	XDT_m1211011-186	NA	10/12/21 07:49
Instrument Blank	SJJ0155-IBLL	XDT_m1211011-189	NA	10/12/21 08:03
Calibration Check	SJJ0155-CCVI	XDT_m1211011-190	NA	10/12/21 08:08
Calibration Blank	SJJ0155-CCBI	XDT_m1211011-191	NA	10/12/21 08:15



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0168

Instrument: ICPMS1

Calibration: EJ00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
CAL 0	SJJ0168-CAL1	XDT_m1211012-015	NA	10/12/21 15:04
CAL 0	SJJ0168-CAL1	XDT_m1211012-015	NA	10/12/21 15:04
CAL 1 - LOW CHECK	SJJ0168-CAL2	XDT_m1211012-016	NA	10/12/21 15:09
CAL 1 - LOW CHECK	SJJ0168-CAL2	XDT_m1211012-016	NA	10/12/21 15:09
CAL 2	SJJ0168-CAL3	XDT_m1211012-017	NA	10/12/21 15:14
CAL 2	SJJ0168-CAL3	XDT_m1211012-017	NA	10/12/21 15:14
CAL 3	SJJ0168-CAL4	XDT_m1211012-018	NA	10/12/21 15:19
CAL 3	SJJ0168-CAL4	XDT_m1211012-018	NA	10/12/21 15:19
CAL 4	SJJ0168-CAL5	XDT_m1211012-019	NA	10/12/21 15:24
CAL 4	SJJ0168-CAL5	XDT_m1211012-019	NA	10/12/21 15:24
CAL 5	SJJ0168-CAL6	XDT_m1211012-020	NA	10/12/21 15:31
CAL 5	SJJ0168-CAL6	XDT_m1211012-020	NA	10/12/21 15:31
RINSE	SJJ0168-IBL1	XDT_m1211012-021	NA	10/12/21 15:39
RINSE	SJJ0168-IBL1	XDT_m1211012-021	NA	10/12/21 15:39
Initial Cal Check	SJJ0168-ICV1	XDT_m1211012-023	NA	10/12/21 15:45
Initial Cal Check	SJJ0168-ICV1	XDT_m1211012-023	NA	10/12/21 15:45
Initial Cal Blank	SJJ0168-ICB1	XDT_m1211012-024	NA	10/12/21 15:53
Initial Cal Blank	SJJ0168-ICB1	XDT_m1211012-024	NA	10/12/21 15:53
Calibration Check	SJJ0168-CCV1	XDT_m1211012-025	NA	10/12/21 15:58
Calibration Check	SJJ0168-CCV1	XDT_m1211012-025	NA	10/12/21 15:58
Calibration Blank	SJJ0168-CCB1	XDT_m1211012-026	NA	10/12/21 16:06
Calibration Blank	SJJ0168-CCB1	XDT_m1211012-026	NA	10/12/21 16:06
Instrument RL Check	SJJ0168-CRL1	XDT_m1211012-027	NA	10/12/21 16:13
Instrument RL Check	SJJ0168-CRL1	XDT_m1211012-027	NA	10/12/21 16:13
Interference Check A	SJJ0168-IFA1	XDT_m1211012-028	NA	10/12/21 16:19
Interference Check A	SJJ0168-IFA1	XDT_m1211012-028	NA	10/12/21 16:19
Interference Check B	SJJ0168-IFB1	XDT_m1211012-029	NA	10/12/21 16:23
Interference Check B	SJJ0168-IFB1	XDT_m1211012-029	NA	10/12/21 16:23
LR200	SJJ0168-HCV1	XDT_m1211012-030	NA	10/12/21 16:29



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0168

Instrument: ICPMS1

Calibration: EJ00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
LR200	SJJ0168-HCV1	XDT_m1211012-030	NA	10/12/21 16:29
LR300	SJJ0168-HCV2	XDT_m1211012-031	NA	10/12/21 16:34
LR300	SJJ0168-HCV2	XDT_m1211012-031	NA	10/12/21 16:34
Instrument Blank	SJJ0168-IBL2	XDT_m1211012-032	NA	10/12/21 16:41
Instrument Blank	SJJ0168-IBL2	XDT_m1211012-032	NA	10/12/21 16:41
Instrument Blank	SJJ0168-IBL3	XDT_m1211012-033	NA	10/12/21 16:48
Instrument Blank	SJJ0168-IBL3	XDT_m1211012-033	NA	10/12/21 16:48
Calibration Check	SJJ0168-CCV2	XDT_m1211012-034	NA	10/12/21 16:55
Calibration Check	SJJ0168-CCV2	XDT_m1211012-034	NA	10/12/21 16:55
Calibration Blank	SJJ0168-CCB2	XDT_m1211012-035	NA	10/12/21 17:02
Calibration Blank	SJJ0168-CCB2	XDT_m1211012-035	NA	10/12/21 17:02
ZZZZZ	21I0287-22	XDT_m1211012-038	Water	10/12/21 17:18
ZZZZZ	21I0287-22	XDT_m1211012-038	Water	10/12/21 17:18
ZZZZZ	21I0287-22	XDT_m1211012-038	Water	10/12/21 17:18
ZZZZZ	21I0287-22	XDT_m1211012-038	Water	10/12/21 17:18
ZZZZZ	21I0287-30	XDT_m1211012-039	Water	10/12/21 17:23
ZZZZZ	21I0287-30	XDT_m1211012-039	Water	10/12/21 17:23
ZZZZZ	21I0287-30	XDT_m1211012-039	Water	10/12/21 17:23
ZZZZZ	21I0287-28	XDT_m1211012-040	Water	10/12/21 17:29
ZZZZZ	21I0287-28	XDT_m1211012-040	Water	10/12/21 17:29
ZZZZZ	21I0287-28	XDT_m1211012-040	Water	10/12/21 17:29
ZZZZZ	21I0287-16	XDT_m1211012-041	Water	10/12/21 17:34
ZZZZZ	21I0287-16	XDT_m1211012-041	Water	10/12/21 17:34
Instrument Blank	SJJ0168-IBL4	XDT_m1211012-045	NA	10/12/21 17:58
Instrument Blank	SJJ0168-IBL4	XDT_m1211012-045	NA	10/12/21 17:58
Calibration Check	SJJ0168-CCV3	XDT_m1211012-046	NA	10/12/21 18:03
Calibration Check	SJJ0168-CCV3	XDT_m1211012-046	NA	10/12/21 18:03
Calibration Blank	SJJ0168-CCB3	XDT_m1211012-047	NA	10/12/21 18:11
Calibration Blank	SJJ0168-CCB3	XDT_m1211012-047	NA	10/12/21 18:11



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0168

Instrument: ICPMS1

Calibration: EJ00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
ZZZZZ	21I0287-28RE1	XDT_m1211012-056	Water	10/12/21 18:59
ZZZZZ	21I0287-28RE1	XDT_m1211012-056	Water	10/12/21 18:59
Instrument Blank	SJJ0168-IBL5	XDT_m1211012-057	NA	10/12/21 19:07
Instrument Blank	SJJ0168-IBL5	XDT_m1211012-057	NA	10/12/21 19:07
Calibration Check	SJJ0168-CCV4	XDT_m1211012-058	NA	10/12/21 19:12
Calibration Check	SJJ0168-CCV4	XDT_m1211012-058	NA	10/12/21 19:12
Calibration Blank	SJJ0168-CCB4	XDT_m1211012-059	NA	10/12/21 19:20
Calibration Blank	SJJ0168-CCB4	XDT_m1211012-059	NA	10/12/21 19:20
Instrument Blank	SJJ0168-IBL6	XDT_m1211012-069	NA	10/12/21 20:21
Instrument Blank	SJJ0168-IBL6	XDT_m1211012-069	NA	10/12/21 20:21
Calibration Check	SJJ0168-CCV5	XDT_m1211012-070	NA	10/12/21 20:26
Calibration Check	SJJ0168-CCV5	XDT_m1211012-070	NA	10/12/21 20:26
Calibration Blank	SJJ0168-CCB5	XDT_m1211012-071	NA	10/12/21 20:34
Calibration Blank	SJJ0168-CCB5	XDT_m1211012-071	NA	10/12/21 20:34
Calibration Check	SJJ0168-CCV6	XDT_m1211012-073	NA	10/12/21 20:45
Calibration Check	SJJ0168-CCV6	XDT_m1211012-073	NA	10/12/21 20:45
Calibration Blank	SJJ0168-CCB6	XDT_m1211012-074	NA	10/12/21 20:52
Calibration Blank	SJJ0168-CCB6	XDT_m1211012-074	NA	10/12/21 20:52
ZZZZZ	21I0320-11	XDT_m1211012-080	Water	10/12/21 21:21
Instrument Blank	SJJ0168-IBL7	XDT_m1211012-084	NA	10/12/21 21:46
Instrument Blank	SJJ0168-IBL7	XDT_m1211012-084	NA	10/12/21 21:46
Calibration Check	SJJ0168-CCV7	XDT_m1211012-085	NA	10/12/21 21:51
Calibration Check	SJJ0168-CCV7	XDT_m1211012-085	NA	10/12/21 21:51
Calibration Blank	SJJ0168-CCB7	XDT_m1211012-086	NA	10/12/21 21:58
Calibration Blank	SJJ0168-CCB7	XDT_m1211012-086	NA	10/12/21 21:58
Instrument Blank	SJJ0168-IBL8	XDT_m1211012-091	NA	10/12/21 22:22
Instrument Blank	SJJ0168-IBL8	XDT_m1211012-091	NA	10/12/21 22:22
Instrument Blank	SJJ0168-IBL9	XDT_m1211012-096	NA	10/12/21 22:51
Instrument Blank	SJJ0168-IBL9	XDT_m1211012-096	NA	10/12/21 22:51



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0168

Instrument: ICPMS1

Calibration: EJ00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Calibration Check	SJJ0168-CCV8	XDT_m1211012-097	NA	10/12/21 22:56
Calibration Check	SJJ0168-CCV8	XDT_m1211012-097	NA	10/12/21 22:56
Calibration Blank	SJJ0168-CCB8	XDT_m1211012-098	NA	10/12/21 23:03
Calibration Blank	SJJ0168-CCB8	XDT_m1211012-098	NA	10/12/21 23:03
Instrument Blank	SJJ0168-IBLA	XDT_m1211012-102	NA	10/12/21 23:26
Instrument Blank	SJJ0168-IBLA	XDT_m1211012-102	NA	10/12/21 23:26
ZZZZZ	21I0331-02	XDT_m1211012-103	Water	10/12/21 23:31
ZZZZZ	21I0331-02	XDT_m1211012-103	Water	10/12/21 23:31
ZZZZZ	21I0331-01	XDT_m1211012-104	Water	10/12/21 23:36
ZZZZZ	21I0331-01	XDT_m1211012-104	Water	10/12/21 23:36
ZZZZZ	21I0331-01	XDT_m1211012-104	Water	10/12/21 23:36
Instrument Blank	SJJ0168-IBLB	XDT_m1211012-108	NA	10/13/21 00:01
Instrument Blank	SJJ0168-IBLB	XDT_m1211012-108	NA	10/13/21 00:01
Calibration Check	SJJ0168-CCV9	XDT_m1211012-109	NA	10/13/21 00:07
Calibration Check	SJJ0168-CCV9	XDT_m1211012-109	NA	10/13/21 00:07
Calibration Blank	SJJ0168-CCB9	XDT_m1211012-110	NA	10/13/21 00:14
Calibration Blank	SJJ0168-CCB9	XDT_m1211012-110	NA	10/13/21 00:14
Calibration Check	SJJ0168-CCVA	XDT_m1211012-112	NA	10/13/21 00:23
Calibration Check	SJJ0168-CCVA	XDT_m1211012-112	NA	10/13/21 00:23
Calibration Blank	SJJ0168-CCBA	XDT_m1211012-113	NA	10/13/21 00:31
Calibration Blank	SJJ0168-CCBA	XDT_m1211012-113	NA	10/13/21 00:31
Instrument Blank	SJJ0168-IBLC	XDT_m1211012-118	NA	10/13/21 00:59
Instrument Blank	SJJ0168-IBLC	XDT_m1211012-118	NA	10/13/21 00:59
ZZZZZ	21I0331-01RE1	XDT_m1211012-119	Water	10/13/21 01:04
Instrument Blank	SJJ0168-IBLD	XDT_m1211012-123	NA	10/13/21 01:27
Instrument Blank	SJJ0168-IBLD	XDT_m1211012-123	NA	10/13/21 01:27
Calibration Check	SJJ0168-CCVB	XDT_m1211012-124	NA	10/13/21 01:32
Calibration Check	SJJ0168-CCVB	XDT_m1211012-124	NA	10/13/21 01:32
Calibration Blank	SJJ0168-CCBB	XDT_m1211012-125	NA	10/13/21 01:39



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0168

Instrument: ICPMS1

Calibration: EJ00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Calibration Blank	SJJ0168-CCBB	XDT_m1211012-125	NA	10/13/21 01:39
Instrument Blank	SJJ0168-IBL	XDT_m1211012-130	NA	10/13/21 02:07
Instrument Blank	SJJ0168-IBL	XDT_m1211012-130	NA	10/13/21 02:07
Instrument Blank	SJJ0168-IBLF	XDT_m1211012-135	NA	10/13/21 02:36
Instrument Blank	SJJ0168-IBLF	XDT_m1211012-135	NA	10/13/21 02:36
Calibration Check	SJJ0168-CCVC	XDT_m1211012-136	NA	10/13/21 02:41
Calibration Check	SJJ0168-CCVC	XDT_m1211012-136	NA	10/13/21 02:41
Calibration Blank	SJJ0168-CCBC	XDT_m1211012-137	NA	10/13/21 02:48
Calibration Blank	SJJ0168-CCBC	XDT_m1211012-137	NA	10/13/21 02:48
MW-28_092021	21I0294-02	XDT_m1211012-138	Water	10/13/21 02:52
MW-28_092021	21I0294-02	XDT_m1211012-138	Water	10/13/21 02:52
MW-28_092021	BJJ0192-DUP3	XDT_m1211012-139	Water	10/13/21 02:57
MW-28_092021	BJJ0192-DUP3	XDT_m1211012-139	Water	10/13/21 02:57
MW-28_092021	BJJ0192-MS3	XDT_m1211012-140	Water	10/13/21 03:02
MW-28_092021	BJJ0192-MS3	XDT_m1211012-140	Water	10/13/21 03:02
MW-28_092021	BJJ0192-MSD3	XDT_m1211012-141	Water	10/13/21 03:08
MW-28_092021	BJJ0192-MSD3	XDT_m1211012-141	Water	10/13/21 03:08
Instrument Blank	SJJ0168-IBLG	XDT_m1211012-142	NA	10/13/21 03:16
Instrument Blank	SJJ0168-IBLG	XDT_m1211012-142	NA	10/13/21 03:16
ZZZZZ	21I0326-02	XDT_m1211012-143	Water	10/13/21 03:21
ZZZZZ	21I0326-02	XDT_m1211012-143	Water	10/13/21 03:21
ZZZZZ	21I0326-02	XDT_m1211012-143	Water	10/13/21 03:21
ZZZZZ	21I0326-04	XDT_m1211012-144	Water	10/13/21 03:26
ZZZZZ	21I0326-04	XDT_m1211012-144	Water	10/13/21 03:26
ZZZZZ	21I0326-04	XDT_m1211012-144	Water	10/13/21 03:26
ZZZZZ	21I0326-05	XDT_m1211012-145	Water	10/13/21 03:31
ZZZZZ	21I0326-05	XDT_m1211012-145	Water	10/13/21 03:31
ZZZZZ	21I0326-05	XDT_m1211012-145	Water	10/13/21 03:31
ZZZZZ	21I0326-06	XDT_m1211012-146	Water	10/13/21 03:37



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0168

Instrument: ICPMS1

Calibration: EJ00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
ZZZZZ	21I0326-06	XDT_m1211012-146	Water	10/13/21 03:37
ZZZZZ	21I0326-06	XDT_m1211012-146	Water	10/13/21 03:37
Instrument Blank	SJJ0168-IBLH	XDT_m1211012-147	NA	10/13/21 03:44
Instrument Blank	SJJ0168-IBLH	XDT_m1211012-147	NA	10/13/21 03:44
Calibration Check	SJJ0168-CCVD	XDT_m1211012-148	NA	10/13/21 03:49
Calibration Check	SJJ0168-CCVD	XDT_m1211012-148	NA	10/13/21 03:49
Calibration Blank	SJJ0168-CCBD	XDT_m1211012-149	NA	10/13/21 03:57
Calibration Blank	SJJ0168-CCBD	XDT_m1211012-149	NA	10/13/21 03:57
Calibration Check	SJJ0168-CCVE	XDT_m1211012-151	NA	10/13/21 04:06
Calibration Check	SJJ0168-CCVE	XDT_m1211012-151	NA	10/13/21 04:06
Calibration Blank	SJJ0168-CCBE	XDT_m1211012-152	NA	10/13/21 04:13
Calibration Blank	SJJ0168-CCBE	XDT_m1211012-152	NA	10/13/21 04:13
MW-24_092021	21I0294-04	XDT_m1211012-153	Water	10/13/21 04:18
MW-24_092021	21I0294-04	XDT_m1211012-153	Water	10/13/21 04:18
MW-60_092021	21I0294-05	XDT_m1211012-154	Water	10/13/21 04:22
ZZZZZ	21I0326-01	XDT_m1211012-155	Water	10/13/21 04:27
ZZZZZ	21I0326-01	XDT_m1211012-155	Water	10/13/21 04:27
ZZZZZ	21I0326-01	XDT_m1211012-155	Water	10/13/21 04:27
ZZZZZ	21I0326-03	XDT_m1211012-156	Water	10/13/21 04:32
ZZZZZ	21I0326-03	XDT_m1211012-156	Water	10/13/21 04:32
ZZZZZ	21I0326-03	XDT_m1211012-156	Water	10/13/21 04:32
Instrument Blank	SJJ0168-IBLI	XDT_m1211012-157	NA	10/13/21 04:38
Instrument Blank	SJJ0168-IBLI	XDT_m1211012-157	NA	10/13/21 04:38
ZZZZZ	21I0320-02	XDT_m1211012-158	Water	10/13/21 04:43
ZZZZZ	21I0320-02	XDT_m1211012-158	Water	10/13/21 04:43
ZZZZZ	21I0320-04	XDT_m1211012-159	Water	10/13/21 04:47
ZZZZZ	21I0320-04	XDT_m1211012-159	Water	10/13/21 04:47
ZZZZZ	21I0320-20	XDT_m1211012-160	Water	10/13/21 04:52
ZZZZZ	21I0320-20	XDT_m1211012-160	Water	10/13/21 04:52



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0168

Instrument: ICPMS1

Calibration: EJ00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
<i>ZZZZZ</i>	21I0320-05	XDT_m1211012-161	Water	10/13/21 04:58
Instrument Blank	SJJ0168-IBLJ	XDT_m1211012-162	NA	10/13/21 05:06
Instrument Blank	SJJ0168-IBLJ	XDT_m1211012-162	NA	10/13/21 05:06
Calibration Check	SJJ0168-CCVF	XDT_m1211012-163	NA	10/13/21 05:11
Calibration Check	SJJ0168-CCVF	XDT_m1211012-163	NA	10/13/21 05:11
Calibration Blank	SJJ0168-CCBF	XDT_m1211012-164	NA	10/13/21 05:18
Calibration Blank	SJJ0168-CCBF	XDT_m1211012-164	NA	10/13/21 05:18
MW-60_092021	21I0294-06	XDT_m1211012-165	Water	10/13/21 05:23
MW-60_092021	21I0294-06	XDT_m1211012-165	Water	10/13/21 05:23
MW-55_092021	21I0294-07	XDT_m1211012-166	Water	10/13/21 05:27
MW-55_092021	21I0294-08	XDT_m1211012-167	Water	10/13/21 05:32
MW-55_092021	21I0294-08	XDT_m1211012-167	Water	10/13/21 05:32
MW-42_092021	21I0294-09	XDT_m1211012-168	Water	10/13/21 05:37
Instrument Blank	SJJ0168-IBLK	XDT_m1211012-169	NA	10/13/21 05:43
Instrument Blank	SJJ0168-IBLK	XDT_m1211012-169	NA	10/13/21 05:43
MW-42_092021	21I0294-10	XDT_m1211012-170	Water	10/13/21 05:48
MW-42_092021	21I0294-10	XDT_m1211012-170	Water	10/13/21 05:48
MW-54_092021	21I0294-11	XDT_m1211012-171	Water	10/13/21 05:52
MW-54_092021	21I0294-12	XDT_m1211012-172	Water	10/13/21 05:57
MW-54_092021	21I0294-12	XDT_m1211012-172	Water	10/13/21 05:57
<i>ZZZZZ</i>	21I0320-06	XDT_m1211012-173	Water	10/13/21 06:03
<i>ZZZZZ</i>	21I0320-06	XDT_m1211012-173	Water	10/13/21 06:03
Instrument Blank	SJJ0168-IBLL	XDT_m1211012-174	NA	10/13/21 06:11
Instrument Blank	SJJ0168-IBLL	XDT_m1211012-174	NA	10/13/21 06:11
Calibration Check	SJJ0168-CCVG	XDT_m1211012-175	NA	10/13/21 06:16
Calibration Check	SJJ0168-CCVG	XDT_m1211012-175	NA	10/13/21 06:16
Calibration Blank	SJJ0168-CCBG	XDT_m1211012-176	NA	10/13/21 06:23
Calibration Blank	SJJ0168-CCBG	XDT_m1211012-176	NA	10/13/21 06:23
<i>ZZZZZ</i>	21I0320-07	XDT_m1211012-177	Water	10/13/21 06:28



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0168

Instrument: ICPMS1

Calibration: EJ00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
ZZZZZ	21I0320-08	XDT_m1211012-178	Water	10/13/21 06:32
ZZZZZ	21I0320-08	XDT_m1211012-178	Water	10/13/21 06:32
ZZZZZ	21I0320-09	XDT_m1211012-179	Water	10/13/21 06:37
ZZZZZ	21I0320-10	XDT_m1211012-180	Water	10/13/21 06:42
ZZZZZ	21I0320-10	XDT_m1211012-180	Water	10/13/21 06:42
Instrument Blank	SJJ0168-IBLM	XDT_m1211012-181	NA	10/13/21 06:48
Instrument Blank	SJJ0168-IBLM	XDT_m1211012-181	NA	10/13/21 06:48
ZZZZZ	21I0320-12	XDT_m1211012-182	Water	10/13/21 06:53
ZZZZZ	21I0320-12	XDT_m1211012-182	Water	10/13/21 06:53
ZZZZZ	21I0320-13	XDT_m1211012-183	Water	10/13/21 06:57
ZZZZZ	21I0320-14	XDT_m1211012-184	Water	10/13/21 07:02
ZZZZZ	21I0320-14	XDT_m1211012-184	Water	10/13/21 07:02
ZZZZZ	21I0320-15	XDT_m1211012-185	Water	10/13/21 07:08
Instrument Blank	SJJ0168-IBLN	XDT_m1211012-186	NA	10/13/21 07:16
Instrument Blank	SJJ0168-IBLN	XDT_m1211012-186	NA	10/13/21 07:16
Calibration Check	SJJ0168-CCVH	XDT_m1211012-187	NA	10/13/21 07:21
Calibration Check	SJJ0168-CCVH	XDT_m1211012-187	NA	10/13/21 07:21
Calibration Blank	SJJ0168-CCBH	XDT_m1211012-188	NA	10/13/21 07:28
Calibration Blank	SJJ0168-CCBH	XDT_m1211012-188	NA	10/13/21 07:28
Calibration Check	SJJ0168-CCVI	XDT_m1211012-190	NA	10/13/21 07:37
Calibration Check	SJJ0168-CCVI	XDT_m1211012-190	NA	10/13/21 07:37
Calibration Blank	SJJ0168-CCBI	XDT_m1211012-191	NA	10/13/21 07:45
Calibration Blank	SJJ0168-CCBI	XDT_m1211012-191	NA	10/13/21 07:45
ZZZZZ	21I0320-16	XDT_m1211012-193	Water	10/13/21 07:54
ZZZZZ	21I0320-16	XDT_m1211012-193	Water	10/13/21 07:54
ZZZZZ	21I0320-17	XDT_m1211012-194	Water	10/13/21 07:59
ZZZZZ	21I0320-18	XDT_m1211012-195	Water	10/13/21 08:04
ZZZZZ	21I0320-18	XDT_m1211012-195	Water	10/13/21 08:04
Instrument Blank	SJJ0168-IBLO	XDT_m1211012-196	NA	10/13/21 08:10



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0168

Instrument: ICPMS1

Calibration: EJ00039

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Instrument Blank	SJJ0168-IBLO	XDT_m1211012-196	NA	10/13/21 08:10
Instrument Blank	SJJ0168-IBLP	XDT_m1211012-201	NA	10/13/21 08:38
Instrument Blank	SJJ0168-IBLP	XDT_m1211012-201	NA	10/13/21 08:38
Calibration Check	SJJ0168-CCVJ	XDT_m1211012-202	NA	10/13/21 08:43
Calibration Check	SJJ0168-CCVJ	XDT_m1211012-202	NA	10/13/21 08:43
Calibration Blank	SJJ0168-CCBJ	XDT_m1211012-203	NA	10/13/21 08:50
Calibration Blank	SJJ0168-CCBJ	XDT_m1211012-203	NA	10/13/21 08:50
ZZZZZ	21I0325-07	XDT_m1211012-204	Solid	10/13/21 08:55
ZZZZZ	21I0325-08	XDT_m1211012-205	Solid	10/13/21 08:59
ZZZZZ	21I0325-11	XDT_m1211012-206	Solid	10/13/21 09:04
Instrument Blank	SJJ0168-IBLQ	XDT_m1211012-213	NA	10/13/21 09:37
Instrument Blank	SJJ0168-IBLQ	XDT_m1211012-213	NA	10/13/21 09:37
Calibration Check	SJJ0168-CCVK	XDT_m1211012-214	NA	10/13/21 09:42
Calibration Check	SJJ0168-CCVK	XDT_m1211012-214	NA	10/13/21 09:42
Calibration Blank	SJJ0168-CCBK	XDT_m1211012-215	NA	10/13/21 09:49
Calibration Blank	SJJ0168-CCBK	XDT_m1211012-215	NA	10/13/21 09:49
Instrument Blank	SJJ0168-IBLR	XDT_m1211012-219	NA	10/13/21 10:09
Instrument Blank	SJJ0168-IBLR	XDT_m1211012-219	NA	10/13/21 10:09
Calibration Check	SJJ0168-CCVL	XDT_m1211012-220	NA	10/13/21 10:14
Calibration Check	SJJ0168-CCVL	XDT_m1211012-220	NA	10/13/21 10:14
Calibration Blank	SJJ0168-CCBL	XDT_m1211012-221	NA	10/13/21 10:22
Calibration Blank	SJJ0168-CCBL	XDT_m1211012-221	NA	10/13/21 10:22



ICP INTERFERENCE CHECK SAMPLE
EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00031

Sequence: SJJ0139

Standard ID: J010724

Lab Sample ID	Analyte	True	Found	%R	Units
SJJ0139-IFA1	Iron-54	20000	20222.84	101	ug/L
	Iron-57	20000	20109.20	101	ug/L

* Indicates %R outside of QC limits

NOTE: True value and %R are populated only for analytes found in the interference check standards, and will be seen only if those analytes were requested.



ICP INTERFERENCE CHECK SAMPLE

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00031

Sequence: SJJ0139

Standard ID: J010724

Lab Sample ID	Analyte	True	Found	%R	Units
SJJ0139-IFB1	Iron-54	20000	20694.93	103	ug/L
	Iron-57	20000	20450.81	102	ug/L

* Indicates %R outside of QC limits

NOTE: True value and %R are populated only for analytes found in the interference check standards, and will be seen only if those analytes were requested.



ICP INTERFERENCE CHECK SAMPLE

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00033

Sequence: SJJ0155

Standard ID: J010724

Lab Sample ID	Analyte	True	Found	%R	Units
SJJ0155-IFA1	Iron-54 (dissolved)	20000	19737.39	98.7	ug/L
	Iron-57 (dissolved)	20000	19714.49	98.6	ug/L
	Lead-208 (dissolved)	0	0.0400		ug/L

* Indicates %R outside of QC limits

NOTE: True value and %R are populated only for analytes found in the interference check standards, and will be seen only if those analytes were requested.



ICP INTERFERENCE CHECK SAMPLE
EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00033

Sequence: SJJ0155

Standard ID: J010724

Lab Sample ID	Analyte	True	Found	%R	Units
SJJ0155-IFB1	Iron-54 (dissolved)	20000	19649.21	98.2	ug/L
	Iron-57 (dissolved)	20000	19770.85	98.9	ug/L
	Lead-208 (dissolved)	0	0.0400		ug/L

* Indicates %R outside of QC limits

NOTE: True value and %R are populated only for analytes found in the interference check standards, and will be seen only if those analytes were requested.



ICP INTERFERENCE CHECK SAMPLE

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Sequence: SJJ0168

Standard ID: J010724

Lab Sample ID	Analyte	True	Found	%R	Units
SJJ0168-IFA1	Iron-54	20000	19103.62	95.5	ug/L
	Iron-54 (dissolved)	20000	19103.62	95.5	ug/L
	Iron-57	20000	19031.17	95.2	ug/L
	Iron-57 (dissolved)	20000	19031.17	95.2	ug/L
	Lead-208 (dissolved)	0	0.0650		ug/L

* Indicates %R outside of QC limits

NOTE: True value and %R are populated only for analytes found in the interference check standards, and will be seen only if those analytes were requested.



ICP INTERFERENCE CHECK SAMPLE

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Sequence: SJJ0168

Standard ID: J010724

Lab Sample ID	Analyte	True	Found	%R	Units
SJJ0168-IFB1	Iron-54	20000	19085.93	95.4	ug/L
	Iron-54 (dissolved)	20000	19085.93	95.4	ug/L
	Iron-57	20000	19073.18	95.4	ug/L
	Iron-57 (dissolved)	20000	19073.18	95.4	ug/L
	Lead-208 (dissolved)	0	0.0670		ug/L

* Indicates %R outside of QC limits

NOTE: True value and %R are populated only for analytes found in the interference check standards, and will be seen only if those analytes were requested.



DETECTION LEVEL STANDARD
EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00031

Sequence: SJJ0139

Lab Sample ID: SJJ0139-CRL1

Analyte	True	Found	%R	Units	QC Limits
Iron-54	36.000	39.1	109	ug/L	50 - 150
Iron-57	36.000	36.4	101	ug/L	50 - 150

* Values outside of QC limits



DETECTION LEVEL STANDARD
EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00033

Sequence: SJJ0155

Lab Sample ID: SJJ0155-CRL1

Analyte	True	Found	%R	Units	QC Limits
Iron-54 (dissolved)	36.000	38.0	106	ug/L	50 - 150
Iron-57 (dissolved)	36.000	36.7	102	ug/L	50 - 150
Lead-208 (dissolved)	0.10000	0.107	107	ug/L	50 - 150

* Values outside of QC limits



DETECTION LEVEL STANDARD
EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: ICPMS1

Calibration: EJ00039

Sequence: SJJ0168

Lab Sample ID: SJJ0168-CRL1

Analyte	True	Found	%R	Units	QC Limits
Iron-54	36.000	37.6	105	ug/L	50 - 150
Iron-54 (dissolved)	36.000	37.6	105	ug/L	50 - 150
Iron-57	36.000	35.0	97.1	ug/L	50 - 150
Iron-57 (dissolved)	36.000	35.0	97.1	ug/L	50 - 150
Lead-208 (dissolved)	0.10000	0.104	104	ug/L	50 - 150

* Values outside of QC limits



HIGH-CONCENTRATION CALIBRATION VERIFICATION

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00031

Laboratory ID: SJJ0139-HCV1

Sequence: SJJ0139

Standard ID: J010416

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Iron-54	20000	20300	1.3	10.00
Iron-57	20000	20100	0.3	10.00

* Values outside of QC limits



HIGH-CONCENTRATION CALIBRATION VERIFICATION

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00031

Laboratory ID: SJJ0139-HCV2

Sequence: SJJ0139

Standard ID: J010417

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Iron-54	30000	30900	3.0	10.00
Iron-57	30000	30700	2.5	10.00

* Values outside of QC limits



HIGH-CONCENTRATION CALIBRATION VERIFICATION

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00033

Laboratory ID: SJJ0155-HCV1

Sequence: SJJ0155

Standard ID: J010416

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Iron-54 (dissolved)	20000	19700	-1.6	10.00
Iron-57 (dissolved)	20000	19700	-1.7	10.00
Lead-208 (dissolved)	200.00	203	1.6	10.00

* Values outside of QC limits



HIGH-CONCENTRATION CALIBRATION VERIFICATION

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00033

Laboratory ID: SJJ0155-HCV2

Sequence: SJJ0155

Standard ID: J010417

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Iron-54 (dissolved)	30000	29400	-2.1	10.00
Iron-57 (dissolved)	30000	29500	-1.7	10.00
Lead-208 (dissolved)	300.00	304	1.5	10.00

* Values outside of QC limits



HIGH-CONCENTRATION CALIBRATION VERIFICATION

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00039

Laboratory ID: SJJ0168-HCV1

Sequence: SJJ0168

Standard ID: J010416

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Iron-54	20000	19000	-5.1	10.00
Iron-54 (dissolved)	20000	19000	-5.1	10.00
Iron-57	20000	19300	-3.5	10.00
Iron-57 (dissolved)	20000	19300	-3.5	10.00
Lead-208 (dissolved)	200.00	200	0.08	10.00

* Values outside of QC limits



HIGH-CONCENTRATION CALIBRATION VERIFICATION

EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00039

Laboratory ID: SJJ0168-HCV2

Sequence: SJJ0168

Standard ID: J010417

ANALYTE	EXPECTED (ug/L)	FOUND (ug/L)	% DRIFT	QC LIMIT
Iron-54	30000	28600	-4.5	10.00
Iron-54 (dissolved)	30000	28600	-4.5	10.00
Iron-57	30000	28800	-3.9	10.00
Iron-57 (dissolved)	30000	28800	-3.9	10.00
Lead-208 (dissolved)	300.00	302	0.7	10.00

* Values outside of QC limits



HOLDING TIME SUMMARY

Analysis: EPA 6020B

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sample Name	Date Collected	Date Received	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
MW-28_092021 21I0294-01	09/20/21 10:10	09/21/21 15:38	10/06/21 13:56	16	180	10/08/21 03:52	18	180	
MW-28_092021 21I0294-02	09/20/21 10:10	09/21/21 15:38	10/07/21 11:34	17	180	10/13/21 02:52	23	180	
MW-24_092021 21I0294-03	09/20/21 11:11	09/21/21 15:38	10/06/21 13:56	16	180	10/08/21 03:57	18	180	
MW-24_092021 21I0294-04	09/20/21 11:11	09/21/21 15:38	10/07/21 11:34	17	180	10/13/21 04:18	23	180	
MW-60_092021 21I0294-05	09/20/21 11:30	09/21/21 15:38	10/06/21 13:56	16	180	10/13/21 04:22	23	180	
MW-60_092021 21I0294-06	09/20/21 11:30	09/21/21 15:38	10/07/21 11:34	17	180	10/13/21 05:23	23	180	
MW-55_092021 21I0294-07	09/20/21 12:29	09/21/21 15:38	10/06/21 13:56	16	180	10/13/21 05:27	23	180	
MW-55_092021 21I0294-08	09/20/21 12:29	09/21/21 15:38	10/07/21 11:34	16	180	10/13/21 05:32	23	180	
MW-42_092021 21I0294-09	09/20/21 12:35	09/21/21 15:38	10/06/21 13:56	16	180	10/13/21 05:37	23	180	
MW-42_092021 21I0294-10	09/20/21 12:35	09/21/21 15:38	10/07/21 11:34	16	180	10/13/21 05:48	23	180	
MW-54_092021 21I0294-11	09/20/21 13:54	09/21/21 15:38	10/06/21 13:56	16	180	10/13/21 05:52	23	180	
MW-54_092021 21I0294-12	09/20/21 13:54	09/21/21 15:38	10/07/21 11:34	16	180	10/13/21 05:57	23	180	
Duplicate BJJ0192-DUP3	09/20/21 10:10	09/21/21 15:38	10/07/21 11:34	17	180	10/13/21 02:57	23	180	
Matrix Spike BJJ0192-MS3	09/20/21 10:10	09/21/21 15:38	10/07/21 11:34	17	180	10/13/21 03:02	23	180	
Matrix Spike Dup BJJ0192-MSD3	09/20/21 10:10	09/21/21 15:38	10/07/21 11:34	17	180	10/13/21 03:08	23	180	

* Indicates hold time exceedance.



Analytical Resources, Incorporated
Analytical Chemists and Consultants

**METHOD DETECTION
AND REPORTING LIMITS
EPA 6020B**

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Instrument: ICPMS1

Analyte	MDL	RL	Units
Iron-54	18.2	36.0	ug/L
Iron-54 (dissolved)	18.2	36.0	ug/L
Iron-57	6.63	36.0	ug/L
Iron-57 (dissolved)	18.2	36.0	ug/L
Lead-208 (dissolved)	0.0513	0.100	ug/L

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGAG10
Lot Number: P2-AG679501
Matrix: 7% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Silver
Starting Material: Ag Shot
Starting Material Lot#: 2217
Starting Material Purity: 99.9993%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9996 ± 30 µg/mL
Density: 1.053 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **10015 ± 56 µg/mL**
ICP Assay NIST SRM 3151 Lot Number: 160729

Assay Method #2 **9992 ± 25 µg/mL**
Volhard NIST SRM 999c Lot Number: 999c

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

s Ag <	M Eu <	0.000253	O Na	0.005562	M Se <	0.018179	M Zn	0.005799	
O Al	0.006295	O Fe	0.002932	M Nb <	0.000253	M Si	0.022484	M Zr <	0.005559
M As <	0.002403	M Ga <	0.000253	M Nd <	0.000253	M Sm <	0.000253		
M Au	0.001634	M Gd <	0.000253	O Ni <	0.005472	M Sn	0.001927		
O B <	0.009978	M Ge <	0.000754	M Os <	0.000254	O Sr	0.000086		
M Ba <	0.000785	M Hf <	0.000253	M P <	0.053784	M Ta <	0.000253		
M Be <	0.002407	M Hg <	0.001332	M Pb	0.003281	M Tb <	0.000253		
M Bi	0.001671	M Ho <	0.000253	M Pd <	0.001382	M Te <	0.003715		
O Ca	0.007115	M In <	0.003483	M Pr <	0.000253	M Th <	0.000253		
M Cd <	0.000253	M Ir <	0.000254	M Pt <	0.000253	M Ti <	0.002706		
M Ce <	0.000573	O K	0.004010	M Rb <	0.000253	M Tl <	0.000253		
M Co <	0.000253	M La <	0.000253	M Re <	0.000253	M Tm <	0.000253		
O Cr <	0.005043	O Li <	0.000214	M Rh <	0.000253	M U <	0.000253		
M Cs <	0.002769	M Lu <	0.000253	M Ru <	0.000254	M V <	0.000822		
O Cu	0.004614	O Mg	0.001034	M S <	0.560935	M W <	0.002146		
M Dy <	0.000253	M Mn <	0.000253	M Sb <	0.006899	M Y <	0.000253		
M Er <	0.000253	M Mo <	0.000479	M Sc <	0.000733	M Yb <	0.000253		

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 107.87 +1 6 Ag(H₂O)₆⁺

Chemical Compatibility -Stable in HNO₃, and HF. Avoid basic media. Ag forms more insoluble salts than any other metal. It also is subject to photochemical reduction to the metal in HCl media although 10 µg/mL solutions in 10% HCl [AgCl_x1-x] are commonly used in the analytical laboratory. The most common solubility problems exist with arsenate, arsenite, bromide, chloride, iodide, carbonate, chromate, cyanide, iodate, oxalate, oxide, sulfate, sulfide, tartrate, and thiocyanate in aqueous media. The addition of nitric acid renders many of these salts soluble.

Stability - 2-100 ppb levels stable for 75+ days when mixed with equivalent levels of all other elements including the precious metals (where chloride is present) when in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Ag Containing Samples (Preparation and Solution) -Metal (Soluble in HNO₃); Oxides (Soluble in HNO₃); Ores (Digestion with conc. HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 107 amu	1 ppt	N/A	91Zr16O
ICP-OES 243.779 nm	0.12/0.01 µg/mL	1	Mn, Th, Ni, Rh
ICP-OES 328.068 nm	0.007/0.0007 µg/mL	1	Ce, Rh, V
ICP-OES 338.289 nm	0.013/0.001 µg/mL	1	Ce, Cr, Th

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 07, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- June 07, 2023

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Supervisor, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGAS10
 Lot Number: R2-AS691113
 Matrix: 2% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Arsenic
 Starting Material: As Pieces
 Starting Material Lot#: 2208
 Starting Material Purity: 99.9980%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9981 ± 55 µg/mL
Density: 1.028 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **9981 ± 55 µg/mL**
 ICP Assay NIST SRM 3103a Lot Number: 100818

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i) (X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$
 w_i = the weighting factors for each method calculated using the inverse square of the variance:
 $w_i = (1/u_{char i}^2) / (\sum(1/u_{char j}^2))$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2
 u_{char} = $[\sum(w_i)^2 (u_{char i})^2]^{1/2}$ where $u_{char i}$ are the errors from each characterization method
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with
 $u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2
 $u_{char a}$ = the errors from characterization
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag <	0.001578	M Eu <	0.000526	O Na	0.036136	M Se <	0.014204	O Zn <	0.003390
O Al	0.006694	M Fe	0.002633	O Nb <	0.011526	O Si	0.139479	M Zr <	0.003156
s As <		M Ga <	0.000526	M Nd <	0.000526	M Sm <	0.000526		
M Au <	0.000526	M Gd <	0.000526	O Ni <	0.005537	M Sn <	0.001052		
M B	0.017011	M Ge <	0.000526	M Os <	0.000526	M Sr <	0.000526		
M Ba <	0.000526	M Hf <	0.000526	O P <	0.056500	M Ta <	0.000526		
O Be <	0.001130	M Hg <	0.002104	M Pb <	0.000526	M Tb <	0.000526		
M Bi <	0.002104	M Ho <	0.000526	M Pd <	0.000526	M Te <	0.003682		
O Ca	0.005657	M In <	0.000526	M Pr <	0.002630	M Th <	0.000526		
M Cd <	0.000526	M Ir <	0.000526	M Pt <	0.000526	O Ti <	0.001017		
M Ce <	0.000526	O K	0.003865	M Rb <	0.002104	M Tl <	0.000526		
M Co <	0.003156	M La <	0.000526	M Re <	0.000526	M Tm <	0.000526		
M Cr	0.000877	M Li <	0.000526	M Rh <	0.000526	M U <	0.000526		
M Cs <	0.002104	M Lu <	0.000526	M Ru <	0.000526	M V <	0.001578		
M Cu <	0.003156	O Mg	0.000235	O S <	0.056500	M W <	0.000526		
M Dy <	0.000526	M Mn <	0.001052	M Sb <	0.000526	M Y <	0.000526		
M Er <	0.000526	M Mo <	0.000526	M Sc <	0.002104	M Yb <	0.000526		

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 74.92 ; mix of +3 and +5 ; 6 ; H3AsO4 and HAsO2

Chemical Compatibility - Arsenic has no cationic chemistry. It is soluble in HCl, HNO3, H3PO4, H2SO4 and HF aqueous matrices water and NH4OH. It is stable with most inorganic anions (forms arsenate when boiled with chromate) but many cationic metals form the insoluble arsenates under pH neutral conditions. When fluorinated and / or under acidic conditions arsenate formation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO3 / LDPE container.

As Containing Samples (Preparation and Solution) - Metal (soluble in 1:1 H2O / HNO3); Oxides (the oxide exists in crystalline and amorphous forms where the amorphous form is more water soluble. The oxides typically dissolve in dilute acidic solutions when boiled); Minerals (one gram of powdered sample is fused in a Ni crucible with 10 grams of a 1:1 mix of K2CO3 and KNO3 and the melt extracted with hot water); Organic Matrices (0.2 to 0.5 grams of sample are fused with 15 grams of a 1:1 Na2CO3 / Na2O2 mix in a Ni crucible. The fuseate is extracted with water and acidified with HNO3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 75 amu	20 ppt	N/A	40Ar35Cl, 59Co16O, 36Ar38Ar1H,8Ar37C I,Ar39K, 150Nd2+,150Sm2+
ICP-OES 189.042 nm	0.05/0.005 µg/mL	1	Cr
ICP-OES 193.696 nm	0.1/0.01 µg/mL	1	V, Ge
ICP-OES 228.812 nm	0.1/0.01 µg/mL	1	Cd, Pt, Ir, Co

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 25, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **March 25, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGCD10
Lot Number: P2-CD675954
Matrix: 3% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Cadmium
Starting Material: Cd Shot
Starting Material Lot#: 1954
Starting Material Purity: 99.9998%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10014 ± 30 µg/mL
Density: 1.029 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10021 ± 32 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #2	10038 ± 43 µg/mL ICP Assay NIST SRM 3108 Lot Number: 130116
Assay Method #3	9996 ± 30 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ i}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag	0.000834	O Eu <	0.002146	O Na	0.003359	M Se <	0.003997	O Zn	0.000251
O Al	0.002435	O Fe <	0.001180	M Nb <	0.000399	O Si	0.009519	M Zr <	0.000399
M As <	0.003997	M Ga <	0.000399	M Nd <	0.000399	M Sm <	0.000799		
M Au <	0.002809	M Gd <	0.000399	M Ni <	0.002398	M Sn <	0.000799		
M B <	0.005197	M Ge <	0.004397	M Os <	0.000401	O Sr <	0.000107		
M Ba <	0.000399	M Hf <	0.000399	O P <	0.023606	M Ta <	0.000399		
O Be <	0.000107	O Hg <	0.010730	M Pb <	0.001599	M Tb <	0.000399		
M Bi <	0.000399	M Ho <	0.000399	M Pd <	0.000799	M Te <	0.005596		
O Ca	0.001399	O In <	0.015558	M Pr <	0.000399	M Th <	0.000399		
s Cd <		M Ir <	0.000401	M Pt <	0.000399	O Ti <	0.000536		
M Ce <	0.000399	O K	0.004479	M Rb <	0.000399	M Tl	0.000625		
M Co <	0.000399	M La <	0.000399	M Re <	0.000399	M Tm <	0.000399		
M Cr <	0.001199	O Li <	0.000214	M Rh <	0.000399	M U <	0.000399		
M Cs <	0.000399	M Lu <	0.000399	M Ru <	0.000401	M V <	0.001599		
O Cu <	0.003219	O Mg	0.000083	O S <	0.021460	M W <	0.000799		
M Dy <	0.000399	O Mn <	0.000429	M Sb <	0.001599	M Y <	0.000399		
M Er <	0.000399	M Mo <	0.000399	O Sc <	0.000429	M Yb <	0.000399		

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 112.41 +2 4 Cd₂(OH)(aq)₃₊ and Cd(OH)(aq)

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, and HF. Avoid basic media forming insoluble carbonate and hydroxide.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO₃ / LDPE container.

Cd Containing Samples (Preparation and Solution) -Metal (soluble in HNO₃); Oxides (soluble in HCl or HNO₃); Ores (dissolve in HCl /HNO₃ then take to fumes with H₂SO₄. The silica and lead sulfate are filtered off after the addition of water); Organic based (dry ash at 450°C and dissolve ash in HCl), (sulfuric / peroxide acid digestion).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 111 amu	11 ppt	n/a	95Mo16O
ICP-OES 214.438 nm	0.003 / 0.0003 µg/mL	1	Pt, Ir
ICP-OES 226.502 nm	0.003 / 0.0003 µg/mL	1	Ir
ICP-OES 228.802 nm	0.003 / 0.0003 µg/mL	1	Co, Ir, As, Pt

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 07, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- March 07, 2023

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Supervisor, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGCO10
Lot Number: N2-CO671028
Matrix: 3% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Cobalt
Starting Material: COBALT
Starting Material Lot#: 1749
Starting Material Purity: 99.9978%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9988 ± 34 µg/mL
Density: 1.057 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	9973 ± 32 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #2	10024 ± 50 µg/mL ICP Assay NIST SRM traceable to 3113 Lot Number: M2-CO661665

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Ag	0.022956	M	Eu <	0.000422	O Na	0.008125	M	Se <	0.009290	M	Zn	0.007197	
O Al	0.013621	O	Fe	0.048700	M	Nb <	0.000422	O	Si	0.017539	M	Zr <	0.014357
i As <		M	Ga <	0.000844	M	Nd <	0.017735	M	Sm <	0.001689			
M Au <	0.000583	M	Gd	0.003247	O	Ni <	0.043642	M	Sn <	0.005067			
M B <	0.013512	M	Ge <	0.004645	M	Os <	0.000583	O	Sr	0.000841			
O Ba	0.071210	M	Hf <	0.000422	n	P <		M	Ta <	0.000422			
O Be <	0.001771	M	Hg <	0.002334	M	Pb	0.010094	M	Tb <	0.001689			
M Bi	0.000614	M	Ho <	0.000422	M	Pd <	0.000422	M	Te <	0.008445			
O Ca	0.025034	M	In <	0.003378	M	Pr <	0.006756	M	Th <	0.000422			
M Cd <	0.000844	M	Ir <	0.000583	M	Pt <	0.000422	M	Ti <	0.002533			
M Ce	0.002721	O	K	0.005785	M	Rb <	0.001689	M	Tl <	0.000422			
s Co <		M	La	0.000877	M	Re	0.016853	M	Tm <	0.000422			
M Cr <	0.020269	O	Li	0.000262	M	Rh <	0.000422	M	U <	0.000422			
M Cs	0.000877	M	Lu <	0.000422	M	Ru <	0.000583	M	V <	0.001689			
M Cu	0.007197	O	Mg	0.003444	n	S <		M	W <	0.000844			
M Dy <	0.000422	O	Mn <	0.006072	M	Sb <	0.005911	M	Y	0.001228			
M Er <	0.000422	M	Mo <	0.005911	M	Sc <	0.001689	M	Yb <	0.003378			

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.
- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.93 +2 6 Co(H₂O)₆²⁺

Chemical Compatibility - Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Co Containing Samples (Preparation and Solution) - Metal (soluble in HNO₃); Oxides (Soluble in HCl); Ores (dissolve in HCl / HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 59 amu	2 ppt	n/a	42Ca16O1H , 40Ar18O1H , 36Ar23Na, 43Ca16O, 24Mg35Cl
ICP-OES 228.616 nm	0.01/0.001 µg/mL	1	
ICP-OES 237.862 nm	0.01/0.002 µg/mL	1	W, Re, Al, Ta
ICP-OES 238.892 nm	0.01/0.002 µg/mL	1	Fe, W, Ta

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 15, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **January 15, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Supervisor, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGCR(3)10
 Lot Number: P2-CR684202
 Matrix: 10% (v/v) HNO₃
 Value / Analyte(s): 10 000 µg/mL ea:
 Chromium
 Starting Material: Cr METAL
 Starting Material Lot#: 2077
 Starting Material Purity: 99.9942%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10056 ± 49 µg/mL
Density: 1.084 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10061 ± 71 µg/mL ICP Assay NIST SRM 3112a Lot Number: 170630
Assay Method #2	10052 ± 64 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.000540	M Eu < 0.003200	O Na < 0.130027	M Se < 0.012000	O Zn < 0.002700
O Al < 0.016626	O Fe < 0.202502	M Nb < 0.022000	n Si < 0.000540	M Zr < 0.020000
M As < 0.003836	O Ga < 0.031000	M Nd < 0.000540	M Sm < 0.035000	
M Au < 0.000540	M Gd < 0.000540	O Ni < 0.009165	M Sn < 0.004049	
M B < 0.049000	M Ge < 0.005400	M Os < 0.088000	O Sr < 0.000250	
O Ba < 0.002000	M Hf < 0.000540	i P < 0.000540	M Ta < 0.000540	
O Be < 0.000250	M Hg < 0.001600	M Pb < 0.002557	M Tb < 0.000540	
M Bi < 0.008952	M Ho < 0.000540	M Pd < 0.001100	M Te < 0.004800	
O Ca < 0.074605	M In < 0.001100	M Pr < 0.000540	M Th < 0.000540	
M Cd < 0.000540	M Ir < 0.000540	M Pt < 0.000540	O Ti < 0.013428	
M Ce < 0.000540	O K < 0.034105	i Rb < 0.000540	M Tl < 0.001100	
O Co < 0.002900	M La < 0.001100	M Re < 0.002700	O Tm < 0.001800	
s Cr < 0.000540	O Li < 0.000130	M Rh < 0.032000	M U < 0.001100	
M Cs < 0.019000	M Lu < 0.000540	M Ru < 0.094000	O V < 0.159869	
O Cu < 0.010018	O Mg < 0.001449	i S < 0.000540	M W < 0.028000	
M Dy < 0.000540	O Mn < 0.014000	M Sb < 0.008600	M Y < 0.001100	
M Er < 0.016000	O Mo < 0.013000	O Sc < 0.001400	M Yb < 0.000540	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 52.00 +3 6 Cr(H₂O)₆³⁺

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Cr₃ Containing Samples (Preparation and Solution) -Metal (soluble in HCl); Oxides/Ores (Chrome ore/oxides are very difficult to dissolve. The following procedures [A-D] are commonly used: A. Fusion with KHSO₄ and extraction with hot KCl. The residue fused with Na₂CO₃ and KClO₃, 3:1. B. Fusion with NaKSO₄ and NaF 2:1, C. Fusion with magnesia or lime and sodium or potassium carbonates, 4:1. D. Fusion with Na₂O₂ or NaOH and KNO₃ or NaOH and Na₂O₂. Nickel, iron, copper, or silver crucibles should be used for D. Platinum may be used for A, B, C); Organic Matrices (ash at 4500C followed by one of the fusion methods above or sulfuric/hydrogen peroxide acid digestions may be applicable to non oxide containing samples).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 52 amu	40 ppt	N/A	36S16O, 36Ar16O - The 50Cr, 53Cr, 54Cr lines suffer from many more potential interferences from sulfur, chlorine and argon compounds of oxygen, nitrogen and carbon.
ICP-OES 205.552 nm	0.006/0.0008 µg/mL	1	Os
ICP-OES 276.654 nm	0.01/0.001 µg/mL	1	Cu, Ta, V
ICP-OES 284.325 nm	0.008/0.0007 µg/mL	1	

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 02, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **November 02, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGCU10
 Lot Number: P2-CU682108
 Matrix: 3% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Copper
 Starting Material: Cu Metal
 Starting Material Lot#: 2095
 Starting Material Purity: 99.9996%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10013 ± 30 µg/mL
Density: 1.032 g/mL (measured at 20 ± 4 °C)

Assay Information:

- Assay Method #1** **9977 ± 50 µg/mL**
 ICP Assay NIST SRM 3114 Lot Number: 121207

- Assay Method #2** **10024 ± 26 µg/mL**
 EDTA NIST SRM 928 Lot Number: 928

- Assay Method #3** **10007 ± 46 µg/mL**
 Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.007542	M Eu < 0.000942	O Na < 0.001434	M Se < 0.016971	M Zn < 0.005657
O Al < 0.000609	O Fe < 0.008700	M Nb < 0.000942	O Si < 0.003052	M Zr < 0.000942
M As < 0.010371	M Ga < 0.000942	M Nd < 0.000942	M Sm < 0.000942	
M Au < 0.001885	M Gd < 0.000942	M Ni < 0.003781	M Sn < 0.005657	
O B < 0.003663	M Ge < 0.005657	M Os < 0.000942	M Sr < 0.000942	
M Ba < 0.004253	M Hf < 0.000942	O P < 0.031668	M Ta < 0.000942	
M Be < 0.000942	O Hg < 0.007064	M Pb < 0.005789	M Tb < 0.000942	
M Bi < 0.000942	M Ho < 0.000942	M Pd < 0.000942	M Te < 0.004714	
O Ca < 0.002304	M In < 0.000942	M Pr < 0.000942	M Th < 0.000942	
M Cd < 0.000942	M Ir < 0.000942	M Pt < 0.000942	O Ti < 0.002801	
M Ce < 0.000942	O K < 0.000763	M Rb < 0.000942	M Tl < 0.000942	
M Co < 0.001890	M La < 0.000942	M Re < 0.000942	M Tm < 0.000942	
M Cr < 0.005657	O Li < 0.000243	i Rh < 0.000942	M U < 0.000942	
M Cs < 0.000942	M Lu < 0.000942	M Ru < 0.039588	M V < 0.003771	
s Cu < 0.000942	O Mg < 0.000320	O S < 0.007174	M W < 0.005657	
M Dy < 0.000942	O Mn < 0.000793	M Sb < 0.001885	M Y < 0.000942	
M Er < 0.000942	M Mo < 0.005657	M Sc < 0.000942	M Yb < 0.000942	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 63.55 +2 6 Cu(H₂O)₆²⁺

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Cu Containing Samples (Preparation and Solution) -Metal (soluble in HNO₃); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 63 amu	10 ppt	n/a	40Ar23Na 47Ti16O, 14N12C37Cl, 16O12C35Cl, 23Na40Ca
ICP-OES 219.958 nm	0.01/.002 µg/mL	1	Th, Ta, Nb, U, Hf
ICP-OES 224.700 nm	0.01/.001 µg/mL	1	Pb, Ir, Ni, W
ICP-OES 324.754 nm	0.06/.001 µg/mL		Nb, U, Th, Mo, Hf

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

August 24, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **August 24, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGMN10
 Lot Number: P2-MN687536
 Matrix: 3% (v/v) HNO₃
 Value / Analyte(s): 10 000 µg/mL ea:
 Manganese
 Starting Material: Mn Metal
 Starting Material Lot#: 2275
 Starting Material Purity: 99.9909%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10046 ± 30 µg/mL
Density: 1.035 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10045 ± 25 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #2	10083 ± 68 µg/mL ICP Assay NIST SRM 3132 Lot Number: 050429
Assay Method #3	10031 ± 47 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.001500	M Eu < 0.000730	O Na 0.176713	M Se < 0.006600	M Zn 0.009960
O Al 0.004337	M Fe < 0.650000	M Nb < 0.000730	O Si 0.097995	M Zr < 0.000730
M As < 0.008000	M Ga 0.004337	M Nd < 0.001500	M Sm < 0.000730	
M Au < 0.000730	M Gd < 0.000730	M Ni 0.024097	M Sn < 0.002200	
M B 0.069078	M Ge < 0.004400	M Os < 0.000730	O Sr 0.000931	
M Ba < 0.001500	M Hf < 0.000730	i P <	M Ta < 0.000730	
M Be < 0.000730	M Hg < 0.002200	M Pb 0.007389	M Tb < 0.000730	
M Bi < 0.003000	M Ho < 0.000730	M Pd < 0.000730	M Te < 0.019000	
O Ca 0.062652	M In < 0.003000	M Pr < 0.000730	M Th < 0.000730	
M Cd < 0.001500	M Ir < 0.000730	M Pt < 0.000730	O Ti < 0.006500	
M Ce < 0.007300	O K 0.006425	M Rb < 0.006600	M Tl < 0.000730	
O Co 0.014779	M La < 0.003000	M Re < 0.000730	M Tm < 0.000730	
O Cr 0.273102	O Li 0.000417	M Rh < 0.003000	M U < 0.001500	
M Cs < 0.000730	M Lu < 0.000730	M Ru < 0.004400	M V < 0.000730	
O Cu 0.007711	O Mg 0.321297	i S <	M W < 0.004400	
M Dy < 0.001500	s Mn <	M Sb < 0.021000	O Y 0.001365	
M Er < 0.001500	M Mo 0.010281	O Sc < 0.004100	M Yb < 0.000730	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 54.94 +2 6 Mn(H₂O)₆2+

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO₃/LDPE container.

Mn Containing Samples (Preparation and Solution) -Metal (Soluble in dilute acids); Oxides (Soluble in dilute acids); Ores (Dissolve with HCl. If silica is present add HF and then fume off silica by adding H₂SO₄ and heat to SO₃ fumes - dense white fumes).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 55 amu	10 ppt	n/a	40Ar14N1H,39K16 O,37Cl18O,40Ar15 N,38Ar17O,36Ar18O 1H ,38Ar16O1H,37Cl17 O1H,23Na32S
ICP-OES 257.610 nm	0.0014 / 0.00002 µg/mL	1	Ce, W, Re
ICP-OES 259.373 nm	0.0016 / 0.00002 µg/mL	1	U, Ta, Mo, Fe, Nb
ICP-OES 260.569 nm	0.0021 / 0.00002 µg/mL	1	Co

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 05, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **January 05, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGNI10
 Lot Number: P2-NI686384
 Matrix: 3% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Nickel
 Starting Material: Ni Metal
 Starting Material Lot#: 2277 and 2282
 Starting Material Purity: 99.9992%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9979 ± 30 µg/mL
Density: 1.038 g/mL (measured at 20 ± 4 °C)

Assay Information:

- Assay Method #1** **9971 ± 54 µg/mL**
 ICP Assay NIST SRM 3136 Lot Number: 120619

- Assay Method #2** **9970 ± 32 µg/mL**
 EDTA NIST SRM 928 Lot Number: 928

- Assay Method #3** **9993 ± 33 µg/mL**
 Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag	0.002606	M Eu	<	0.001100	O Na	0.004965	O Se	<	0.067000	M Zn	0.006578	
M Al	<	0.013000	O Fe	0.018618	M Nb	<	0.001100	O Si	0.010923	M Zr	<	0.001100
O As	<	0.067000	M Ga	<	0.001100	M Nd	<	0.001100	M Sm	<	0.001100	
M Au	<	0.002100	M Gd	<	0.001100	s Ni	<		M Sn	<	0.016000	
M B	<	0.017000	M Ge	<	0.004200	M Os	0.002110	O Sr	<	0.000940		
M Ba	<	0.001100	M Hf	<	0.001100	i P	<		M Ta	<	0.001100	
O Be	<	0.000410	M Hg	0.014895	M Pb	0.006578	M Tb	<	0.001100			
M Bi	<	0.004200	M Ho	<	0.001100	M Pd	<	0.001100	M Te	<	0.015000	
O Ca	0.003351	M In	<	0.001100	M Pr	<	0.001100	M Th	<	0.001100		
M Cd	0.001365	M Ir	0.004716	M Pt	<	0.001100	M Ti	<	0.004200			
M Ce	<	0.001100	O K	0.004716	M Rb	<	0.001100	M Tl	<	0.001100		
O Co	0.017377	M La	<	0.001100	M Re	0.001737	M Tm	<	0.001100			
O Cr	<	0.006700	O Li	<	0.000140	M Rh	<	0.006300	M U	<	0.001100	
M Cs	<	0.007300	M Lu	<	0.001100	M Ru	<	0.019000	M V	<	0.002100	
M Cu	0.004096	O Mg	0.000372	i S	<			M W	<	0.006300		
M Dy	<	0.001100	O Mn	<	0.001900	M Sb	0.005833	O Y	<	0.000540		
M Er	<	0.001100	M Mo	<	0.008400	M Sc	<	0.002100	M Yb	<	0.001100	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.69 +2 6 Ni(H₂O)₆²⁺

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Ni Containing Samples (Preparation and Solution) -Metal (Soluble in HNO₃); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 60 amu	100 ppt	n/a	43Ca16O1H , 44Ca16O, 23Na37Cl
ICP-OES 221.647 nm	0.01 / 0.0009 µg/mL	1	Si
ICP-OES 231.604 nm	0.02 / 0.002 µg/mL	1	Sb, Ta, Co
ICP-OES 232.003 nm	0.02 / 0.006 µg/mL	1	Cr, Re, Os, Nb, Ag, Pt, Fe

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 02, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- December 02, 2023

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGZN10
 Lot Number: P2-ZN686137
 Matrix: 2% (v/v) HNO₃
 Value / Analyte(s): 10 000 µg/mL ea:
 Zinc
 Starting Material: Zn Shot
 Starting Material Lot#: 2201
 Starting Material Purity: 99.9993%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10040 ± 30 µg/mL
Density: 1.033 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10009 ± 54 µg/mL ICP Assay NIST SRM 3168a Lot Number: 120629
Assay Method #2	10049 ± 33 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #3	10041 ± 28 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

u_{char} = $[\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.003057	M Eu < 0.000509	O Na < 0.001874	M Se < 0.023441	s Zn <
O Al < 0.005720	O Fe < 0.006348	M Nb < 0.000509	O Si < 0.057200	M Zr < 0.000509
M As < 0.003057	M Ga < 0.007134	M Nd < 0.000509	M Sm < 0.000509	
M Au < 0.000510	M Gd < 0.000509	M Ni < 0.000509	M Sn < 0.000509	
O B < 0.017160	M Ge < 0.003057	M Os < 0.000510	M Sr < 0.000509	
M Ba < 0.000509	M Hf < 0.000509	O P < 0.057200	M Ta < 0.000509	
M Be < 0.000509	M Hg < 0.001021	O Pb < 0.023870	M Tb < 0.000509	
M Bi < 0.005095	M Ho < 0.000509	M Pd < 0.002038	M Te < 0.023441	
O Ca < 0.033793	M In < 0.000509	M Pr < 0.000509	M Th < 0.000509	
O Cd < 0.003924	M Ir < 0.000510	M Pt < 0.000509	M Ti < 0.000509	
M Ce < 0.000509	O K < 0.001499	M Rb < 0.002038	M Tl < 0.009172	
M Co < 0.000509	M La < 0.000509	M Re < 0.000509	M Tm < 0.000509	
O Cr < 0.001549	O Li < 0.000457	M Rh < 0.000509	M U < 0.000509	
M Cs < 0.000509	M Lu < 0.000509	M Ru < 0.006129	M V < 0.000509	
O Cu < 0.010296	O Mg < 0.000349	O S < 0.034320	M W < 0.001019	
M Dy < 0.000509	M Mn < 0.000509	M Sb < 0.001019	M Y < 0.000509	
M Er < 0.000509	M Mo < 0.000509	M Sc < 0.000509	M Yb < 0.000509	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 65.39 +2 4 Zn(OH)(aq)1+

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media forming insoluble carbonate and hydroxide. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Zn Containing Samples (Preparation and Solution) -Metal (soluble in HNO₃); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO₃); Organic based (dry ash at 4500C and dissolve ash in HCl) (sulfuric/peroxide acid digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 66 amu	7 ppt	N/A	50Ti16O,50Cr16O, 50V16O, 34S16O2, 32S16O18O, 32S17O2, 33S16O17O, 32S34S, 33S2
ICP-OES 202.548 nm	0.004/0.0002 µg/mL	1	Nb, Cu, Co, Hf
ICP-OES 206.200 nm	0.006/0.0006 µg/mL	1	Sb, Ta, Bi, Os
ICP-OES 213.856 nm	0.002/0.0004 µg/mL	1	Ni, Cu, V

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 05, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **December 05, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGU1
Lot Number: P2-U683975
Matrix: 2% (v/v) HNO₃
Value / Analyte(s): 1 000 µg/mL ea:
Uranium
Starting Material: Uranyl Nitrate
Starting Material Lot#: 1948
Starting Material Purity: 99.9985%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 1001 ± 5 µg/mL
Density: 1.010 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **1001 ± 5 µg/mL**
ICP Assay NIST SRM 3164 Lot Number: 080521

Assay Method #2 **1002 ± 6 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/(u_{char j}^2)))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

u_{char} = $[\sum(w_i)^2 (u_{char i}^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Certified Abundance:

IV's Certified Abundance

Isotope	Atom %
Uranium 238U	99.8 ± 0.1
Uranium 235U	0.24 ± 0.05

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.000103	M Eu < 0.000103	M Na < 0.020618	M Se < 0.001246	M Zn < 0.003533
M Al < 0.003740	M Fe < 0.001029	M Nb < 0.000207	M Si < 0.035027	M Zr < 0.000103
M As < 0.001143	M Ga < 0.001350	M Nd < 0.000623	M Sm < 0.000311	
M Au < 0.000207	M Gd < 0.000311	M Ni < 0.008313	M Sn < 0.007273	
M B < 0.005819	M Ge < 0.001974	M Os < 0.000103	M Sr < 0.001039	
M Ba < 0.002286	M Hf < 0.000103	i P <	M Ta < 0.000103	
M Be < 0.001350	M Hg < 0.000415	M Pb < 0.000103	M Tb < 0.000103	
M Bi < 0.000103	M Ho < 0.000103	M Pd < 0.000207	M Te < 0.006234	
M Ca < 0.010391	M In < 0.000103	M Pr < 0.000103	M Th < 0.010535	
M Cd < 0.000103	M Ir < 0.000103	M Pt < 0.000103	M Ti < 0.000207	
M Ce < 0.000103	M K < 0.041565	M Rb < 0.000519	M Tl < 0.000103	
M Co < 0.000415	M La < 0.001662	M Re < 0.000103	M Tm < 0.000103	
M Cr < 0.001870	M Li < 0.001662	M Rh < 0.000103	s U <	
M Cs < 0.000175	M Lu < 0.000103	M Ru < 0.000519	M V < 0.000207	
M Cu < 0.000792	M Mg < 0.002493	i S <	M W < 0.000103	
M Dy < 0.000103	M Mn < 0.001454	M Sb < 0.000103	M Y < 0.000103	
M Er < 0.000103	M Mo < 0.000415	M Sc < 0.006234	M Yb < 0.000103	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 238.03 +6 8 UO₂²⁺(uranyl)

Chemical Compatibility - Soluble in HCl and HNO₃. Avoid H₃PO₄. H₂SO₄ and HF matrices should not be a problem depending upon [U]. Although the UO₂²⁺ ion is distinctly basic, any U+4 will precipitate in basic media. UO₂²⁺salts are generally soluble in water and UO₂²⁺ is stable with most metals and inorganic anions. The uranyl phosphate is insoluble in water. UF₄ and UF₆ are water soluble.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO₃ / LDPE container.

U Containing Samples (Preparation and Solution) -Metal (Dissolves rapidly in HCl and HNO₃); Oxide (Soluble in HNO₃); Ores (Digest for 1-2 hours with 1 gram of ore to 30 mL 1:1 HNO₃. Silica insolubles are removed by filtration after bringing the sample to fumes with conc. H₂SO₄.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 238 amu	2 ppt	N/A	206Pb16O2
ICP-OES 263.553 nm	0.3 / 0.01 µg/mL	1	Ce, Ir, Th, Rh, W, Zr, Ta, Ti, V, Hf, Fe, Re, Ru
ICP-OES 367.007 nm	0.3 / 0.02 µg/mL	1	Th, Ce
ICP-OES 385.958 nm	0.3 / 0.01 µg/mL	1	Th, Fe

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 28, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **September 28, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Multi Analyte Custom Grade Solution
 Catalog Number: AR-6020ICS-0A10
 Lot Number: R2-MEB692465
 Matrix: 1.4% (v/v) HNO3
 Value / Analyte(s):
 1 000 µg/mL ea:
 Chloride,
 200 µg/mL ea:
 Carbon,
 100 µg/mL ea:
 Calcium, Aluminum,
 Iron, Potassium,
 Magnesium, Sodium,
 Phosphorus, Sulfur,
 2 µg/mL ea:
 Titanium, Molybdenum

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Aluminum, Al	100.0 ± 0.3 µg/mL	Calcium, Ca	100.0 ± 0.5 µg/mL
Carbon, C	200.1 ± 0.5 µg/mL	Chloride, Cl	1 000 ± 5 µg/mL
Iron, Fe	100.0 ± 0.5 µg/mL	Magnesium, Mg	100.0 ± 0.5 µg/mL
Molybdenum, Mo	2.001 ± 0.012 µg/mL	Phosphorus, P	100.1 ± 0.6 µg/mL
Potassium, K	100.0 ± 0.5 µg/mL	Sodium, Na	100.0 ± 0.5 µg/mL
Sulfur, S	100.0 ± 0.5 µg/mL	Titanium, Ti	2.001 ± 0.017 µg/mL

Density: 1.007 g/mL (measured at 20 ± 4 °C)

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Al	ICP Assay	3101a	140903
Al	EDTA	928	928
C	Acidimetric	84L	84L
Ca	ICP Assay	3109a	130213
Ca	EDTA	928	928
Fe	ICP Assay	3126a	140812
Fe	EDTA	928	928
K	ICP Assay	3141a	140813
K	Gravimetric		See Sec. 4.2
Mg	ICP Assay	3131a	140110
Mg	EDTA	928	928
Mo	ICP Assay	3134	130418
Na	ICP Assay	3152a	120715
Na	Gravimetric		See Sec. 4.2
P	ICP Assay	3139a	060717
P	Acidimetric	84L	84L
S	Acidimetric	84L	84L
S	ICP Assay	traceable to 3154	M2-S657208
Ti	ICP Assay	3162a	130925

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char i}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

u_{char} = $[\sum(w_i)^2 (u_{char i}^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a)(u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

N/A

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

April 22, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **April 22, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGAG10
Lot Number: P2-AG688237
Matrix: 7% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Silver
Starting Material: Ag Shot
Starting Material Lot#: 2217
Starting Material Purity: 99.9993%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10004 ± 30 µg/mL
Density: 1.054 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	9984 ± 32 µg/mL ICP Assay NIST SRM 3151 Lot Number: 160729
Assay Method #2	10016 ± 26 µg/mL Volhard NIST SRM 999c Lot Number: 999c

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

s Ag <	M Eu <	0.000253	O Na	0.005563	M Se <	0.018179	M Zn	0.005800	
O Al	0.006296	O Fe	0.002932	M Nb <	0.000253	M Si	0.022487	M Zr <	0.005559
M As <	0.002403	M Ga <	0.000253	M Nd <	0.000253	M Sm <	0.000253		
M Au	0.001635	M Gd <	0.000253	O Ni <	0.005472	M Sn	0.001928		
O B <	0.009978	M Ge <	0.000754	M Os <	0.000254	O Sr	0.000086		
M Ba <	0.000785	M Hf <	0.000253	M P <	0.053784	M Ta <	0.000253		
M Be <	0.002407	M Hg <	0.001332	M Pb	0.003281	M Tb <	0.000253		
M Bi	0.001671	M Ho <	0.000253	M Pd <	0.001382	M Te <	0.003715		
O Ca	0.007116	M In <	0.003483	M Pr <	0.000253	M Th <	0.000253		
M Cd <	0.000253	M Ir <	0.000254	M Pt <	0.000253	M Ti <	0.002706		
M Ce <	0.000573	O K	0.004010	M Rb <	0.000253	M Tl <	0.000253		
M Co <	0.000253	M La <	0.000253	M Re <	0.000253	M Tm <	0.000253		
O Cr <	0.005043	O Li <	0.000214	M Rh <	0.000253	M U <	0.000253		
M Cs <	0.002769	M Lu <	0.000253	M Ru <	0.000254	M V <	0.000822		
O Cu	0.004614	O Mg	0.001035	M S <	0.560935	M W <	0.002146		
M Dy <	0.000253	M Mn <	0.000253	M Sb <	0.006899	M Y <	0.000253		
M Er <	0.000253	M Mo <	0.000479	M Sc <	0.000733	M Yb <	0.000253		

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 107.87 +1 6 Ag(H₂O)₆⁺
Chemical Compatibility - Stable in HNO₃, and HF. Avoid basic media. Ag forms more insoluble salts than any other metal. It also is subject to photochemical reduction to the metal in HCl media although 10 µg/mL solutions in 10% HCl [AgCl_x1-x] are commonly used in the analytical laboratory. The most common solubility problems exist with arsenate, arsenite, bromide, chloride, iodide, carbonate, chromate, cyanide, iodate, oxalate, oxide, sulfate, sulfide, tartrate, and thiocyanate in aqueous media. The addition of nitric acid renders many of these salts soluble.

Stability - 2-100 ppb levels stable for 75+ days when mixed with equivalent levels of all other elements including the precious metals (where chloride is present) when in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Ag Containing Samples (Preparation and Solution) - Metal (Soluble in HNO₃); Oxides (Soluble in HNO₃); Ores (Digestion with conc. HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 107 amu	1 ppt	N/A	91Zr16O
ICP-OES 243.779 nm	0.12/0.01 µg/mL	1	Mn, Th, Ni, Rh
ICP-OES 328.068 nm	0.007/0.0007 µg/mL	1	Ce, Rh, V
ICP-OES 338.289 nm	0.013/0.001 µg/mL	1	Ce, Cr, Th

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 29, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **January 29, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is an ISO 9001:2015 certified company, ISO 17025:2017 certified laboratory, and ISO 14001:2015 certified environmental management system. We are also a member of the American Society for Testing and Materials (ASTM) and the International Organization of Standards (ISO).



2.0 PRODUCT DESCRIPTION

Product Name: **10015 ± 44 µg/mL**
 Product Code: **10008 ± 25 µg/mL**
 Product Description: **10014 ± 36 µg/mL**

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10015 ± 44 µg/mL
Density: 1.0000 g/mL
Assay Information:

Assay Method #1	10015 ± 44 µg/mL Uncertainty: ± 4.4% (k=2)
Assay Method #2	10008 ± 25 µg/mL Uncertainty: ± 2.5% (k=2)
Assay Method #3	10014 ± 36 µg/mL Uncertainty: ± 3.6% (k=2)

Our certified values are based on a series of replicate measurements performed under controlled conditions. The uncertainty associated with these values is expressed as a percentage of the certified value. This uncertainty includes the uncertainty associated with the measurement process, the stability of the instrument, and the purity of the reagents used.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i) (X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char i}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char i})^2]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

OE<!" >% ' 9\$(!" (%\$&#G& () N*+E V# #5 95G)' &5 \$<#15) ; \$) : >#%") 5" I E<& 95\$(!& ;) %&#< \$!& V#G& #%& %&>) %& 2 # 15F !5() #\$\$) 95((<& +7 ? A ? 95\$(Q&%)%#5' (<& : &# ' 9%& : &5(2_&F<15F #5' V#G : & ' !G(!) 5 &%)%& *5 %& \$#" & ' _<& & 5) N*+E +7 ? A ? #% #V#1G#G&2 (<& (& : 15G) 9" & " (!b" ">&\$!;!& ' I

4.1 Thermometer Calibration

OT<(<%) : & (& % #& N*+E (%\$&#G& (<%)9F< (<%) : & (& (<# (#& \$#G# (& GQ#5 #\$\$& !(& \$#G#(!) 5 #G) %) %Q

4.2 Balance Calibration

OT<#5#Q!\$#6G#6#5\$& " #& \$#G# (& GQ#5 #\$\$& !(& \$#G#(!) 5 #G) %) %Q#5' >% \$& 9%& E<& _&F<(" 9" & ;) %& (!5F #& #559#G\$) : >#& () : #" (& _&F<(" #5' #& (%\$&#G& () N*+E I

4.3 Glassware Calibration

OT5 !5G) 9" & >% \$& 9%& !" 9" & () \$#G# (& #G= # " T F# " " _#& 9" & !5 (<& : #59;#\$(9%5F #5' 89#G(Q \$) 5(%6) ; =7 ? A ? " I

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

=7 ? A ? " #& (& (& ;) % (#& : & (#G\$! : >9%1& " GQTU#6*=@ B+ #5' *=@?+I E<& %& 9G : (<& :) (" &5" !(!V& : (<) ' ;) %&#< &G : &5(2" %&>) %& G&G_1 +) G(!) 5" (& (& GQ*=@?+ _& & #5#G& ' !5 #5 dH@ @!6& & =G#5 7)) : ! T5 dH@ @!6& % " KKKKRDV & ; ! \$1&5 (;) %<& %& () V#6) ; >#%\$G& " ') _5 () / IO Y : I

? TF f // / - D / ? B9 f // / / gR , N# // / D / C / ? +& f // / - 1 / / ? 15 // / K- R0
" T6 f // / - 1 / - 1 CR1 ? NG f // / / gR' , +! // / D0 / g / , 1 % // / 0g. 0
? T" f // / / gR / , 4 # // / - K- R0D ? N' f // / / gR' ? +: f // / / gR'
? T9 f // / / gR' ? 4' f // / 1 - / / , N! // / - - / C ? +5 f // / / gR /
, h f // / C - / / ? 4 & f // / - 1 / / ? , " f // / R / / , + % // / / gD0 /
, h# // / - CgDC ? X; f // / C - / / 5 @ f // / / gR' ? E# f // / / gR'
, h& f // / - 0 / / ? XF f // / g - / / ? @G // / / gD0 / ? EG f // / / gR'
? h! f // / R - / / ? X) f // / / gR' ? @ f // / / gR' ? E& f // / 0 / / /
, =# // / - 1 CR ? *5 f // / / K / ? @% f // / / gR' ? E< f // / / gR'
? = ' f // / - 1 / / ? *% f // / / gR' ? @ f // / / gR' , E! // / - - 1 C
? =& f // / C - / / , i // / D0 / g / ? 7G f // / - 1 / / ? E6 f // / / gR'
, =) // / - K K ? H# f // / C / / ? 7 & f // / / gR' ? E: f // / / gR'
, =% // / - 1 CRD , H // / / - 1 C ? 7 < f // / / gR' ? d f // / - 1 / /
? =" // / D0 / g ? H9 f // / / gR' ? 79 f // / / gR' ? J f // / D1 / /
, =9 // / 01gK , ? F // / gKOR ! + f // / / gR' ? j f // / - C / /
? ^Q f // / D1 / / , ? 5 // / - gD0 ? +G f // / 1 C / ? k f // / / gR'
? B% f // / / gR' ? ?) f // / - C / / ? +\$ f // / C - / / ? kG f // / / gR'

? O=<&\$ & GQ*=@?+ , O=<&\$ & GQ*=@ B+ !O+&\$(%6*5(& & #5\$& 5 ON) (= <&\$ & e) % " O+) 6Q!) 5 + (#5' # % B6& & 5

6.0 INTENDED USE

Oe) %<& \$#G#(!) 5) ; #5#Q!\$#6!5" (% : &5(" #5' V#G #(!) 5) ; #5#Q!\$#6: & (<) " # " #>>%>#%#(&

@#F&C) ; 1

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

0+() % G&_ && #>>%U: #(&Q1m 0/ m = _ <|& !5 " &#&' E= E G#F1

Qj <|& " () %& ' !5 (<& " &#&' E= E G#F2(%5">!) 5); (<| " =7 ? A ? ! " 5&F&F1G& T;(&%) >&5!5F (<& " &#&' E= E G#F (%5">!) 5); (<& =7 ? A ? _ !&) \$\$\$9%2&" 9&15F !5 # F%# 9#6!5\$%&# " & !5 (<& #5#&Q& \$) 5\$&5(%!) 5! " P1 *(! (<& %&">) 5" !G&(Q); (<& 9" &%) (\$\$\$) 95(;) %<| " &; &\$(! j <&5 (<& G) (& ! " _ &!F<& G) (< G&); %& #5' #; (& %G&15F >#F&\$' !5 ") %F&2 (<& : # " ' ! ; ; & % \$ &) G' & % & ' _ !&G& # : & # " 9% &); (%5">!) 5 : # " 9 " " !

OT;(&%) >&5!5F (<& " &#&' E= E G#F2` &&> \$#> (!F<(& " &#&' _ <&5 5) (!5 9" & #5' ") % G&_ &&5 1m 01m = j : !5! : !c& (<& &; &\$") ; (%5">!) 5! d" & # (C' m 1m = j : !5! : !c& VY& : & (%\$' !& (!) 5 & %) % _ <&5 9" !5F (<& %&>) %& ' &5" ! (Q ^) 5) (>|& (& ; % : (<& \$) 5 (#!5& % ^) 5) (% (9% % & :) V& ' #889) (") \$) 5 (#!5& %

Oe) %) % !5;) % : # (!) 52W" ! (www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - CgIKRn0 g T&XC, Rgn0
Chemical Compatibility -+ G& !5 X= QXN, 02Xe #5' XC+, 11 TVY! 5&9(%6: & !#1 +) G& !5 " (%5F&G G# " ! \$ N#, X ;) % : !5F (<& T&, X P L X C, F C O' > & \$! " ! + (#G& _ ! (< :) " (: & (#& #5' !5) % #5! \$ #5! 5" ! E<& >< " > < # (& ! " !5") G& !5 _ # (& % #5') 5& " & F < (&) G& !5 # \$! I
Stability - CQ // >> G& V& " (#G& ;) %) 5 (< " !5 - V XN, 0 AH^ @ B \$) 5 (#!5& % - 0 / 2 // >> : ") G (!) 5" \$ < & : ! \$ # & " (#G& ;) % & # % !5 C D V XN, 0 AH^ @ B \$) 5 (#!5& %
Al Containing Samples (Preparation and Solution) -? & #6lh & (' ! " ") G& ' !5 X= 6AXN, 0 P& OT&, 0 LN#C=, (; 9" !) 5 !5 @ (Po

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences
*=@0+ C. #: 9	0/ >>(<	NAT	- C= - DN2- 0= - 1N2 - X- C= - 1N2 -- h- g, 2 D1= %Qn2 D1e&Qn
*=@OB+ - g. l/ . R5:	/ l- A l / / K YFA H	-	e&
*=@OB+ 0K111/ - 5:	/ l/ D A l / / g YFA H	-	d2 = &
*=@OB+ 0Kgl- DC5:	/ l/ 0 A l / / g YFA H	-	?) 2 ! % 2 &

8.0 HAZARDOUS INFORMATION

O&# " & % & %) ((<& + # ; & Q^ # (# + < & & (;) % & ;) % : # (!) 5 % F # % !5F (<| " =7 ? A ? !

9.0 HOMOGENEITY

OE<| " ") G (!) 5 _ # " : !U& ' #\$\$\$) %!5F () #5 !5G) 9" & > % \$ & ' 9% & #5' ! " F9#%5(&& () G& < :) F&5& 9" ! X) :) F&5&!(Q' # (# !5' ! \$ # (& (< # ((<& &5' 9" & % <) 96 (#' & # : !5! : 9: "# : > & " !c&) ; / !C : H () # " " 9% < :) F&5&!(Q

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

OM+7 = & % d ! \$ # (& N9: G& % M+7 Q / 01

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

O= <& : ! \$ # 6E& " (!5F OT \$\$\$& ' ! (& A TCHT = & % d ! \$ # (& N9: G& % / R R O / -

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

OT & ; & % \$ & \$? # (& % # 6 @) % 9 \$ & % OT \$\$\$& ' ! (& A TCHT = & % d ! \$ # (& N9: G& % / R R O / C

! " # % & () * ! + # - . (/ 0 1 * 2 * 3 * \$ 4 5 # % ^ (7 2 # & % 1 8, # 0) % & ; : < / . (= ? @ * 3 * A 2 " " # C 0 0 E D D < E @ : 0 9 C F 9 0 0 . (G % B F : 0 9 C F 9 0 1 : @ " # % ! & 6' ! + # - 9 " J @ K L & ! # % ! & 6' ! + # - 9 " J

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

@#F&0) ; 1

11.1 Certification Issue Date

p#59#%QC. 2C/ C-

OE<& \$&%d(\$#(!) 5 !" V#6' _!(<15 (<&: &#" 9%&: &5(95\$&%#15(Q">&\$!;!&' >%VW &' (<&=7 ? A? ? !" ") %&' #5' <#5' &' !5 #\$\$) %5\$&_!(<15" (%\$(!) 5" FIV&5 !5 +&\$. 1-1 E<!" \$&%d(\$#(!) 5 !" 59&:1&' !; !5" (%\$(!) 5" !5 +&\$. 1- #&5) (;) &' %& ; (<&=7 ? A? ? !" ' #: #F&' 2\$) 5(#: !5#(& 2) %& (<&%!" &:)' !;!&' I

11.2 Lot Expiration Date

QJanuary 27, 2025

OE<&' #(& #;(&%_ <\$< (<" =7 ? A? ? "<) 96 5) (G&9" &' I

OE<& 0 (&L!%(!) 5 ' #(& %&:G\$(" (<& >&%&') ; (!: & (<#((<&" (#G0(Q) ; # =7 ? A? ? \$5 G&" 9>>) %&' GQ0 5F (&%: "(#G0(Q)" (9' !&" \$) 5' 9\$(&') 5 >%>&%Q"() %&' #5' <#5' &' =7 ? A? ? "I H) (&L!%(!) 5 !" 0: !(&' >% #%GQ (%5" >!%(!) 5 L0 "") ; _#(&% %& (<&") 0(!) 5P#5' 15;%89&5(0Q0\$<& !#\$6" (#G0(Q

11.3 Period of Validity

O+ &#&' E= E h#F , >&5 ^ #(&Sqqqqqqqqqqqqqqqqqqqqqqqqqqqqqq

OE<" =7 ? A? ? "<) 96 5) (G&9" &' 0 5F&%<#5) 5& Q#%4) %!"U:) 5(<" 15 (<& \$#" &) ; # 0/ : HG ((0P ;% (<& ' #(& ;) >&5!5F (<& #0: !5lc&' G#F) %#;(&%<#&' #(& FIV&5 !5 +&\$! -- 1C2_ <\$<&V&%\$) : &" ;!%(I E<" !" \$) 5(15F&5(9>) 5 (<&=7 ? A? ? G&15F ") %&' #5' <#5' &' !5 #\$\$) %5\$&_!((<&15" (%\$(!) 5" FIV&5 !5 +&\$! . 1-1

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

? !\$<#&6h) (< ^! %&\$() %2M9#0(Q=) 5(%6



Certifying Officer:

@#964 #!5&" = <#!%:#5 A+ &5!) %E&\$<5!\$#6^ !%&\$() %



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGAS10
 Lot Number: R2-AS691113
 Matrix: 2% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Arsenic
 Starting Material: As Pieces
 Starting Material Lot#: 2208
 Starting Material Purity: 99.9980%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9981 ± 55 µg/mL
Density: 1.028 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **9981 ± 55 µg/mL**
 ICP Assay NIST SRM 3103a Lot Number: 100818

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i) (X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$
 w_i = the weighting factors for each method calculated using the inverse square of the variance:
 $w_i = (1/u_{char i}^2) / (\sum(1/u_{char i}^2))$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2
 u_{char} = $[\sum(w_i)^2 (u_{char i})^2]^{1/2}$ where $u_{char i}$ are the errors from each characterization method
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with
 $u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2
 $u_{char a}$ = the errors from characterization
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Ag	<	0.001578	M	Eu	<	0.000526	O	Na		0.036136	M	Se	<	0.014204	O	Zn	<	0.003390
O	Al		0.006694	M	Fe		0.002633	O	Nb	<	0.011526	O	Si		0.139479	M	Zr	<	0.003156
s	As	<		M	Ga	<	0.000526	M	Nd	<	0.000526	M	Sm	<	0.000526				
M	Au	<	0.000526	M	Gd	<	0.000526	O	Ni	<	0.005537	M	Sn	<	0.001052				
M	B		0.017011	M	Ge	<	0.000526	M	Os	<	0.000526	M	Sr	<	0.000526				
M	Ba	<	0.000526	M	Hf	<	0.000526	O	P	<	0.056500	M	Ta	<	0.000526				
O	Be	<	0.001130	M	Hg	<	0.002104	M	Pb	<	0.000526	M	Tb	<	0.000526				
M	Bi	<	0.002104	M	Ho	<	0.000526	M	Pd	<	0.000526	M	Te	<	0.003682				
O	Ca		0.005657	M	In	<	0.000526	M	Pr	<	0.002630	M	Th	<	0.000526				
M	Cd	<	0.000526	M	Ir	<	0.000526	M	Pt	<	0.000526	O	Ti	<	0.001017				
M	Ce	<	0.000526	O	K		0.003865	M	Rb	<	0.002104	M	Tl	<	0.000526				
M	Co	<	0.003156	M	La	<	0.000526	M	Re	<	0.000526	M	Tm	<	0.000526				
M	Cr		0.000877	M	Li	<	0.000526	M	Rh	<	0.000526	M	U	<	0.000526				
M	Cs	<	0.002104	M	Lu	<	0.000526	M	Ru	<	0.000526	M	V	<	0.001578				
M	Cu	<	0.003156	O	Mg		0.000235	O	S	<	0.056500	M	W	<	0.000526				
M	Dy	<	0.000526	M	Mn	<	0.001052	M	Sb	<	0.000526	M	Y	<	0.000526				
M	Er	<	0.000526	M	Mo	<	0.000526	M	Sc	<	0.002104	M	Yb	<	0.000526				

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 74.92 ; mix of +3 and +5 ; 6 ; H3AsO4 and HAsO2

Chemical Compatibility - Arsenic has no cationic chemistry. It is soluble in HCl, HNO3, H3PO4, H2SO4 and HF aqueous matrices water and NH4OH . It is stable with most inorganic anions (forms arsenate when boiled with chromate) but many cationic metals form the insoluble arsenates under pH neutral conditions. When fluorinated and / or under acidic conditions arsenate formation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO3 / LDPE container.

As Containing Samples (Preparation and Solution) - Metal (soluble in 1:1 H2O / HNO3); Oxides (the oxide exists in crystalline and amorphous forms where the amorphous form is more water soluble. The oxides typically dissolve in dilute acidic solutions when boiled); Minerals (one gram of powdered sample is fused in a Ni crucible with 10 grams of a 1:1 mix of K2CO3 and KNO3 and the melt extracted with hot water); Organic Matrices (0.2 to 0.5 grams of sample are fused with 15 grams of a 1:1 Na2CO3 / Na2O2 mix in a Ni crucible. The fuseate is extracted with water and acidified with HNO3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 75 amu	20 ppt	N/A	40Ar35Cl, 59Co16O, 36Ar38Ar1H,8Ar37C I,Ar39K, 150Nd2+,150Sm2+
ICP-OES 189.042 nm	0.05/0.005 µg/mL	1	Cr
ICP-OES 193.696 nm	0.1/0.01 µg/mL	1	V, Ge
ICP-OES 228.812 nm	0.1/0.01 µg/mL	1	Cd, Pt, Ir, Co

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 25, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **March 25, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGBA10
Lot Number: P2-BA682107
Matrix: 2% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Barium
Starting Material: Ba(NO₃)₂
Starting Material Lot#: Mixed Lots
Starting Material Purity: 99.9995%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10072 ± 32 µg/mL
Density: 1.024 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10054 ± 80 µg/mL ICP Assay NIST SRM 3104a Lot Number: 140909
Assay Method #2	10075 ± 30 µg/mL Gravimetric NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ i}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.001538	O Eu < 0.028728	O Na < 0.006767	M Se < 0.007964	O Zn < 0.004335
M Al < 0.005194	M Fe < 0.016554	M Nb < 0.000200	O Si < 0.020780	M Zr < 0.000271
M As < 0.000519	M Ga < 0.000200	M Nd < 0.000200	M Sm < 0.082480	
M Au < 0.003452	M Gd < 0.000200	M Ni < 0.001290	M Sn < 0.000200	
M B < 0.002519	M Ge < 0.000430	M Os < 0.000752	O Sr < 0.027070	
s Ba < 0.000430	M Hf < 0.002746	O P < 0.044677	M Ta < 0.001008	
M Be < 0.000430	M Hg < 0.001063	M Pb < 0.002257	M Tb < 0.000200	
M Bi < 0.002971	M Ho < 0.000200	M Pd < 0.000286	M Te < 0.001470	
O Ca < 0.026224	M In < 0.000200	M Pr < 0.000200	M Th < 0.000200	
M Cd < 0.000200	M Ir < 0.000446	M Pt < 0.000200	M Ti < 0.000324	
M Ce < 0.004362	O K < 0.011526	M Rb < 0.001487	M Tl < 0.000200	
M Co < 0.000200	O La < 0.091587	M Re < 0.000200	M Tm < 0.000954	
M Cr < 0.002191	O Li < 0.002181	M Rh < 0.000200	M U < 0.000200	
M Cs < 0.001640	M Lu < 0.002934	M Ru < 0.000200	M V < 0.000229	
M Cu < 0.003646	O Mg < 0.002379	O S < 0.073041	M W < 0.001627	
M Dy < 0.000200	M Mn < 0.000902	M Sb < 0.000514	O Y < 0.019637	
M Er < 0.000556	M Mo < 0.000455	M Sc < 0.000478	M Yb < 0.001991	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 137.33 +2 6 Ba(H₂O)₆+2

Chemical Compatibility - Soluble in HCl, and HNO₃. Avoid H₂SO₄, HF and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate, iodate, molybdate, sulfite and tungstate in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1 -10,000 ppm solutions chemically stable for years in 1-3.5% HNO₃ / LDPE container.

Ba Containing Samples (Preparation and Solution) -Metal(is best dissolved in diluted HNO₃); Ores(Carbonate fusion in Pt0 followed by HCl dissolution. If sulfate is present dissolve the fuseate using HCl / tartaric acid to prevent BaSO₄ precipitate); Organic Matrices (dry ash and dissolve in dilute HCl.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 138 amu	1 ppt	N/A	122Sn16O, 122Te16O
ICP-OES 230.424 nm	0.004/0.0005 µg/mL	1	Mo, Ir, Co
ICP-OES 233.527 nm	0.004/0.0003 µg/mL	1	
ICP-OES 455.403 nm	0.002/0.0001 µg/mL	1	Zr, U

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 13, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **September 13, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i) (X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char i}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i^2 (u_{char i}^2))]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

OE<!" >% ' 9\$(!" (%\$&#G& () N*+E Y# #5 95G` &5 \$<#15); \$) : >#%") 5" I E<& 95\$(!& ;) %&#< \$!& Y#9& #%& %& >) %& 2 # 15F !5() #\$\$) 95((<& +7 ? A ? 95\$(Q&%)%#5' (<& : &#" 9%& : &5(2_&F<15F #5' Y) @ : &' !@(!) 5 &%)%& ! *5 %%& \$#" &' _<& &5) N*+E +7 ? A ? #%& #Y#1@G&2 (<& (%% : 15G) 9" &' (!b" ">&\$!;!&'

4.1 Thermometer Calibration

OT6(<&%) : &(&% #%& N*+E (%\$&#G& (<%9F< (<&%) : &(&% (<#(#%& \$#0G#(&' GQ#5 #\$\$\$& !(&' \$#0G#(!) 5 #G) %%) %Q

4.2 Balance Calibration

OT6#5#Q!\$#6G#6#5\$& " #%& \$#0G#(&' GQ#5 #\$\$\$& !(&' \$#0G#(!) 5 #G) %%) %Q#5' >% \$&' 9%& E<&_&F<(" 9" &' ;) %& (!5F #%& #559#6Q\$) : >%& () : #" (&%_&F<(" #5' #%& (%\$&#G& () N*+E

4.3 Glassware Calibration

OT5 !5G) 9" & >% \$&' 9%& !" 9" &' () \$#0G#(=6#" " T F6#" " _#%& 9" &' !5 (<& : #59;#\$(9%5F #5' 89#0(Q \$) 5(%6) ; =7 ? A ? " !

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

=7 ? A ? " #%& (&' &' ;) % (#& : &(#6\$! : >9%1&" GQTV#6*=@ B+ #5' *=@?+I E<& &' 96 ; (% :) (" &5" !(IY& : &(<' ;) %&#< &6& : &5(2" %& >) %& G&6_1+) @(!) 5" (&' (&' GQ*=@?+ _&#& #5#Q&' !5 #5 dH@ @!6&9& =6#5 7)) : ! T5 dH@ @!6&9& " KKKKRDx & ; ! \$1&5 (;) %<& %& () Y#6) ; >%#%& " ') _5 () / 10 [: !

? TF // 1D1-1 ? B9 f // // OD1 , N# // - D' / K ? +& f // - DDD , k5 // / 1/ DK , T6 // / R' DR , e& // -- . 1K ? NG f // // OD1 , +! // V0. K0 , k% f // / . / V1 ? T" f // / V1. 0 ? 4 # f // // OD1 ? N' f // // OD1 ? +: f // // OD1 ? T9 f // // C1R ? 4' f // // OD1 ? N! f // / C' 01 ? +5 f // / OD1C , U f // / C- W- ? 4 & f // // D' R ? , " f // // C1R ? +% f // // OD1 ? U# // / - . V / ? Z; f // // OD1 , @ f // VWD' / ? E# f // // OD1 " U& f ? ZF f // / - C11 ? @G f // / - C- ? EG f // // OD1 ? U! f // // OD1 ? Z) f // // OD1 ? @ f // // OD1 ? E& f // / - . R , =# // - DDD ? *5 f // // OD1 ? @% f // // OD1 ? E< f // // OD1 ? =' f // // OD1 ? *% f // // C1R ? @ f // // OD1 , E! f // / CCV ? =& f // // OD1 , h // 0- - C ? 7G f // // D' R ? E6 f // // OD1 ? =) f // / 1/ VR ? H# f // // OD1 ? 7& f // // OD1 ? E: f // // OD1 ? =% f // / - DDD , H f // // VW ? 7< f // // OD1 ? d f // // OD1 ? =" // / - V1C ? H9 f // // OD1 ? 79 f // // C1R ? J f // // D' R ? =9 f // / D' RD , ? F // / - K' . ! + f ? i f // / 1/ VR ? gQ f // // OD1 , ? 5 f // / - 000 ? +G f // // OD1 ? j f // // OD1 ? B% f // // OD1 ? ?) f // / . VC , +\$ f // / - 000 ? j G f // // OD1

? O=<&\$' &' GQ*=@?+ , O=<&\$' &' GQ*=@ B+ !O+&\$(%6*5(&#\$& 5 ON) (= <&\$' &' e) % " O+) 6Q!) 5 + (#5' #% B6& &5

6.0 INTENDED USE

Oe) %<& \$#0G#(!) 5) ; #5#Q!\$#6!5" (% : &5" #5' Y#6 #(!) 5) ; #5#Q!\$#6: &(<' " # " #>>%>%#(&

@#F&C) ; 1

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

Open in a safe place, away from heat, light, and moisture. Store in a cool, dry place.

Keep the container tightly closed when not in use. Do not breathe the dust. Avoid contact with skin and eyes. If contact occurs, wash thoroughly with water. For more information, see the Safety Data Sheet (SDS) available at www.inorganicventures.com/TCT.

Use appropriate personal protective equipment (PPE) when handling. Wear gloves, safety glasses, and a lab coat. Work in a well-ventilated area or fume hood. Dispose of waste according to local regulations.

For more information, visit www.inorganicventures.com/TCT.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - KI - mC1 U&LZC, PmC
Chemical Compatibility - Compatible with water, dilute acids, and bases. Incompatible with strong oxidizing agents and reducing agents.

Stability - Stable under normal conditions. Decomposes at high temperatures.

Be Containing Samples (Preparation and Solution) - Dissolve in water. For analysis, use appropriate dilution. For more information, see the SDS.

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences
*=@0+ K#: 9	1 >>(NAT	
*=@0B+ 0011RV- 5:	// // 0A // // - V [FA H	-	e&2E#2?)
*=@0B+ 0- 0I/ 1C5:	// // 0A // // / K [FA H	-	J2 = &2 d
*=@0B+ 0- 0I- / . 5:	// // . A // // D [FA H	-	= &2E<2E:

8.0 HAZARDOUS INFORMATION

See the SDS for detailed hazard information.

9.0 HOMOGENEITY

The material is homogeneous. For more information, see the SDS.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

OM+7 = &%4!\$#(& N9: G&%M+7 0 / 01

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

0= <&: !\$#6E&" (!5F OT\$\$\$&!(&' A TCHT = &%4!\$#(& N9: G&%RR0// -

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

07 &:&%5\$&? #(&%#6@% 9\$&%OT\$\$\$&!(&' A TCHT = &%4!\$#(& N9: G&%RR0// C

!" #&%!&)"! + # - /00 (1" 2" 3" 4 5 #& . 7 2 #& - %/8. #&.) %&: 0< / . (= ? @ " 3" A 2" ! " B C 0 0 D D 0 < E 0 0 F C F 0 / 0 . (G % H F 0 F C F 0 0 : @ ! " # % ! & 6" ! + # - 9" J @ K L & " # % ! & 6" ! + # - 9" J

11.0 CERTIFICATION, LOT EXPIRATION, PERIOD OF VALIDITY AND REVISION HISTORY

@#F&0); 1

11.1 Certification Issue Date

T>%6CC2C/ - K

OE<& \$&%d(\$#!) 5 !" Y#6 _!(<15 (<& : &#" 9%&: &5(95\$&(Q">&\$!;!&' >%Y! &' (<&=7 ? A? ? !" ") %&' #5' <#5' &' !5 #\$\$) %5\$&_!(<15" (%\$(!) 5" F1Y&5 !5 +&\$. 1-1 E<!" \$&%d(\$#!) 5 !" 59&.!&' !; !5" (%\$(!) 5" !5 +&\$. 1- #&% 5) (;) @ _&') %& ; (<&=7 ? A? ? !" ' #: #F&' 2\$) 5(#: !5#(& 2) %& (<&% !" &:) ' !;!&' !

11.2 Lot Expiration Date

OApril 22, 2023

OE<&' #(& #;(&%_ <1\$< (<!" =7 ? A? ? " <) 96 5) (G& 9" &' !

OE<& 0 (&V#!%(!) 5 ' #(& %&: &\$(" (<& >&%&') ; (!: & (<#((<& "#G0(Q); # =7 ? A? ? \$5 G& " 9>>) %&' GQ0 5F (&%: "(#G0(Q)" (9' !&" \$) 5' 9\$(&') 5 >%>&%Q") %&' #5' <#5' &' =7 ? A? ? " ! H) (&V#!%(!) 5 !" 0: !(&' >% #%Q Q (%5">!%(!) 5 L0 "") ; _#(&% %& (<& ") 0(!) 5P#5' !5;%89&5(Q Q Q\$<& ! \$6" (#G0(Q

11.3 Period of Validity

O+ �&' E= E U#F , >&5 g #(&Soooooooooooooooooooooooooooo

OE<!" =7 ? A? ? " <) 96 5) (G& 9" &' 0 5F&%<#5) 5& Q&#%4) %&' !W.) 5(<" !5 (<& \$#" &) ; # 0/ : HG) ((P ; %& (<& ' #(&) ;) >&5!5F (<& #0: !5!c&' G#F) %&#; (&%<&' #(& F1Y&5 !5 +&\$! -- IC2_ <1\$<&Y&%\$) : &' ; !%(! E<!" !" \$) 5(15F&5(9>) 5 (<&=7 ? A? ? G&15F ") %&' #5' <#5' &' !5 #\$\$) %5\$&_!((<&15" (%\$(!) 5" F1Y&5 !5 +&\$! . 1-1

11.4 Revision Status

O7 &Y!" !) 5 - O7 &Y!" &') 5 E<9%# Qp#5 - 12C C- GQ9(% 5F1 7 &Y!" !) 5 _# " : # & ;) %& ;) @ _!5F %&# ") 5S ?) ' !;!&' +&\$(!) 5 . =<& ! \$6e) %: !5 +) 0(!) 5!

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

? ! \$<#&6U)) (< g! %&\$() %2M9#0(Q=) 5(%6

Certifying Officer:

@#964 #!5&" = <#1% : #5 A+ &5!) %E&\$<5! \$6g !%&\$() %

@#F& 1) ; 1

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGCA10
 Lot Number: R2-CA697921
 Matrix: 2% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Calcium
 Starting Material: Calcium Oxide
 Starting Material Lot#: P2-CA677788
 Starting Material Purity: 99.9995%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9985 ± 30 µg/mL
Density: 1.039 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	9976 ± 43 µg/mL ICP Assay NIST SRM 3109a Lot Number: 130213
Assay Method #2	9965 ± 25 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #3	10008 ± 26 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/WM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char i})^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an UPLA-Filtered Clean Room. An UPLA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.002500	M Eu < 0.001300	M Na 0.008214	O Se < 0.022000	O Zn 0.001158
O Al < 0.030000	O Fe 0.002316	M Nb < 0.001300	O Si < 0.022000	M Zr < 0.006200
O As < 0.025000	M Ga < 0.002500	M Nd < 0.001300	M Sm < 0.001300	
M Au < 0.013000	M Gd < 0.001300	O Ni < 0.005300	O Sn < 0.013000	
O B < 0.006900	O Ge < 0.018000	M Os < 0.002500	M Sr 0.115847	
M Ba 0.000905	M Hf < 0.002500	O P < 0.027000	M Ta < 0.008600	
O Be < 0.000270	M Hg < 0.001300	M Pb 0.001685	M Tb < 0.001300	
M Bi < 0.002500	M Ho < 0.001300	M Pd < 0.006200	O Te < 0.045000	
s Ca < 0.002500	M In < 0.001300	M Pr < 0.001300	M Th < 0.001300	
O Cd < 0.000540	M Ir < 0.001300	M Pt < 0.001300	O Ti < 0.004200	
M Ce < 0.001300	O K 0.015797	M Rb < 0.014000	M Tl < 0.001300	
O Co 0.000558	M La < 0.001300	M Re < 0.001300	M Tm < 0.001300	
O Cr < 0.006000	O Li < 0.006900	M Rh < 0.002500	M U < 0.001300	
M Cs < 0.001300	M Lu < 0.001300	M Ru < 0.003800	O V < 0.002200	
M Cu < 0.002500	O Mg 0.002843	n S < 0.007400	M W < 0.012000	
M Dy < 0.001300	O Mn 0.000115	M Sb < 0.007400	M Y < 0.001300	
M Er < 0.001300	M Mo 0.002527	O Sc < 0.006100	M Yb < 0.001300	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 40.08 +2 6 Ca(H₂O)₆+2

Chemical Compatibility - Soluble in HCl and HNO₃. Avoid H₂SO₄, HF, H₃PO₄ and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate, and tungstate in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO₃ / LDPE container.

Ca Containing Samples (Preparation and Solution) -Metal (best dissolved in diluted HNO₃); Ores (Carbonate fusion in Pt0 followed by HCl dissolution); Organic Matrices (dry ash and dissolution in dilute HCl. Do not heat when dissolving to avoid precipitation of SiO₂). The oxide, hydroxide, carbonate, phosphate, and fluoride of calcium are soluble in % levels of HCl or HNO₃. The sulfates (gypsum, anhydrite, etc.), certain silicates, and complex compounds require fusion with Na₂CO₃ followed by HCl / water dissolution. Note that contamination is a very real problem when analyzing for trace levels.

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 44 amu	1200 ppt	n/a	16O212C, 28Si16O, 88Sr
ICP-OES 393.366 nm	0.0002 / 0.00004 µg/mL	1	U, Ce
ICP-OES 396.847 nm	0.0005 / 0.00006 µg/mL	1	Th
ICP-OES 422.673 nm	0.01 / 0.001 µg/mL	1	Ge

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 09, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- November 09, 2024

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGCD10
Lot Number: P2-CD685077
Matrix: 3% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Cadmium
Starting Material: Cd Shot
Starting Material Lot#: 1954
Starting Material Purity: 99.9996%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9954 ± 30 µg/mL
Density: 1.029 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **9956 ± 54 µg/mL**
ICP Assay NIST SRM 3108 Lot Number: 130116

Assay Method #2 **9953 ± 32 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i})^2 / (\sum(1/(u_{char\ i})^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Ag < 0.006348	M Eu < 0.010622	O Na < 0.004020	M Se < 0.008116	O Zn < 0.002152
O Al < 0.011566	M Fe < 0.003011	M Nb < 0.000405	O Si < 0.005480	M Zr < 0.000405
M As < 0.001623	M Ga < 0.000405	M Nd < 0.000405	M Sm < 0.000405	
M Au < 0.000405	M Gd < 0.000405	M Ni < 0.002840	M Sn < 0.001217	
M B < 0.004463	M Ge < 0.000405	M Os < 0.000405	M Sr < 0.000405	
O Ba < 0.000968	M Hf < 0.000405	O P < 0.045730	M Ta < 0.000405	
M Be < 0.000405	O Hg < 0.002152	M Pb < 0.002434	M Tb < 0.000405	
M Bi < 0.000405	M Ho < 0.000405	M Pd < 0.000405	M Te < 0.016636	
O Ca < 0.002946	O In < 0.021520	M Pr < 0.000405	M Th < 0.000405	
s Cd <	M Ir < 0.000405	M Pt < 0.000405	M Ti < 0.001217	
M Ce < 0.000405	O K < 0.008179	M Rb < 0.000405	M Tl < 0.004495	
M Co < 0.000405	M La < 0.000405	M Re < 0.000405	M Tm < 0.000405	
M Cr < 0.002907	M Li < 0.000405	M Rh < 0.000405	M U < 0.000405	
M Cs < 0.002374	M Lu < 0.000405	M Ru < 0.000405	M V < 0.003179	
M Cu < 0.002434	O Mg < 0.000137	O S < 0.037660	M W < 0.000405	
M Dy < 0.000405	M Mn < 0.001623	M Sb < 0.004057	M Y < 0.000405	
M Er < 0.000405	M Mo < 0.000811	M Sc < 0.001623	M Yb < 0.000811	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 112.41 +2 4 Cd₂(OH)(aq)₃+ and Cd(OH)(aq)

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, and HF. Avoid basic media forming insoluble carbonate and hydroxide.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO₃ / LDPE container.

Cd Containing Samples (Preparation and Solution) -Metal (soluble in HNO₃); Oxides (soluble in HCl or HNO₃); Ores (dissolve in HCl /HNO₃ then take to fumes with H₂SO₄. The silica and lead sulfate are filtered off after the addition of water); Organic based (dry ash at 450°C and dissolve ash in HCl), (sulfuric / peroxide acid digestion).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 111 amu	11 ppt	n/a	95Mo16O
ICP-OES 214.438 nm	0.003 / 0.0003 µg/mL	1	Pt, Ir
ICP-OES 226.502 nm	0.003 / 0.0003 µg/mL	1	Ir
ICP-OES 228.802 nm	0.003 / 0.0003 µg/mL	1	Co, Ir, As, Pt

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

November 08, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- November 08, 2023

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGCO10
Lot Number: N2-CO671028
Matrix: 3% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Cobalt
Starting Material: COBALT
Starting Material Lot#: 1749
Starting Material Purity: 99.9978%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9988 ± 34 µg/mL
Density: 1.057 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	9973 ± 32 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #2	10024 ± 50 µg/mL ICP Assay NIST SRM traceable to 3113 Lot Number: M2-CO661665

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Ag	0.022956	M	Eu <	0.000422	O Na	0.008125	M	Se <	0.009290	M	Zn	0.007197	
O Al	0.013621	O	Fe	0.048700	M	Nb <	0.000422	O	Si	0.017539	M	Zr <	0.014357
i As <		M	Ga <	0.000844	M	Nd <	0.017735	M	Sm <	0.001689			
M Au <	0.000583	M	Gd	0.003247	O	Ni <	0.043642	M	Sn <	0.005067			
M B <	0.013512	M	Ge <	0.004645	M	Os <	0.000583	O	Sr	0.000841			
O Ba	0.071210	M	Hf <	0.000422	n	P <		M	Ta <	0.000422			
O Be <	0.001771	M	Hg <	0.002334	M	Pb	0.010094	M	Tb <	0.001689			
M Bi	0.000614	M	Ho <	0.000422	M	Pd <	0.000422	M	Te <	0.008445			
O Ca	0.025034	M	In <	0.003378	M	Pr <	0.006756	M	Th <	0.000422			
M Cd <	0.000844	M	Ir <	0.000583	M	Pt <	0.000422	M	Ti <	0.002533			
M Ce	0.002721	O	K	0.005785	M	Rb <	0.001689	M	Tl <	0.000422			
s Co <		M	La	0.000877	M	Re	0.016853	M	Tm <	0.000422			
M Cr <	0.020269	O	Li	0.000262	M	Rh <	0.000422	M	U <	0.000422			
M Cs	0.000877	M	Lu <	0.000422	M	Ru <	0.000583	M	V <	0.001689			
M Cu	0.007197	O	Mg	0.003444	n	S <		M	W <	0.000844			
M Dy <	0.000422	O	Mn <	0.006072	M	Sb <	0.005911	M	Y	0.001228			
M Er <	0.000422	M	Mo <	0.005911	M	Sc <	0.001689	M	Yb <	0.003378			

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.93 +2 6 Co(H₂O)₆2+

Chemical Compatibility - Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Co Containing Samples (Preparation and Solution) - Metal (soluble in HNO₃); Oxides (Soluble in HCl); Ores (dissolve in HCl / HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 59 amu	2 ppt	n/a	42Ca16O1H , 40Ar18O1H , 36Ar23Na, 43Ca16O, 24Mg35Cl
ICP-OES 228.616 nm	0.01/0.001 µg/mL	1	
ICP-OES 237.862 nm	0.01/0.002 µg/mL	1	W, Re, Al, Ta
ICP-OES 238.892 nm	0.01/0.002 µg/mL	1	Fe, W, Ta

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 15, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- January 15, 2023

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Supervisor, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGCR(3)10
Lot Number: R2-CR691013
Matrix: 10% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Chromium
Starting Material: Cr METAL
Starting Material Lot#: 2077
Starting Material Purity: 99.9942%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10044 ± 40 µg/mL
Density: 1.082 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10057 ± 58 µg/mL ICP Assay NIST SRM 3112a Lot Number: 170630
Assay Method #2	10035 ± 50 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an UPLA-Filtered Clean Room. An UPLA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.000540	M Eu < 0.003200	O Na < 0.130091	M Se < 0.012000	O Zn < 0.002700
O Al < 0.016634	O Fe < 0.202602	M Nb < 0.022000	n Si <	M Zr < 0.020000
M As < 0.003838	O Ga < 0.031000	M Nd < 0.000540	M Sm < 0.035000	
M Au < 0.000540	M Gd < 0.000540	O Ni < 0.009170	M Sn < 0.004051	
M B < 0.049000	M Ge < 0.005400	M Os < 0.088000	O Sr < 0.000250	
O Ba < 0.002000	M Hf < 0.000540	i P <	M Ta < 0.000540	
O Be < 0.000250	M Hg < 0.001600	M Pb < 0.002559	M Tb < 0.000540	
M Bi < 0.008956	M Ho < 0.000540	M Pd < 0.001100	M Te < 0.004800	
O Ca < 0.074642	M In < 0.001100	M Pr < 0.000540	M Th < 0.000540	
M Cd < 0.000540	M Ir < 0.000540	M Pt < 0.000540	O Ti < 0.013435	
M Ce < 0.000540	O K < 0.034122	i Rb <	M Tl < 0.001100	
O Co < 0.002900	M La < 0.001100	M Re < 0.002700	O Tm < 0.001800	
s Cr <	O Li < 0.000130	M Rh < 0.032000	M U < 0.001100	
M Cs < 0.019000	M Lu < 0.000540	M Ru < 0.094000	O V < 0.159949	
O Cu < 0.010023	O Mg < 0.001450	i S <	M W < 0.028000	
M Dy < 0.000540	O Mn < 0.014000	M Sb < 0.008600	M Y < 0.001100	
M Er < 0.016000	O Mo < 0.013000	O Sc < 0.001400	M Yb < 0.000540	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 52.00 +3 6 Cr(H₂O)₆³⁺

Chemical Compatibility - Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Cr₃ Containing Samples (Preparation and Solution) - Metal (soluble in HCl); Oxides/Ores (Chromite ore/oxides are very difficult to dissolve. The following procedures [A-D] are commonly used: A. Fusion with KHSO₄ and extraction with hot KCl. The residue fused with Na₂CO₃ and KClO₃, 3:1. B. Fusion with NaKSO₄ and NaF 2:1, C. Fusion with magnesia or lime and sodium or potassium carbonates, 4:1. D. Fusion with Na₂O₂ or NaOH and KNO₃ or NaOH and Na₂O₂. Nickel, iron, copper, or silver crucibles should be used for D. Platinum may be used for A, B, C); Organic Matrices (ash at 450°C followed by one of the fusion methods above or sulfuric/hydrogen peroxide acid digestions may be applicable to non oxide containing samples).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 52 amu	40 ppt	N/A	36S ¹⁶ O, 36Ar ¹⁶ O - The 50Cr, 53Cr, 54Cr lines suffer from many more potential interferences from sulfur, chlorine and argon compounds of oxygen, nitrogen and carbon.
ICP-OES 205.552 nm	0.006/0.0008 µg/mL	1	Os
ICP-OES 276.654 nm	0.01/0.001 µg/mL	1	Cu, Ta, V
ICP-OES 284.325 nm	0.008/0.0007 µg/mL	1	

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 25, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **March 25, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGCU10
 Lot Number: R2-CU693370
 Matrix: 3% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Copper
 Starting Material: Cu Metal
 Starting Material Lot#: 2095
 Starting Material Purity: 99.9996%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10016 ± 30 µg/mL
Density: 1.033 g/mL (measured at 20 ± 4 °C)

Assay Information:

- Assay Method #1** **10010 ± 55 µg/mL**
 ICP Assay NIST SRM 3114 Lot Number: 121207

- Assay Method #2** **10017 ± 26 µg/mL**
 EDTA NIST SRM 928 Lot Number: 928

- Assay Method #3** **10015 ± 25 µg/mL**
 Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an UPLA-Filtered Clean Room. An UPLA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.007542	M Eu < 0.000942	O Na < 0.001434	M Se < 0.016971	M Zn < 0.005657
O Al < 0.000609	O Fe < 0.008698	M Nb < 0.000942	O Si < 0.003052	M Zr < 0.000942
M As < 0.010371	M Ga < 0.000942	M Nd < 0.000942	M Sm < 0.000942	
M Au < 0.001885	M Gd < 0.000942	M Ni < 0.003780	M Sn < 0.005657	
O B < 0.003662	M Ge < 0.005657	M Os < 0.000942	M Sr < 0.000942	
M Ba < 0.004252	M Hf < 0.000942	O P < 0.031668	M Ta < 0.000942	
M Be < 0.000942	O Hg < 0.007064	M Pb < 0.005788	M Tb < 0.000942	
M Bi < 0.000942	M Ho < 0.000942	M Pd < 0.000942	M Te < 0.004714	
O Ca < 0.002304	M In < 0.000942	M Pr < 0.000942	M Th < 0.000942	
M Cd < 0.000942	M Ir < 0.000942	M Pt < 0.000942	O Ti < 0.002801	
M Ce < 0.000942	O K < 0.000762	M Rb < 0.000942	M Tl < 0.000942	
M Co < 0.001890	M La < 0.000942	M Re < 0.000942	M Tm < 0.000942	
M Cr < 0.005657	O Li < 0.000243	i Rh <	M U < 0.000942	
M Cs < 0.000942	M Lu < 0.000942	M Ru < 0.039588	M V < 0.003771	
s Cu <	O Mg < 0.000320	O S < 0.007172	M W < 0.005657	
M Dy < 0.000942	O Mn < 0.000793	M Sb < 0.001885	M Y < 0.000942	
M Er < 0.000942	M Mo < 0.005657	M Sc < 0.000942	M Yb < 0.000942	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 63.55 +2 6 Cu(H₂O)₆²⁺

Chemical Compatibility - Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Cu Containing Samples (Preparation and Solution) - Metal (soluble in HNO₃); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 63 amu	10 ppt	n/a	40Ar23Na 47Ti16O, 14N12C37Cl, 16O12C35Cl, 23Na40Ca
ICP-OES 219.958 nm	0.01/0.02 µg/mL	1	Th, Ta, Nb, U, Hf
ICP-OES 224.700 nm	0.01/0.01 µg/mL	1	Pb, Ir, Ni, W
ICP-OES 324.754 nm	0.06/0.01 µg/mL		Nb, U, Th, Mo, Hf

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

June 05, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **June 05, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



300 Technology Drive
 Christiansburg, VA 24073 USA
 inorganicventures.com

P: 800-669-6799/540-585-3030
 F: 540-585-3012
 info@inorganicventures.com

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is a participant in the National Voluntary Laboratory Accreditation Program (NVLAP) administered by the National Institute of Standards and Technology (NIST). We are accredited for the analysis of the following elements:



2.0 PRODUCT DESCRIPTION

Sample ID: 2110294
 Description: Iron, Fe
 Matrix: Aqueous
 Container: 100 mL
 Date: 10/21/2021

3.0 CERTIFIED VALUES AND UNCERTAINTIES

ANALYTE	CERTIFIED VALUE	ANALYTE	CERTIFIED VALUE
Iron, Fe	10 000.0 ± 40.0 µg/mL		

Density: 1.000 g/mL

Assay Information:

ANALYTE	METHOD	NIST SRM#	SRM LOT#
Iron, Fe	ICP-OES	9900	1000
Iron, Fe	BET	KCR	KCR

Characterization of CRM/RM by Two or More Methods: Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \frac{\sum(w_i X_i)}{\sum w_i}$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$
 w_i = the weighting factors for each method calculated using the inverse square of the variance:
 $w_i = (1/u_{char i})^2 / (\sum(1/(u_{char i})^2))$

CRM/RM Expanded Uncertainty (\pm) = $U_{CRM/RM} = k(u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$
 k = coverage factor = 2
 u_{char} = $[\sum(w_i)^2 (u_{char i})^2]^{1/2}$ where $u_{char i}$ are the errors from each characterization method
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method: Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = \bar{X}_a$$

\bar{X}_a = mean of Assay Method A with
 $u_{char a}$ = the standard uncertainty of characterization Method A

CRM/RM Expanded Uncertainty (\pm) = $U_{CRM/RM} = k(u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$
 k = coverage factor = 2
 $u_{char a}$ = the errors from characterization
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

The certified value of this CRM/RM is traceable to the NIST SRM 9900 Iron, Fe. The uncertainty of this value is based on the uncertainty of the NIST SRM 9900 and the uncertainty of the assay method used.

Sample ID: 2110294

4.1 Thermometer Calibration

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4.2 Balance Calibration

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4.3 Glassware Calibration

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5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

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6.0 INTENDED USE

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

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8.0 HAZARDOUS INFORMATION

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9.0 HOMOGENEITY

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10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

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10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

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10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

O 7 & ; & % & 5 \$? # (& % # 6 @) % 9 \$ & % OT \$ \$ & ! (& A T C H T = & % ! (! \$ # (& N 9 : G % / R R O I / C

! " % % ! &) ! + # - . / 0 0 (1 * 2 ! 3 * \$ 4 / 5 # 6 . (7 2 8 & % 4 8 . # 0) % & ; 0 < / . (= > ? @ * 3 A 2 ! " B C 0 0 D D E D < E @ : 0 F C F 9 0 / 0 . (G % H F : 0 F C F 9 0 ! : @ ! " % \$! & 6 ! + # - 9 " J @ K L & ! " % \$! & 6 ! + # - 9 " J

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

@ # F & C) ; 0

11.1 Certification Issue Date

T>%6C/ 2C/ C-

OE<& \$&%d(\$#(!) 5 !" X#6 ` !(<15 (<:& #9%&: &5(95\$&%#15(Q">&\$!;!&' >%X' &' (<=&=7 ? A? ? !" ") %&' #5' <#5' &' !5 #\$\$) %5\$&` !(<15" (%\$(!) 5" FIX&5 !5 +&\$.1-1 E<! " \$&%d(\$#(!) 5 !" 59&.!&' !; !5" (%\$(!) 5" !5 +&\$.1- #&5) (;) & ` & `) %&; (<=&=7 ? A? ? !" ' #: #F& 2\$) 5(#: !5#(& 2) %& (<&% !" &:) ' !;!&' !

11.2 Lot Expiration Date

OApril 20, 2025

OE<&' #(& #;(%& <1\$< (<! " =7 ? A? ? " <) 96 5) (G& 9" &' !

OE<& 0 (&\>!%(!) 5 ' #(& %&:G\$(" (<&>&%&') ; (!: & (<#((<&" (#G0(Q) ; # =7 ? A? ? \$5 G& " 9>>) %&' GQ0 5F (&%: "(#G0(Q)" (9' !&" \$) 5' 9\$(&') 5 >%>&%Q"() %&' #5' <#5' &' =7 ? A? ? " ! H) (&\>!%(!) 5 !" 0: !(&' >% #%GQ GQ (%5">!%(!) 5 L0 "") ; ` #(&% %& (<&") 0(!) 5P#5' 15;%89&5(QQ\$<& !:\$6" (#G0(Q

11.3 Period of Validity

O+ �&' E= E U#F , >&5 _#(&Shhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhhh

OE<! " =7 ? A? ? " <) 96 5) (G& 9" &' 0 5F&%<#5) 5& Q#%4) %&' !V:) 5(<" !5 (<&\$#&' &) ; # 0/ : HG ((0P ;% (<&' #(&) ;) >&5!5F (<& #0: !5!f &' G#F) %#;(&%<#&' #(& FIX&5 !5 +&\$! --1C2' <1\$<&X&%\$) : &" ;!%(! E<! " !" \$) 5(!5F&5(9>) 5 (<=&=7 ? A? ? G&15F ") %&' #5' <#5' &' !5 #\$\$) %5\$& ` !(< (<&15" (%\$(!) 5" FIX&5 !5 +&\$! .1-1

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

? !\$<#&6U)) (< _!%&\$() %2M9#0(Q=) 5(%6



Certifying Officer:

@#964 #!5&" = <#!%:#5 A+ &5!) %E&\$<5!\$#6_ !%&\$() %



@#F&0) ; 0

1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is an ISO 9001:2015 certified company, ISO 17025:2017 certified laboratory, and ISO 14001:2015 certified environmental management system. We are also a member of the International Society for Testing and Materials (ASTM) and the International Organization of Standardization (ISO).



2.0 PRODUCT DESCRIPTION

Product Name: **15F T5#6**
 Description: **4% & + 9(!) 5**
 Material: **4 U- /**
 Dimensions: **H) (N9: 3.5" + COU// K. R**
 Weight: **? (#%S CW LXAPYN, 0**
 Identification: **J#6 AT5#6" PS - / /// ZFA H&#S**
 Markings: **@ (#" " !9: UN, 0**
 Additional: **+(#%15F ? (#%#6H) (I S CO- 0**
 Notes: **+(#%15F ? (#%#6@%CS KKIKK. - W**

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: - / - \] 0/ ZFA H
Density: - / / CDFA HL: &#" 9%& # (C /] 1 ^=P

Assay Information:

Assay Method #1	10018 ± 54 µg/mL *=@T"#QN*+E+7? 0- 1- # H) (N9: 3.5" 1/ R- 0
Assay Method #2	10016 ± 24 µg/mL 4 %X: &(%\$ N*+E+7? H) (N9: 3.5" && +&\$! 11C
Assay Method #3	10014 ± 45 µg/mL =#96#& N*+E+7? H) (N9: 3.5" && +&\$! 11C

OE<&=#96#(& J#6&!" # X#6& \$#96#(& ;%: (<& _&f<()); # "(#%15F : #(&#%6(<#(<#" 3.5" \$&&%1!& ' !%&\$(&X" I # N#!) 5#6*5" (!9(&); +(#5' #'%" #5' E&\$<5) 6 FQLN*+EP+7 ? A ? I +&& +&\$ 11C;) %G#5\$& (%\$&#G6(Q

E<& ;) 66) !5F &89#!) 5" #& 9" & 15 (<& \$#96#!) 5); (<& \$!& X#6& #5' (<& 95\$&%#15(Q 7 &>) %& 95\$&%#15(!& %&>)& &5 (' & 95\$&%#15(!& &#>)&" & # (>>)%V: #(&Q(<& KDW \$) 5;! &5\$& 6&&69" !5F # \$) X&%F& ;#\$() %&; ` a C

@#F&-); 1

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i) (X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$
 w_i = the weighting factors for each method calculated using the inverse square of the variance:
 $w_i = (1/u_{char i}^2) / (\sum(1/u_{char i}^2))$

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2
 $u_{char} = [\sum(w_i)^2 (u_{char i})^2]^{1/2}$ where $u_{char i}$ are the errors from each characterization method
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with
 $u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2
 $u_{char a}$ = the errors from characterization
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

OE<!" >% ' 9\$(!" (%\$&#G& () N*+E X# #5 95G` &5 \$<#15) ; \$) : >#%") 5" I E<& 95\$(!& ;) %&#< \$!& X#9& #%& %&>) %& 2 # 15F !5() #\$\$) 95((<& +7 ? A ? 95\$(Q&%)%#5' (<& : &#" 9%& &5(2_&F<15F #5' X) @ : &' !@(!) 5 &%)%& ! *5 %%& \$#" &" _<&& 5) N*+E +7 ? A ? #& #X#1@G&2 (<& (& : 15G) 9" &" (!b" ">&\$!;!&'

4.1 Thermometer Calibration

OT6(<&%) : &(&% #& N*+E (%\$&#G& (<%9F< (<&%) : &(&% (<# (#% \$#0G#(& GQ#5 #\$\$\$& !(& \$#0G#(!) 5 (#G) %%) %Q

4.2 Balance Calibration

OT6#5#Q!\$#6G#0#5\$&" #& \$#0G#(& GQ#5 #\$\$\$& !(& \$#0G#(!) 5 (#G) %%) %Q#5' >%\$& 9%& E<&_&F<(" 9" & ;) %& (!5F #& #559#6Q\$) : >%& () : #" (&%_&F<(" #5' #& (%\$&#G& () N*+E

4.3 Glassware Calibration

OT5 !5G) 9" &>%\$& 9%& !" 9" & () \$#0G#(=#" " T F#"" _#& 9" &' !5 (<& : #59;#\$(9%5F #5' 89#0(Q \$) 5(%6) ; =7 ? A ? " !

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

=7 ? A ? " #& (& (& ;) % (#& : &(#6\$! : >9%1&" GQTV:#6*=@ B+ #5' *=@?+I E<&%& 96 : (<& :) (" &5"!(IX& : &(<)' ;) %&#< &6& : &5(2" %&>) %& G&_1 +) @(!) 5" (& (& GQ*=@?+ _&%& #5#Q&' !5 #5 dH@ @!6&9& =6#5 7)) : ! T5 dH@ @!6&9& " KKKKRDW &;;!\$1&5(;) %<& %& () X#6) ; >%\$&6" ') _5 () / IO Z: I

? TF f	/ / / - / / / ?	B9 f	/ / / / / / ,	N#	/ / C / / / / ?	+& f	/ / / . K / / ,	k5	/ / - . / / /
, T6	/ / / - / / / ,	e&	/ / / DR / / ?	NG f	/ / / / / / ,	+!	/ / - C / / / ,	k% f	/ / / - / / /
? T" f	/ / / D / / / ?	4 # f	/ / / / / / ?	N' f	/ / / / / / ?	+	f / / / / / /		
? T9 f	/ / / C / / / ?	4' f	/ / / / / / ,	N! f	/ / / 1K / / ?	+5 f	/ / / / / /		
, g f	/ / / D / / / ?	4 & f	/ / / C / / / ?	, " f	/ / / 00 / / ,	+%	/ / / / / / DD		
, g# f	/ / / / R / / ?	Y; f	/ / / / / / ,	@ f	/ / / 0C / / / ?	E# f	/ / / / / /		
, g& f	/ / / / RC ?	YF f	/ / / C / / / ?	@G f	/ / / 00 / / / ?	EG f	/ / / / / /		
? g! f	/ / / / / / / ?	Y) f	/ / / / / / / ?	@ f	/ / / / / / / ?	E& f	/ / - . / / /		
, =#	/ / / 0 - / / / ?	*5 f	/ / / / / / / ?	@% f	/ / / / / / / ?	E< f	/ / / / / /		
, =' f	/ / / / 1D ?	*% f	/ / / / / / / ?	@ f	/ / / C . / / / ?	E! f	/ / / / / /		
? =& f	/ / / / / / / " U f	? 7G	/ / 1R / / / / ?	E6 f	/ / / / / / /				
, =) f	/ / / / . R ?	H# f	/ / / / / / / ?	7& f	/ / / / / / / ?	E: f	/ / / / / /		
, =%	/ / / / D / / ,	H f	/ / / / / R / ?	7< f	/ / / / / / / ?	d f	/ / / / / /		
? =" f	/ / / / / / / ?	H9 f	/ / / / / / / ?	79 f	/ / / / / / / ,	J f	/ / / - - / /		
? =9 f	/ / / C . / / ,	? F	/ / / \ 0 / / ,	+	/ / / CR / / / ?	i f	/ / / / / /		
? hQ f	/ / / / / / / ,	? 5	/ / / / 1R ?	+G f	/ / / / / / / ?	j f	/ / / / / /		
? B% f	/ / / / / / / ?	?) f	/ / / / / / / ,	+\$ f	/ / / / 01 / / ,	j G f	/ / / / C /		

? O=<&\$' & GQ*=@?+ , O=<&\$' & GQ*=@ B+ !O+&\$(%6*5(&#&5\$& 5 ON) (= <&\$' & e) % " O+) 6Q!) 5 + (#5' #& B6& &5

6.0 INTENDED USE

Oe) %<& \$#0G#(!) 5) ; #5#Q!\$#6!5" (% : &5(" #5' X#0 #(!) 5) ; #5#Q!\$#6: &(<)' " # " #>>%>%#(&

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

Open to air, store in a dry, cool place. Do not use if the container is damaged or the seal is broken.

Keep away from heat, fire, and open flames. Do not use if the container is damaged or the seal is broken. Do not use if the container is damaged or the seal is broken.

Do not use if the container is damaged or the seal is broken. Do not use if the container is damaged or the seal is broken.

For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 0Kl- / m l P unL#8P

Chemical Compatibility - +) @G& l5 Y= QYN, 02 YC+, 1 #5' Ye #89& 9" : #(%\$& l TX)! 9" &); Y=6 1' 9& () l5") @G& (Q); (<& > & % < 0 % (& l + (#G& _ l (< #G: & (#6 #5' l5) % #5!\$ #5!) 5" & \& & > (=6 10l

Stability - CQ // >> G& X& & " (#G& ;) %) 5 (< " l5 - W YN, 0 Ah @B \$) 5 (#!5& % - G / 2 // >>: ") @ (!) 5" \$ < & : ! \$ # @ " (#G& ;) % C # % l5 - DW YN, 0 Ah @B \$) 5 (#!5& %

K Containing Samples (Preparation and Solution) - ? & (#6Lh!"") @& " X& % Q % > ! @ l5 _ (#& P n % " L+) ' l9: \$ % @ 5 # (& ; 9") l5 @ (;) @ _ & : C Q Y = 6 ' ! " ") @ (!) 5 @ # 5 ' @ X & & ; U l5 ") ' l9: \$ % @ 5 # (& \$ % ! \$ # P n % # 5 ! \$? # (%\$& " L+ 969 % \$ A & % V ! & ' ! F & " () l5 P

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences
*=@0+ 0K #: 9	- / >> (5#	0RT%Y20N#- \, 2 . R+ & d2 = &
*=@0B+ 1/ 1l. C- 5:	- l- A / l / DZFA H	-	C5') % & % # % ! # (!) 5 ; % : 7 l B l ") 5 ") : &) > (! \$ # 6 ' & " ! F 5 "
*=@0B+ . \ \ 11K/ 5:	/ l l A / l / - ZFA H	-	C5') % & % # % ! # (!) 5 ; % : 7 l B l ") 5 ") : &) > (! \$ # 6 ' & " ! F 5 "
*=@0B+ . . . - lD0- 5:	- l / A / l / 0 ZFA H	-	C5') % & % # % ! # (!) 5 ; % : 7 l B l ") 5 ") : &) > (! \$ # 6 ' & " ! F 5 "

8.0 HAZARDOUS INFORMATION

Open to air, store in a dry, cool place. Do not use if the container is damaged or the seal is broken.

9.0 HOMOGENEITY

Open to air, store in a dry, cool place. Do not use if the container is damaged or the seal is broken.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

OM+7 = & % l ! \$ # (& N9: G& % M+7 G / 01

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

O= < & : ! \$ # 6 E & " (! 5 F OT \$ \$ \$ & ! ! (& ' A TCHT = & % l ! \$ # (& N9: G& % R R O l / -

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

O7 & ; & % 5 \$ & ? # (& % # 6 @ %) 9 \$ & % OT \$ \$ \$ & ! ! (& ' A TCHT = & % l ! \$ # (& N9: G& % R R O l / C

! " # % & ! &) * + # - . / 00 (1 * 2 * 3 * \$ 4 5 # % . 7 2 # & - % / # 8 # 9 0 : ; < = > ? @ * 3 * A 2 * ! " # C 0 0 D D E D < E @ ; 0 F C F 9 0 / 0 . (G % H F : 0 F C F 9 0 : @ ! " # % & ! & 6 * + # - 9 * J @ K L & ! " # % & ! & 6 * + # - 9 * J

@#F&0);1

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

e&G9#%Q/\ 2C/ C-

OE<& \$&%d(!\$#(!) 5 !" X#6' _!(<!5 (<&: &# " 9%&: &5(95\$&%#(!5(Q">&\$;!&' >%X' &' (<&=7 ? A' ? !" ") %&' #5' <#5' &' !5 #\$\$) %5\$&_!(<!5" (%\$(!) 5" F!X&5 !5 +&\$. 1-1 E<!" \$&%d(!\$#(!) 5 !" 59&;!&' !; !5" (%\$(!) 5" !5 +&\$. 1- #5) (;) &') %d; (<&=7 ? A' ? !" ' #: #F&' 2\$) 5(#: !5#(&' 2) %d (<&%_!" &:) ' !;!&' !

11.2 Lot Expiration Date

February 06, 2025

OE<&' #(&#;(&%_<\$< (<" =7 ? A' ? " <) 96 5) (G& 9" &' !

OE<& 0 (&\>!%(!) 5 ' #(&%&(\$(" (&>&%)'); (!: & (<#((<" (#G0(Q); # =7 ? A' ? \$5 G&" 9>>) %&' GQ0 5F (&%: "#G0(Q)" 9' !&" \$) 5' 9\$(&') 5 >%>&%Q" () %&' #5' <#5' &' =7 ? A' ? " ! H) (&\>!%(!) 5 !" 0: !(&' >% #%QCGQ (%5">!%(!) 5 l0 ""); _#(&%)% (<&") 0(!) 5P#5' !5;%89&5(QCGQ<&: !5#6" (#G0(Q

11.3 Period of Validity

O+ &#&' E= E g#F , >&5 h#(&Soooooooooooooooooooooooooooo

OE<" =7 ? A' ? " <) 96 5) (G& 9" &' 0 5F&%<#5) 5& Q&#%4) %' !V:) 5(<" !5 (<&\$#" &); # 0/ : HG) ((P ;% (<&' #(&);) >&5!5F (<& #0: !5lc&' G#F) %#;(&%<&' #(& F!X&5 !5 +&\$! -- 1C2_<\$<&X&%\$) : &" ;!%(! E<!" !" \$) 5(!5F&5(9>) 5 (<&=7 ? A' ? G&!5F " () %&' #5' <#5' &' !5 #\$\$) %5\$&_!(< (<!5" (%\$(!) 5" F!X&5 !5 +&\$! . 1-1

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

? !\$<#&6g)) (< h! %&\$() %2M9#0(Q=) 5(%6



Certifying Officer:

@#964 #!5&" =<#!%:#5 A+ &5!) %E&\$<5!\$#6h !%&\$() %



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGMG10
 Lot Number: R2-MG695748
 Matrix: 2% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Magnesium
 Starting Material: Magnesium Metal
 Starting Material Lot#: 2168
 Starting Material Purity: 99.9984%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10044 ± 30 µg/mL
Density: 1.053 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10055 ± 26 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #2	10042 ± 57 µg/mL ICP Assay NIST SRM 3131a Lot Number: 140110
Assay Method #3	10033 ± 26 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/WM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an UPLA-Filtered Clean Room. An UPLA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Ag	0.002104	M	Eu <	0.000910	O Na	0.071011	O Se <	0.048000	O Zn	0.003296
M Al	0.003550	M	Fe	0.002536	M Nb <	0.000460	O Si <	0.032000	O Zr <	0.002700
M As <	0.001400	M	Ga <	0.000460	M Nd <	0.000910	M Sm <	0.000460		
M Au <	0.001400	M	Gd <	0.000460	O Ni <	0.001600	M Sn <	0.002300		
O B	0.006847	M	Ge <	0.001400	M Os <	0.000460	O Sr	0.000278		
O Ba	0.000963	M	Hf <	0.000460	O P	0.015216	M Ta <	0.000460		
O Be <	0.000120	M	Hg <	0.000460	M Pb <	0.000460	M Tb <	0.000460		
M Bi <	0.000460	M	Ho <	0.000460	M Pd <	0.003200	M Te <	0.007300		
O Ca	0.053258	M	In <	0.000460	M Pr <	0.000460	M Th <	0.000460		
O Cd <	0.000360	M	Ir <	0.000460	M Pt <	0.001900	O Ti <	0.001700		
M Ce <	0.002300	M	K	0.048186	M Rb	0.002409	M Tl	0.003043		
M Co <	0.000910	M	La <	0.002800	M Re <	0.000460	M Tm <	0.000460		
M Cr <	0.002300	O	Li	0.027897	M Rh <	0.000460	M U <	0.000460		
M Cs	0.001039	M	Lu <	0.000460	M Ru <	0.000460	M V <	0.000460		
O Cu <	0.003000	s	Mg <		O S <	0.190000	M W <	0.000460		
M Dy <	0.000460	O	Mn	0.015216	M Sb	0.020796	O Y <	0.000720		
M Er <	0.000460	M	Mo <	0.000910	O Sc <	0.000480	M Yb <	0.000460		

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 24.31 +2 6 Mg(H₂O)₆+2

Chemical Compatibility -Soluble in HCl, HNO₃, and H₂SO₄ avoid HF, H₃PO₄ and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicates, carbonates, hydroxides, oxides, and tungstates in neutral and slightly acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO₃ / LDPE container.

Mg Containing Samples (Preparation and Solution) -Metal (Best dissolved in diluted HNO₃); Oxide (Readily soluble in above compatible aqueous acidic solutions); Ores (Carbonate fusion in Pt₀ followed by HCl dissolution); Organic Matrices (Sulfuric / peroxide digestion or nitric / sulfuric / perchloric acid decomposition, or dry ash and dissolution in dilute HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 24 amu	42 ppt	n/a	7Li17O, 48Ti+2 , 48Ca+2
ICP-OES 279.553 nm	0.0002 / 0.00003 µg/mL	1	Th
ICP-OES 280.270 nm	0.0003 / 0.00005 µg/mL	1	U, V
ICP-OES 285.213 nm	0.002 / 0.00003 µg/mL	1	U, Hf, Cr, Zr

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 01, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **September 01, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Director, Quality Control



Certifying Officer:

Paul Gaines
Chairman / Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGMN10
 Lot Number: P2-MN687536
 Matrix: 3% (v/v) HNO₃
 Value / Analyte(s): 10 000 µg/mL ea:
 Manganese
 Starting Material: Mn Metal
 Starting Material Lot#: 2275
 Starting Material Purity: 99.9909%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10046 ± 30 µg/mL
Density: 1.035 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10045 ± 25 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #2	10083 ± 68 µg/mL ICP Assay NIST SRM 3132 Lot Number: 050429
Assay Method #3	10031 ± 47 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char i}^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.001500	M Eu < 0.000730	O Na 0.176713	M Se < 0.006600	M Zn 0.009960
O Al 0.004337	M Fe < 0.650000	M Nb < 0.000730	O Si 0.097995	M Zr < 0.000730
M As < 0.008000	M Ga 0.004337	M Nd < 0.001500	M Sm < 0.000730	
M Au < 0.000730	M Gd < 0.000730	M Ni 0.024097	M Sn < 0.002200	
M B 0.069078	M Ge < 0.004400	M Os < 0.000730	O Sr 0.000931	
M Ba < 0.001500	M Hf < 0.000730	i P <	M Ta < 0.000730	
M Be < 0.000730	M Hg < 0.002200	M Pb 0.007389	M Tb < 0.000730	
M Bi < 0.003000	M Ho < 0.000730	M Pd < 0.000730	M Te < 0.019000	
O Ca 0.062652	M In < 0.003000	M Pr < 0.000730	M Th < 0.000730	
M Cd < 0.001500	M Ir < 0.000730	M Pt < 0.000730	O Ti < 0.006500	
M Ce < 0.007300	O K 0.006425	M Rb < 0.006600	M Tl < 0.000730	
O Co 0.014779	M La < 0.003000	M Re < 0.000730	M Tm < 0.000730	
O Cr 0.273102	O Li 0.000417	M Rh < 0.003000	M U < 0.001500	
M Cs < 0.000730	M Lu < 0.000730	M Ru < 0.004400	M V < 0.000730	
O Cu 0.007711	O Mg 0.321297	i S <	M W < 0.004400	
M Dy < 0.001500	s Mn <	M Sb < 0.021000	O Y 0.001365	
M Er < 0.001500	M Mo 0.010281	O Sc < 0.004100	M Yb < 0.000730	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 54.94 +2 6 Mn(H₂O)₆2+

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO₃/LDPE container.

Mn Containing Samples (Preparation and Solution) -Metal (Soluble in dilute acids); Oxides (Soluble in dilute acids); Ores (Dissolve with HCl. If silica is present add HF and then fume off silica by adding H₂SO₄ and heat to SO₃ fumes - dense white fumes).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 55 amu	10 ppt	n/a	40Ar14N1H,39K16 O,37Cl18O,40Ar15 N,38Ar17O,36Ar18O 1H ,38Ar16O1H,37Cl17 O1H,23Na32S
ICP-OES 257.610 nm	0.0014 / 0.00002 µg/mL	1	Ce, W, Re
ICP-OES 259.373 nm	0.0016 / 0.00002 µg/mL	1	U, Ta, Mo, Fe, Nb
ICP-OES 260.569 nm	0.0021 / 0.00002 µg/mL	1	Co

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

January 05, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **January 05, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGMO10
Lot Number: R2-MO693167
Matrix: tr. NH4OH
H2O
Value / Analyte(s): 10 000 µg/mL ea:
Molybdenum
Starting Material: Ammonium Molybdate
Starting Material Lot#: 2257
Starting Material Purity: 99.9914%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10013 ± 35 µg/mL
Density: 1.011 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **10035 ± 67 µg/mL**
ICP Assay NIST SRM 3134 Lot Number: 130418

Assay Method #2 **10005 ± 40 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/WRM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of $k = 2$.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/(u_{char j}^2)))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char i}^2))]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an UPLA-Filtered Clean Room. An UPLA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.001826	M Eu < 0.000300	M Na < 0.008750	M Se < 0.007480	M Zn < 0.002553
M Al < 0.004455	M Fe < 0.002093	M Nb < 0.015030	i Si <	M Zr < 0.005393
M As < 0.003006	M Ga < 0.000300	i Nd <	M Sm < 0.000300	
M Au < 0.006012	M Gd < 0.000300	M Ni < 0.004828	M Sn < 0.001004	
M B < 0.035184	M Ge < 0.000903	M Os < 0.003006	M Sr < 0.001903	
O Ba < 0.015613	M Hf < 0.000896	i P <	M Ta < 0.000300	
M Be < 0.003006	M Hg < 0.003006	M Pb < 0.000409	M Tb < 0.000300	
M Bi < 0.000401	M Ho < 0.000300	M Pd < 0.001114	M Te < 0.060122	
O Ca < 0.032589	M In < 0.015030	M Pr < 0.090184	M Th < 0.000786	
O Cd < 0.051800	M Ir < 0.007483	M Pt < 0.000388	O Ti < 0.093240	
M Ce < 0.015030	M K < 1.114508	M Rb < 0.040641	M Tl < 0.013140	
M Co < 0.004032	M La < 0.000300	M Re < 0.000300	M Tm < 0.000300	
M Cr < 0.005931	O Li < 0.000215	M Rh < 0.000300	M U < 0.000937	
M Cs < 0.002812	M Lu < 0.000300	M Ru < 0.003006	M V < 0.000759	
M Cu < 0.005172	M Mg < 0.005212	i S <	M W < 0.592427	
M Dy < 0.000300	M Mn < 0.000952	M Sb < 0.003147	M Y < 0.000300	
M Er < 0.000300	s Mo <	M Sc < 0.009019	M Yb < 0.000300	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 95.94 +6 6,7,8,9 [MoO4]

-2(chemical form as received)

Chemical Compatibility -Mo is received in a NH4OH matrix giving the operator the option of using HCl or HF to stabilize acidic solutions. The [MoO4]-2 is soluble in concentrated HCl [MoOCl5]-2, dilute HF / HNO3 [MoOF5]-2 and basic media [MoO4]-2. Stable at ppm levels with some metals provided it is fluorinated. Do not mix with Alkaline or Rare Earths when HF is present. Stable with most inorganic anions provided it is in the [MoO4]-2 chemical form.

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the [MoOF5]-2 for months in 1% HNO3 / LDPE container. 1-10,000 ppm single element solutions as the [MoO4]-2 chemically stable for years in 1% NH4OH in a LDPE container.

Mo Containing Samples (Preparation and Solution) -Metal (Soluble in HF / HNO3 or hot dilute HCl); Oxide (soluble in HF or NH4OH); Organic Matrices (Dry ash at 450EC in Pt0 and dissolve oxide with HF or HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 95 amu	3 ppt	n/a	40Ar39K16O,79Br1 60,190Os2+,190Pt 2+
ICP-OES 202.030 nm	0.008 / 0.0002 µg/mL	1	Os, Hf
ICP-OES 203.844 nm	0.012 / 0.002 µg/mL	1	
ICP-OES 204.598 nm	0.012 / 0.001 µg/mL	1	Ir, Ta

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

May 28, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **May 28, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is a ISO 17025 & ISO 9001:2015 certified laboratory. We are a member of the American Society for Testing and Materials (ASTM) and the International Organization of Standardization (ISO). We are also a member of the National Institute of Standards and Technology (NIST) and the National Institute of Environmental Health Sciences (NIEHS). We are a member of the American Chemical Society (ACS) and the American Society for Environmental Analysis (ASEA). We are a member of the American Society for Quality (ASQ) and the American Society for Nondestructive Testing (ASNT). We are a member of the American Society of Testing and Materials (ASTM) and the International Organization of Standardization (ISO). We are a member of the National Institute of Standards and Technology (NIST) and the National Institute of Environmental Health Sciences (NIEHS). We are a member of the American Chemical Society (ACS) and the American Society for Environmental Analysis (ASEA). We are a member of the American Society for Quality (ASQ) and the American Society for Nondestructive Testing (ASNT).



2.0 PRODUCT DESCRIPTION

Product Name: **15F T5#6**
 Description: **4% & +) 5**
 = (#0 F N9: G&S = 4 NT-/
 H) (N9: G&S + CONT// R1C
 ? (#%S CV LWPXN, 0
 J#0& AT5#6" PS - / /// YFA H&S
 +)' !9:
 +(#%F ? (#%#6 N#C=, 0
 +(#%F ? (#%#6H) (ZS CC. 1
 +(#%F ? (#%#6@%CS KKIKKDRV

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: - / / D0 [0/ YFA H
Density: - / / 0\ FA HL: &#"9&' (#/ [1]=P

Assay Information:

Assay Method #1	10070 ± 26 µg/mL 4 %V! &(%\$ N*+E +7 ? H) (N9: G&S+ && +&\$! 11C
Assay Method #2	10012 ± 31 µg/mL *=@T""#QN*+E +7 ? 0- DC# H) (N9: G&S- C' . - D
Assay Method #3	10059 ± 20 µg/mL =#96#&' N*+E +7 ? H) (N9: G&S+ && +&\$! 11C

OE<&=#96#(&' J#0&'! # V#0& \$#96#(&' ;%: (<& ^ &f<()); # "(#%F : #((<#(<#" G&S \$&%!1&' ' !&\$(\$QW! # N#!) 5#6*5" (!9(&); +(#5' #'%" #5' E&\$<5) 6 FQLN*+EP+7 ? A ? I +&& +&\$ 11C;) %G#5\$& (%\$&#G6(Q

E<& ;) 66) !5F &89#(!) 5" #&9" &' 15 (<& \$#96#(!) 5); (<& \$&%!1&' V#6& #5' (<& 95\$&%#15(Q 7 &>) %&' 95\$&%#15(!&' %&>&' &5 (' &' 95\$&%#15(!&' &#>&' " &' #(>>)%L: #(&Q(<& KDV \$) 5;! &5\$& 6&69" !5F #) V&#F& ;#\$() %; _ ` C

@#F&-); 1

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char i}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k(u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i^2)(u_{char i}^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a)(u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (z) = U_{CRM/RM} = k(u_{char a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

OE<!" >% ' 9\$(! (%\$&#G& () N*+E V# #5 95G%_ &5 \$<#15) ; \$) : >#%") 5" I E<& 95\$(!& ;) %&#< \$!& V#9& #%& %&) %& 2 #_15F !5() #\$\$) 95((<+7 ? A ? 95\$(Q&%)%#5' (<& : &#" 9%& : &5(2^ &F<15F #5' V#9 : & ' !9(!) 5 &%)%#1 *5 %%& \$#" & ^ <) N*+E +7 ? A ? #%& #V#19#G&2 (< (& : &5G) 9" & " (!a" ">&\$!;!& ' I

4.1 Thermometer Calibration

OT6(<8%): &(&% #%& N*+E (%\$&#G& (<%9F< (<8%): &(&% (<#(#%& \$#0G#(& GQ#5 #\$\$\$& !(& \$#0G#(!) 5 (#G) %%) %Q

4.2 Balance Calibration

OT6#5#Q!\$#6G#6#5\$& " #%& \$#0G#(& GQ#5 #\$\$\$& !(& \$#0G#(!) 5 (#G) %%) %Q#5' >%\$& 9%& E<& ^ &F<(" 9" & ;) %& (!5F #%& #559#6Q\$) : >%& () : #" (&%& &F<(" #5' #%& (%\$&#G& () N*+E I

4.3 Glassware Calibration

OT5 !5G) 9" & >%\$& 9%& !" 9" & () \$#0G#(& #6=6#" " T F6#" " ^ #%& 9" & !5 (<& : #59;#\$(9%5F #5' 89#0(Q \$) 5(%6) ; =7 ? A ? " I

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

=7 ? A ? " #%& (& (& ;) % (#& : &(#6\$! : >9%1& " GQTU#6*=@ B+ #5' *=@?+I E<& %& " 96 ; % : (< :) " (" &5" !(!V& : (<) ' ;) %&#< &6: &5(2" %&) %& G&6 ^ I +) 9(!) 5" (& (& GQ*=@?+ ^ &#& #5#0b& !5 #5 c H@ Q!6&9& =6#5 7)) : I T5 c H@ Q!6&9& " KKKKRDV &;;!\$1&5(;) %< & % :) V#6) ; >%#1&6" ') ^ 5 () / IO Y: I

, TF e // // QD ? B9 e // // R1/ " N# e // // , +& e // // 1. // , k5 // // QD
, T6 // // 0\ RR , d& // // - D / , NG e // // - 0 // , +! // // 1K\ 1R , k% // // \ R
, T" e // // \ K / ? 4# e // // R1/ ? N' e // // R1/ ? +: e // // R1/
? T9 e // // R1/ ? 4' e // // R1/ , N! e // // QD ? +5 e // // - . //
, f // // K0 ? 4 & e // // 01 // ? , " e // // R1/ , +% // // QDD
, f # // // QK ? X; e // // R1/ , @ // // \ DDD ? E# e // // 1Q /
, f & e // // - 0 / ? XF e // // - . // ? @G e // // R1/ ? EG e // // R1/
, f ! e // // R- // ? X) e // // R1/ ? @ e // // R1/ , E& e // // 1R /
, =# // // RD- C ? *5 e // // R1/ ? @% e // // R1/ ? E< e // // QD /
, =' e // // QD ? *% e // // R1/ ? @ e // // R1/ , E! // // DDD
? =& e // // - . // , h - // // 1K - R ? 7G e // // 01 // ? E6 e // // R1/
, =) e // // 0. / ? H# e // // R1/ ? 7& e // // R1/ ? E: e // // R1/
, =% e // // - 1 // , H // // \ \ K ? 7< e // // R1/ ? c e // // R1/
? =" e // // 01 // ? H9 e // // R1/ ? 79 e // // - . // , J e // // - \ //
, =9 e // // - 1 // , ? F // // CR0. / , + // // 1R00 / , i e // // D / //
? gQ e // // R1/ , ? 5 // // - 0K ? +G e // // - . // , j e // // . 0 /
? B% e // // R1/ , ?) e // // 1R / , +\$ e // // 0. / , j G e // // - 0 /

? O=<&\$_& GQ*=@?+ , O=<&\$_& GQ*=@ B+ !O+&\$(%6*5(&#\$& 5 ON) (= <&\$_& d) % " O+) 6Q!) 5 + (#5' #%& B6& &5

6.0 INTENDED USE

Od) %< & \$#0G#(!) 5) ; #5#Q!\$#6!5" (9: &5(" #5' V#6 #(!) 5) ; #5#Q!\$#6: &(<) " #" #>>%>#%#(&

@#F&C) ; 1

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

0+() % G&(^ &&5 #>>%U: #(&Q1l O0/ I = ^ <I& !5 " &#& E= E G#F1

0i <I& (") %' !5 (<& " &#& E= E G#F2(%5">!%(!) 5); (<!" =7 ? A ? !" 5&F&F1G& T;(&%) >&5!5F (<& " &#& E= E G#F (%5">!%(!) 5); (<& =7 ? A ? ^ !&) \$\$\$9%2&" 9&I5F !5 # F%' 9#6!5\$%&#" & !5 (<& #5#&Q& \$) 5\$&5(%!) 5!" P1 *(!" (<& %&">) 5"!G&(Q); (<& 9" &%)(#\$\$) 95(;) %<!" & ;&\$! i <&5 (<& G) (I& !" ^ &IF<& G) (< G& ; %& #5' #; (&G&I5F >#F&\$' !5 ") %F&2 (<& : #"" ' ! ;&%&5&\$) G' &%& ^ !&G& # : &#" 9%& ; (%5">!%(!) 5 : #"" 9" " !

OT;(&%) >&5!5F (<& " &#& E= E G#F2_&& \$> \$> (IF<(Q) &#& ^ <&5 5) (! 9" & #5' ") % G&(^ &&5 1l OC1l = () : !5! !b& (<& & ;&\$") ; (%5">!%(!) 5! c" & # (C l [1l = () : !5! !b& WY& : &(%\$' !&(!) 5 &%)%%' <&5 9" !5F (<& %& >) %& ' &5" ! (Q g) 5) (>!) & (& ; % : (<& \$) 5(#!5&% g) 5) (% (9% %& :) V& #889) (") \$) 5(#!5&%

Od) %) % !5;) % : # (!) 52W" ! (www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - CClK m Δ PN#ml#8P#%F&Q !) 5! \$!5 5#(9%&

Chemical Compatibility -+) G& !5 X= 2XN, 02 XC+, 1 #5' Xd #89&) 9" : #(%\$&' ! +(#G& ^ !(< #& : &(#& #5' !5) %!\$ #5!) 5" !

Stability - CQ// >>G&V&6 " (#G& ;) %) 5(<" !5 - V XN, 0 AHg@B\$) 5(#!5&% - Q/ 2// >>: ") 9(!) 5" \$<& : ! \$ #& (# G& ;) % Q& # % !5 - DV XN, 0 AHg@B\$) 5(#!5&%

Na Containing Samples (Preparation and Solution) - ? &(#6Lg!") V& V&Q%#>!" Q!5 ^ #(&%&η %& L!(<!9: \$%&) 5#(& ; 9") ! 5 !5 F#><!(& \$%&G& ;) 6 ^ & GQX= 6' !") 9(!) 5 CQ#5_ &V&6) ; N# 15 9(<!9: \$%&) 5#(& \$% ! \$ # Pη %!\$? #(%\$& L+ 969%\$ A>&%U' & ' !F& (!) 5) %5!(%\$A 969%\$A-&%<θ %\$ # \$! ' &\$) : >) ! (!) 5P1

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences
*=@0+ 00 #: 9	0- / >>(5#	1\ ElmC21\ = #nC
*=@0B+ 00/ 100. 5:	Cl/ A/ I/ K YFA H	-	@ 2 k5
*=@0B+ DRRlKkD 5:	/ I/ 0 A/ I/ \ \ YFA H	-	C5') %&%#%!(!) 5 ; %: 7 IBI") 5 ") : &) >(! \$ # 6' & " !F5"
*=@0B+ DRkDKD 5:	/ I/ . A/ I/ / / / K YFA H	-	C5') %&%#%!(!) 5 ; %: 7 IBI") 5 ") : &) >(! \$ # 6' & " !F5"

8.0 HAZARDOUS INFORMATION

0&#& " & %& ; & %) ((<& + # ; & Qg # (# + <& & (;) %&5 ;) % : # (!) 5 %&F#%15F (<!" =7 ? A ? ? !

9.0 HOMOGENEITY

OE<!" ") 9(!) 5 ^ # " : !U& #\$\$) %!5F () #5 !5G) 9" & >%\$&' 9%& #5' !" F9#%5(&& () G& <) :) F&5&) 9" ! X) :) F&5&!(Q' # (# !5' ! \$ # (& (< # ((<& & 5' 9" &%<) 96 (# # & : !5! : 9: " # : >& " !b&) ; / IC: H () # " " 9%& <) :) F&5&!(Q

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

OM+7 = %&4!\$#(& N9: G&%M+7 G/ 01

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

O= <& : ! \$ # 6 E& " (!5F OT \$ \$ % ! ! (& ' A TCHT = %&4!\$#(& N9: G&%RR0/ -

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

OT & ; %& 5 \$ & ? # (&% # 6 @ %) 9 \$ & % OT \$ \$ % ! ! (& ' A TCHT = %&4!\$#(& N9: G&%RR0/ C

!" %&!(&) * ! + # - . / (0 1 * " 2 ! " 3 \$ % & ' (7 2 # & % 4 8 . # .) % & ; : 0 < / . (= ? @ * 3 " A 2 ! " B C 0 0 D D E & < E @ ; 0 F C F 9 0 / 0 . (G % H F . 0 F C F 9 0 : @ ! " # % ! & 6 ! + # - 9 " J @ K L & ! " # % ! & 6 ! + # - 9 " J

@#F&0) ; 1

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

o#59#%QCD2C/ C-

OE<& \$&%d(!\$#(!) 5 !" V#6' ^ !(<!5 (<&: &# 9%&: &5(95\$&%#5(Q">&\$;!&' >%VW &' (<&=7 ? A' ? !" ") %&' #5' <#5' &' !5 #\$\$) %5\$& ^ !(<!5" (%\$(!) 5" F!V&5 !5 +&\$. 1-1 E<!" \$&%d(!\$#(!) 5 !" 59&;!&' !; !5" (%\$(!) 5" !5 +&\$. 1- #%&5) (;) & ^ &') %d; (<&=7 ? A' ? !" ' #: #F&' 2\$) 5(#: !5#(&' 2) %q (<&%!" &:) ' !;!&' !

11.2 Lot Expiration Date

QJanuary 25, 2025

OE<&' #(&#;(&%& <!\$< (<" =7 ? A' ? " <) 96 5) (G&9" &' !

OE<& q (&L>!%(!) 5 ' #(&%&Q\$(" (<&>&%')); (!: & (<#((<&" (#G&Q); # =7 ? A' ? \$5 G&" 9>>) %&' GQq 5F (&%: "#G&Q)" (9' !&" \$) 5' 9\$(&') 5 >%>&%Q" () %&' #5' <#5' &' =7 ? A' ? " ! H) (&L>!%(!) 5 !" &: !(&' >% #%Q&Q (%5">!%(!) 5 Lq ""); ^ #(&%)% (<&") Q(!) 5P#5' !5;%89&5(Q&Q\$<&: !5#6" (#G&Q

11.3 Period of Validity

O+ &#&' E= E f #F , >&5 g #(&Spoooooooooooooooooooooooooooo

OE<!" =7 ? A' ? " <) 96 5) (G&9" &' q 5F&%<#5) 5& Q&#%L) %' !U:) 5(<" !5 (<&\$#" &); # 0/ : HG) ((P ;% (<&' #(&);) >&5!5F (<& #Q: !5!b&' G#F) %#;(&%<&' #(& F!V&5 !5 +&\$! -- 1C2^ <!\$<&V&%\$) : &" ;!%(! E<!" !" \$) 5(!5F&5(9>) 5 (<&=7 ? A' ? G&!5F ") %&' #5' <#5' &' !5 #\$\$) %5\$& ^ !(< (<&!5" (%\$(!) 5" F!V&5 !5 +&\$! . 1-1

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

? !\$<#&6f)) (< g! %&\$() %2M9#Q(=) 5(%6



Certifying Officer:

@#964 #!5&" = <#!%:#5 A+ &5!) %E&\$<5!\$#6g !%&\$() %



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGNI10
 Lot Number: P2-NI686384
 Matrix: 3% (v/v) HNO₃
 Value / Analyte(s): 10 000 µg/mL ea:
 Nickel
 Starting Material: Ni Metal
 Starting Material Lot#: 2277 and 2282
 Starting Material Purity: 99.9992%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9979 ± 30 µg/mL
Density: 1.038 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	9971 ± 54 µg/mL ICP Assay NIST SRM 3136 Lot Number: 120619
Assay Method #2	9970 ± 32 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #3	9993 ± 33 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag	0.002606	M Eu	<	0.001100	O Na	0.004965	O Se	<	0.067000	M Zn	0.006578	
M Al	<	0.013000	O Fe	0.018618	M Nb	<	0.001100	O Si	0.010923	M Zr	<	0.001100
O As	<	0.067000	M Ga	<	0.001100	M Nd	<	0.001100	M Sm	<	0.001100	
M Au	<	0.002100	M Gd	<	0.001100	s Ni	<		M Sn	<	0.016000	
M B	<	0.017000	M Ge	<	0.004200	M Os	0.002110	O Sr	<	0.000940		
M Ba	<	0.001100	M Hf	<	0.001100	i P	<		M Ta	<	0.001100	
O Be	<	0.000410	M Hg	0.014895	M Pb	0.006578	M Tb	<	0.001100			
M Bi	<	0.004200	M Ho	<	0.001100	M Pd	<	0.001100	M Te	<	0.015000	
O Ca	0.003351	M In	<	0.001100	M Pr	<	0.001100	M Th	<	0.001100		
M Cd	0.001365	M Ir	0.004716	M Pt	<	0.001100	M Ti	<	0.004200			
M Ce	<	0.001100	O K	0.004716	M Rb	<	0.001100	M Tl	<	0.001100		
O Co	0.017377	M La	<	0.001100	M Re	0.001737	M Tm	<	0.001100			
O Cr	<	0.006700	O Li	<	0.000140	M Rh	<	0.006300	M U	<	0.001100	
M Cs	<	0.007300	M Lu	<	0.001100	M Ru	<	0.019000	M V	<	0.002100	
M Cu	0.004096	O Mg	0.000372	i S	<			M W	<	0.006300		
M Dy	<	0.001100	O Mn	<	0.001900	M Sb	0.005833	O Y	<	0.000540		
M Er	<	0.001100	M Mo	<	0.008400	M Sc	<	0.002100	M Yb	<	0.001100	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.69 +2 6 Ni(H₂O)₆²⁺

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Ni Containing Samples (Preparation and Solution) -Metal (Soluble in HNO₃); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO₃).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 60 amu	100 ppt	n/a	43Ca16O1H , 44Ca16O, 23Na37Cl
ICP-OES 221.647 nm	0.01 / 0.0009 µg/mL	1	Si
ICP-OES 231.604 nm	0.02 / 0.002 µg/mL	1	Sb, Ta, Co
ICP-OES 232.003 nm	0.02 / 0.006 µg/mL	1	Cr, Re, Os, Nb, Ag, Pt, Fe

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 02, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- December 02, 2023

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGPB10
 Lot Number: P2-PB686383
 Matrix: 0.5% (v/v) HNO3
 Value / Analyte(s): 10 000 µg/mL ea:
 Lead
 Starting Material: Lead Nitrate
 Starting Material Lot#: 2299
 Starting Material Purity: 99.9974%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10031 ± 30 µg/mL
Density: 1.015 g/mL (measured at 20 ± 4 °C)

Assay Information:

- Assay Method #1** **10060 ± 63 µg/mL**
 ICP Assay NIST SRM 3128 Lot Number: 101026

- Assay Method #2** **10048 ± 32 µg/mL**
 EDTA NIST SRM 928 Lot Number: 928

- Assay Method #3** **10007 ± 32 µg/mL**
 Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char i})^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag	0.000850	M Eu <	0.000310	O Na	0.005780	M Se <	0.004600	M Zn	0.005440
O Al	0.234602	O Fe	0.023460	M Nb <	0.000310	O Si	0.047600	M Zr <	0.000610
M As <	0.001900	M Ga <	0.000310	M Nd <	0.000310	M Sm <	0.000310		
M Au <	0.002200	M Gd <	0.004300	M Ni <	0.001600	M Sn <	0.000610		
O B <	0.005200	M Ge <	0.000610	M Os <	0.000310	O Sr	0.000442		
O Ba	0.001530	M Hf <	0.000310	O P <	0.052000	M Ta <	0.000310		
O Be <	0.000630	M Hg <	0.001600	s Pb <		M Tb <	0.000310		
O Bi	0.021080	M Ho <	0.000610	M Pd <	0.000310	M Te <	0.004300		
O Ca	0.037400	M In <	0.000310	M Pr <	0.000310	M Th <	0.000310		
M Cd <	0.000610	M Ir <	0.000310	M Pt <	0.000310	M Ti	0.002992		
M Ce <	0.000910	O K	0.008840	M Rb <	0.000610	M Tl	0.037400		
M Co <	0.000610	M La <	0.000610	M Re <	0.000310	M Tm <	0.000610		
M Cr <	0.003400	O Li	0.000108	O Rh <	0.006300	M U <	0.000310		
M Cs	0.002686	M Lu <	0.000310	M Ru <	0.000310	M V <	0.000310		
M Cu <	0.002500	O Mg	0.004760	O S <	0.052000	M W <	0.002200		
M Dy <	0.000310	M Mn <	0.000310	M Sb <	0.001300	M Y <	0.000310		
M Er <	0.000310	O Mo <	0.005400	M Sc <	0.000310	M Yb <	0.000310		

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 207.20 +2 6 Pb(H₂O)₆+2

Chemical Compatibility - Soluble in HCl, HF and HNO₃. Avoid H₂SO₄. Stable with most metals and inorganic anions forming insoluble carbonate, borate, sulfate, sulfite, sulfide, phosphate, oxalate, chromate, tannate, iodate, and cyanide in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO₃ / LDPE container.

Pb Containing Samples (Preparation and Solution) -Metal (Best dissolved in 1:1 H₂O / HNO₃); Oxides (The many different Pb oxides are soluble in HNO₃ with the exception of PbO₂ which is soluble in HCl or HF); Ores and Alloys (Best attacked using 1:1 H₂O / HNO₃); Organic Matrices (Dry ash and dissolve in dilute HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 208 amu	5 ppt	n/a	192Pt16O, 192Os16O
ICP-OES 168.215 nm	0.03 / 0.003 µg/mL	1	Co
ICP-OES 217.000 nm	0.09 / 0.03 µg/mL	1	W, Ir, Hf, Sb, Th
ICP-OES 220.353 nm	0.04 / 0.006 µg/mL	1	Bi, Nb

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 02, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **December 02, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGSB10
 Lot Number: R2-SB688559
 Matrix: 3% (v/v) HNO3
 3% (w/v) tartaric acid
 Value / Analyte(s): 10 000 µg/mL ea:
 Antimony
 Starting Material: Antimony Metal
 Starting Material Lot#: 1857
 Starting Material Purity: 99.9894%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10003 ± 47 µg/mL
Density: 1.061 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 10003 ± 41 µg/mL
 ICP Assay NIST SRM 3102a Lot Number: 140911

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i) (X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$
 w_i = the weighting factors for each method calculated using the inverse square of the variance:
 $w_i = (1/u_{char\ i})^2 / (\sum(1/(u_{char\ i})^2))$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2
 u_{char} = $[\sum((w_i)^2 (u_{char\ i})^2)]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with
 $u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2
 $u_{char\ a}$ = the errors from characterization
 u_{bb} = bottle to bottle homogeneity standard uncertainty
 u_{lts} = long term stability standard uncertainty (storage)
 u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag <	0.000200	M Eu <	0.000300	O Na	0.140000	M Se <	0.007300	O Zn	0.005000
M Al	0.003200	O Fe	0.060000	M Nb <	0.000100	O Si	0.150000	O Zr <	0.006300
M As <	0.004400	M Ga <	0.000400	M Nd <	0.000100	M Sm <	0.000100		
M Au <	0.000210	M Gd <	0.000100	O Ni	0.004800	M Sn <	0.001800		
M B <	0.011000	M Ge <	0.000600	M Os <	0.000110	O Sr	0.000750		
O Ba <	0.004900	M Hf <	0.000100	O P	0.540000	M Ta	0.003300		
M Be <	0.000400	M Hg <	0.000110	M Pb <	0.000400	M Tb <	0.000100		
M Bi <	0.000200	M Ho <	0.000100	M Pd <	0.000210	M Te <	0.000600		
O Ca	0.110000	M In <	0.000100	M Pr <	0.001600	M Th <	0.000100		
M Cd <	0.000200	M Ir <	0.000110	M Pt <	0.000600	M Ti <	0.002800		
M Ce	0.006500	O K	0.020000	M Rb <	0.001000	M Tl <	0.000100		
M Co <	0.000200	O La <	0.016000	M Re <	0.000100	M Tm <	0.000100		
M Cr	0.006900	O Li <	0.000430	M Rh <	0.000300	M U <	0.000100		
M Cs <	0.000200	M Lu <	0.000100	M Ru <	0.000310	M V <	0.000800		
M Cu <	0.000600	O Mg	0.021000	n S <		M W <	0.000200		
M Dy <	0.000100	O Mn	0.001900	s Sb <		M Y <	0.000100		
M Er <	0.000100	M Mo <	0.000500	O Sc <	0.002300	M Yb <	0.000100		

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 121.75 +3 6 Sb(O)C4H4O6-1

Chemical Compatibility -Stable in conc. HCl, dilute or conc. HF. Stable in dilute HNO3 as the fluoride or tartrate complex. Avoid basic media. Stable with most metals and inorganic anions in acidic media as the tartrate provided the acidity is not too high or the acid is oxidizing causing loss of the stabilizing tartrate ion. The fluoride complex of antimony is stable in strong acid but you should only mix with other metals that are fluorinated.

Stability - 2-100 ppb levels stable for months in 1% HNO3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-2% HNO3 / LDPE container.

Sb Containing Samples (Preparation and Solution) -Metal and alloys (Soluble in H2O / HF / HNO3 mixture); Oxides (Soluble in HCl and tartaric acid or H2O / HF / HNO3 mixtures); Ores (fusion with Na2CO3 in Pt0 followed by dissolving the fuseate in a H2O / HF / HNO3 mixture); Organic based (sulfuric acid / hydrogen peroxide digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 121 amu	5 ppt	N/A	105Pd16O, 89Y16O2
ICP-OES 206.833 nm	0.03/0.003 µg/mL	1	Ta, Cr, Ge, Hf
ICP-OES 217.581 nm	0.05/0.005 µg/mL	1	Nb, W, Re, Fe
ICP-OES 231.147 nm	0.06/0.006 µg/mL	1	Ni, Co, Pt

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

April 30, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **April 30, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGSE10
Lot Number: P2-SE684206
Matrix: 3% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Selenium
Starting Material: Se Metal
Starting Material Lot#: 1962
Starting Material Purity: 99.9991%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9992 ± 61 µg/mL
Density: 1.035 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **9993 ± 67 µg/mL**
ICP Assay NIST SRM 3149 Lot Number: 100901

Assay Method #2 **9992 ± 73 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.002242	M Eu < 0.000373	O Na 0.013700	s Se <	O Zn 0.002382
M Al 0.004465	M Fe 0.008506	O Nb < 0.002975	O Si 0.006270	M Zr < 0.001868
O As < 0.022040	M Ga < 0.000373	M Nd < 0.000373	M Sm < 0.000373	
M Au < 0.000373	M Gd < 0.000373	O Ni 0.001849	M Sn 0.000850	
O B < 0.007714	M Ge < 0.002616	M Os < 0.000373	M Sr < 0.001121	
M Ba < 0.001495	M Hf < 0.000373	O P < 0.022040	M Ta < 0.000373	
M Be < 0.001495	M Hg < 0.002240	M Pb 0.006379	M Tb < 0.006353	
M Bi < 0.000373	M Ho < 0.000373	M Pd < 0.000373	M Te < 0.012707	
O Ca 0.006552	M In < 0.000373	M Pr < 0.001495	M Th < 0.002990	
M Cd 0.001169	M Ir < 0.000373	M Pt < 0.000373	M Ti < 0.003363	
M Ce < 0.000373	O K 0.002006	M Rb < 0.001868	M Tl 0.008613	
M Co < 0.000373	M La < 0.001121	M Re < 0.000373	M Tm < 0.000373	
M Cr 0.002870	O Li 0.000062	M Rh < 0.000373	M U < 0.000373	
M Cs < 0.001121	M Lu < 0.000373	M Ru < 0.001493	M V < 0.000747	
M Cu < 0.000747	O Mg 0.001159	O S 0.024674	M W < 0.002242	
M Dy < 0.000373	M Mn < 0.000373	M Sb < 0.002242	M Y < 0.000373	
M Er < 0.000373	O Mo < 0.003195	M Sc < 0.001121	M Yb < 0.000373	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 78.96 +4 6 H₂SeO₃

Chemical Compatibility -Soluble in HCl, HNO₃,H₃PO₄, H₂SO₄ and HF aqueous matrices and water. It is stable with most inorganic anions but many cationic metals form the insoluble selenites under pH neutral conditions. When fluorinated and/or under acidic conditions precipitation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Se Containing Samples (Preparation and Solution) -Metal (soluble in HNO₃); Oxides (readily soluble in water); Minerals and alloys (acid digestion with HNO₃or HNO₃ / HF); Organic Matrices (acid digestion with hot concentrated H₂SO₄ accompanied by the careful dropwise addition of H₂O₂ until clear).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 82 amu	200 ppt	N/A	12C35Cl2
ICP-OES 196.026 nm	0.08/0.006 µg/mL	1	Fe
ICP-OES 203.985 nm	0.2/0.05 µg/mL	1	Sb, Ir, Cr, Ta
ICP-OES 206.279 nm	0.3/0.16 µg/mL	1	Cr, Pt

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

September 13, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **September 13, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGTL10
Lot Number: R2-TL691937
Matrix: 5% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Thallium
Starting Material: TINO₃
Starting Material Lot#: 2118
Starting Material Purity: 99.9998%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 9987 ± 49 µg/mL
Density: 1.035 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **9968 ± 68 µg/mL**
ICP Assay NIST SRM 3158 Lot Number: 151215

Assay Method #2 **10001 ± 58 µg/mL**
Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char i}^2) / (\sum(1/u_{char j}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum((w_i)^2 (u_{char i})^2)]^{1/2}$ where $u_{char i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char a})$$

X_a = mean of Assay Method A with

$u_{char a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an UPLA-Filtered Clean Room. An UPLA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.000200	M Eu < 0.000200	O Na < 0.002479	M Se < 0.011019	O Zn < 0.002288
O Al < 0.004184	O Fe < 0.002824	M Nb < 0.000200	O Si < 0.003744	M Zr < 0.000200
M As < 0.002003	M Ga < 0.000200	M Nd < 0.000200	M Sm < 0.000200	
O Au < 0.002824	M Gd < 0.000200	M Ni < 0.001717	M Sn < 0.000601	
O B < 0.004184	M Ge < 0.000801	M Os < 0.000198	O Sr < 0.000313	
M Ba < 0.000400	M Hf < 0.000200	O P < 0.010460	M Ta < 0.000200	
O Be < 0.000104	M Hg < 0.000794	M Pb < 0.000807	M Tb < 0.000200	
M Bi < 0.005209	M Ho < 0.000200	M Pd < 0.000400	M Te < 0.005008	
O Ca < 0.002426	M In < 0.000200	M Pr < 0.000200	M Th < 0.000200	
M Cd < 0.001312	M Ir < 0.000198	M Pt < 0.000801	O Ti < 0.001255	
M Ce < 0.000200	O K < 0.006150	M Rb < 0.000200	s Tl <	
M Co < 0.000601	M La < 0.000200	M Re < 0.000200	M Tm < 0.000200	
M Cr < 0.000801	O Li < 0.000177	M Rh < 0.000200	M U < 0.000200	
M Cs < 0.003606	M Lu < 0.000200	M Ru < 0.000397	M V < 0.002203	
M Cu < 0.001001	O Mg < 0.000527	O S < 0.015690	M W < 0.000601	
M Dy < 0.000200	M Mn < 0.000801	M Sb < 0.000400	M Y < 0.000200	
M Er < 0.000200	M Mo < 0.001202	O Sc < 0.000711	M Yb < 0.000200	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 204.38 +1 6 TI(H₂O)₆¹⁺

Chemical Compatibility - Soluble in HCl, HNO₃, and H₂SO₄. Stable with most metals and inorganic anions. The sulfite, thiocyanate and oxalate are moderately soluble; the phosphate and arsenite are slightly soluble and the sulfide is insoluble.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO₃ / LDPE container.

Ti Containing Samples (Preparation and Solution) -Metal (Best dissolved in HNO₃ which forms chiefly the Ti¹⁺ ion.); Oxide (The thalious oxide is readily soluble in water. The thallic oxide requires high levels of acid); Ores (Carbonate fusion in PtO followed by HCl dissolution); Organic Matrices (Sulfuric/peroxide digestion or dry ash and dissolution in HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 205 amu	2 ppt	N/A	189Os 16O
ICP-OES 190.864 nm	0.04 / 0.004 µg/mL	1	V, Ti
ICP-OES 276.787 nm	0.1 / 0.01 µg/mL	1	Ta, V, Fe, Cr
ICP-OES 351.924 nm	0.2 / 0.02 µg/mL	1	Th, Ce, Zr

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

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11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

April 08, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **April 08, 2024**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
Catalog Number: CGV10
Lot Number: R2-V688296
Matrix: 7% (v/v) HNO₃
Value / Analyte(s): 10 000 µg/mL ea:
Vanadium
Starting Material: Vanadium pentoxide
Starting Material Lot#: 1782
Starting Material Purity: 99.9907%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10026 ± 30 µg/mL
Density: 1.105 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1 **10025 ± 56 µg/mL**
ICP Assay NIST SRM 3165 Lot Number: 160906

Assay Method #2 **10027 ± 30 µg/mL**
EDTA NIST SRM 928 Lot Number: 928

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ i}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{Its}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{Its} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.000510	M Eu < 0.000110	M Na < 0.095000	M Se < 0.002300	M Zn < 0.008900
O Al < 0.051000	O Fe < 0.350000	M Nb < 0.000710	O Si < 0.260000	M Zr < 0.002500
M As < 0.000410	M Ga < 0.007100	M Nd < 0.000210	M Sm < 0.000110	
M Au < 0.000410	M Gd < 0.000110	M Ni < 0.011000	M Sn < 0.003300	
M B < 0.006000	M Ge < 0.000110	M Os < 0.000410	M Sr < 0.001400	
M Ba < 0.001800	M Hf < 0.000110	O P < 0.120000	M Ta < 0.000110	
M Be < 0.000110	M Hg < 0.000310	M Pb < 0.002300	M Tb < 0.000110	
M Bi < 0.000610	M Ho < 0.000110	M Pd < 0.000610	M Te < 0.000610	
M Ca < 0.180000	M In < 0.000110	M Pr < 0.000110	M Th < 0.000210	
M Cd < 0.000410	M Ir < 0.000110	M Pt < 0.000410	M Ti < 0.021000	
M Ce < 0.000310	M K < 0.400000	M Rb < 0.000410	M Tl < 0.000110	
M Co < 0.001100	M La < 0.000110	M Re < 0.000110	M Tm < 0.000110	
O Cr < 0.190000	M Li < 0.001400	M Rh < 0.000110	M U < 0.000310	
M Cs < 0.005700	M Lu < 0.000110	M Ru < 0.000410	s V <	
M Cu < 0.001800	M Mg < 0.009200	n S <	M W < 0.003100	
M Dy < 0.000110	M Mn < 0.008700	M Sb < 0.076000	M Y < 0.000110	
M Er < 0.000110	M Mo < 0.086000	M Sc < 0.000310	M Yb < 0.000110	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.

- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.

- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 50.94 +5 6 H₂V₁₀O₂₈-

Chemical Compatibility -Soluble in HCl, HNO₃, H₂SO₄, HF, H₃PO₄ and strong basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

V Containing Samples (Preparation and Solution) -Metal (Fusion with NaOH or KOH in NiO or Na₂CO₃ / KNO₃); Oxides (V₂O₃ - use HCl, V₂O₄ - use HCl or HNO₃, V₂O₅ - use concentrated acids); Ores (Na₂CO₃ / KNO₃ in PtO caution - nitrates attack Pto followed by water extraction of fuseate); Organic Matrices (Ash at 450 EC followed by dissolving according to V₂O₅ above) .

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 51 amu	4 ppt	N/A	34S16O1H, 35Cl16O, 38Ar13C, 36Ar15N, 36Ar14N1H, 37Cl14N,36S15N, 33S18O, 34S17O, 102Ru+2,02Pd+2
ICP-OES 290.882 nm	0.008 / 0.0008 µg/mL	1	Hf, Nb
ICP-OES 292.402 nm	0.006 / 0.001 µg/mL	1	Th
ICP-OES 309.311 nm	0.005 / 0.001 µg/mL	1	Mg, U, Th

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

March 01, 2020

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- March 01, 2024

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director



1.0 ACCREDITATION / REGISTRATION

INORGANIC VENTURES is accredited to ISO 17034, "General Requirements for the Competence of Reference Material Producers" and ISO/IEC 17025, "General Requirements for the Competence of Testing and Calibration Laboratories". Inorganic Ventures is also an ISO 9001 registered manufacturer (QSR Certificate Number QSR-1034).



2.0 PRODUCT DESCRIPTION

Product Code: Single Analyte Custom Grade Solution
 Catalog Number: CGZN10
 Lot Number: P2-ZN686137
 Matrix: 2% (v/v) HNO₃
 Value / Analyte(s): 10 000 µg/mL ea:
 Zinc
 Starting Material: Zn Shot
 Starting Material Lot#: 2201
 Starting Material Purity: 99.9993%

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Value: 10040 ± 30 µg/mL
Density: 1.033 g/mL (measured at 20 ± 4 °C)

Assay Information:

Assay Method #1	10009 ± 54 µg/mL ICP Assay NIST SRM 3168a Lot Number: 120629
Assay Method #2	10049 ± 33 µg/mL EDTA NIST SRM 928 Lot Number: 928
Assay Method #3	10041 ± 28 µg/mL Calculated NIST SRM Lot Number: See Sec. 4.2

- The Calculated Value is a value calculated from the weight of a starting material that has been certified directly vs. a National Institute of Standards and Technology (NIST) SRM/RM. See Sec 4.2 for balance traceability.

The following equations are used in the calculation of the certified value and the uncertainty. Reported uncertainties represent expanded uncertainties expressed at approximately the 95% confidence level using a coverage factor of k = 2.

Characterization of CRM/RM by Two or More Methods

Certified Value, $X_{CRM/RM}$, where two or more methods of characterization are used is the weighted mean of the results:

$$X_{CRM/RM} = \sum(w_i)(X_i)$$

X_i = mean of Assay Method i with standard uncertainty $u_{char\ i}$

w_i = the weighting factors for each method calculated using the inverse square of the variance:

$$w_i = (1/u_{char\ i}^2) / (\sum(1/u_{char\ i}^2))$$

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char} = [\sum(w_i)^2 (u_{char\ i})^2]^{1/2}$ where $u_{char\ i}$ are the errors from each characterization method

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

Characterization of CRM/RM by One Method

Certified Value, $X_{CRM/RM}$, where one method of characterization is used is the mean of individual results:

$$X_{CRM/RM} = (X_a) (u_{char\ a})$$

X_a = mean of Assay Method A with

$u_{char\ a}$ = the standard uncertainty of characterization Method A

$$CRM/RM \text{ Expanded Uncertainty } (\pm) = U_{CRM/RM} = k (u_{char\ a}^2 + u_{bb}^2 + u_{lts}^2 + u_{ts}^2)^{1/2}$$

k = coverage factor = 2

$u_{char\ a}$ = the errors from characterization

u_{bb} = bottle to bottle homogeneity standard uncertainty

u_{lts} = long term stability standard uncertainty (storage)

u_{ts} = transport stability standard uncertainty

4.0 TRACEABILITY TO NIST

- This product is traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM/RM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRM/RM are available, the term 'in-house std.' is specified.

4.1 Thermometer Calibration

- All thermometers are NIST traceable through thermometers that are calibrated by an accredited calibration laboratory.

4.2 Balance Calibration

- All analytical balances are calibrated by an accredited calibration laboratory and procedure. The weights used for testing are annually compared to master weights and are traceable to NIST.

4.3 Glassware Calibration

- An in-house procedure is used to calibrate all Class A glassware used in the manufacturing and quality control of CRM/RMs.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP-MS AND ICP-OES (µg/mL)

CRM/RMs are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M Ag < 0.003057	M Eu < 0.000509	O Na < 0.001874	M Se < 0.023441	s Zn <
O Al < 0.005720	O Fe < 0.006348	M Nb < 0.000509	O Si < 0.057200	M Zr < 0.000509
M As < 0.003057	M Ga < 0.007134	M Nd < 0.000509	M Sm < 0.000509	
M Au < 0.000510	M Gd < 0.000509	M Ni < 0.000509	M Sn < 0.000509	
O B < 0.017160	M Ge < 0.003057	M Os < 0.000510	M Sr < 0.000509	
M Ba < 0.000509	M Hf < 0.000509	O P < 0.057200	M Ta < 0.000509	
M Be < 0.000509	M Hg < 0.001021	O Pb < 0.023870	M Tb < 0.000509	
M Bi < 0.005095	M Ho < 0.000509	M Pd < 0.002038	M Te < 0.023441	
O Ca < 0.033793	M In < 0.000509	M Pr < 0.000509	M Th < 0.000509	
O Cd < 0.003924	M Ir < 0.000510	M Pt < 0.000509	M Ti < 0.000509	
M Ce < 0.000509	O K < 0.001499	M Rb < 0.002038	M Tl < 0.009172	
M Co < 0.000509	M La < 0.000509	M Re < 0.000509	M Tm < 0.000509	
O Cr < 0.001549	O Li < 0.000457	M Rh < 0.000509	M U < 0.000509	
M Cs < 0.000509	M Lu < 0.000509	M Ru < 0.006129	M V < 0.000509	
O Cu < 0.010296	O Mg < 0.000349	O S < 0.034320	M W < 0.001019	
M Dy < 0.000509	M Mn < 0.000509	M Sb < 0.001019	M Y < 0.000509	
M Er < 0.000509	M Mo < 0.000509	M Sc < 0.000509	M Yb < 0.000509	

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference
n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

- For the calibration of analytical instruments and validation of analytical methods as appropriate.

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

7.1 Storage and Handling Recommendations

- Store between approximately 4° - 30° C while in sealed TCT bag.
- While stored in the sealed TCT bag, transpiration of this CRM/RM is negligible. After opening the sealed TCT bag transpiration of the CRM/RM will occur, resulting in a gradual increase in the analyte concentration(s). It is the responsibility of the user to account for this effect. When the bottle is weighed both before and after being placed in storage, the mass difference observed will be a measure of transpiration mass loss.
- After opening the sealed TCT bag, keep cap tightly sealed when not in use and store between 4° - 24° C to minimize the effects of transpiration. Use at 20° ± 4° C to minimize volumetric dilution error when using the reported density. Do not pipette from the container. Do not return removed aliquots to container.

- For more information, visit www.inorganicventures.com/TCT

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 65.39 +2 4 Zn(OH)(aq)1+

Chemical Compatibility -Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media forming insoluble carbonate and hydroxide. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Zn Containing Samples (Preparation and Solution) -Metal (soluble in HNO₃); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO₃); Organic based (dry ash at 4500C and dissolve ash in HCl) (sulfuric/peroxide acid digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Interferences (underlined indicates severe)
ICP-MS 66 amu	7 ppt	N/A	50Ti16O,50Cr16O, 50V16O, 34S16O2, 32S16O18O, 32S17O2, 33S16O17O, 32S34S, 33S2
ICP-OES 202.548 nm	0.004/0.0002 µg/mL	1	Nb, Cu, Co, Hf
ICP-OES 206.200 nm	0.006/0.0006 µg/mL	1	Sb, Ta, Bi, Os
ICP-OES 213.856 nm	0.002/0.0004 µg/mL	1	Ni, Cu, V

8.0 HAZARDOUS INFORMATION

- Please refer to the Safety Data Sheet for information regarding this CRM/RM.

9.0 HOMOGENEITY

- This solution was mixed according to an in-house procedure and is guaranteed to be homogeneous. Homogeneity data indicate that the end user should take a minimum sample size of 0.2 mL to assure homogeneity.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001 Quality Management System Registration

- QSR Certificate Number QSR-1034

10.2 ISO/IEC 17025 "General Requirements for the Competence of Testing and Calibration Laboratories"

- Chemical Testing - Accredited / A2LA Certificate Number 883.01

10.3 ISO 17034 "General Requirements for the Competence of Reference Material Producers"

- Reference Material Producer - Accredited / A2LA Certificate Number 883.02

Inorganic Ventures, 300 Technology Drive, Christiansburg, Va. 24073, USA; Telephone: 800.669.6799; 540.585.3030, Fax: 540.585.3012; inorganicventures.com; info@inorganicventures.com

11.0 CERTIFICATION, LOT EXPIRATION AND PERIOD OF VALIDITY

11.1 Certification Issue Date

December 05, 2019

- The certification is valid within the measurement uncertainty specified provided the CRM/RM is stored and handled in accordance with instructions given in Sec 7.1. This certification is nullified if instructions in Sec 7.1 are not followed or if the CRM/RM is damaged, contaminated, or otherwise modified.

11.2 Lot Expiration Date

- **December 05, 2023**

- The date after which this CRM/RM should not be used.

- The lot expiration date reflects the period of time that the stability of a CRM/RM can be supported by long term stability studies conducted on properly stored and handled CRM/RMs. Lot expiration is limited primarily by transpiration (loss of water from the solution) and infrequently by chemical stability.

11.3 Period of Validity

- Sealed TCT Bag Open Date: _____

- This CRM/RM should not be used longer than one year (or six months in the case of a 30 mL bottle) from the date of opening the aluminized bag or after the date given in Sec. 11.2, whichever comes first. This is contingent upon the CRM/RM being stored and handled in accordance with the instructions given in Sec. 7.1.

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Approved By:

Michael Booth
Manager, Quality Control



Certifying Officer:

Paul Gaines
CEO, Senior Technical Director





Form I
INORGANIC ANALYSIS DATA SHEET
EPA 353.2

MW-28_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-01 SDG: 21I0294
Sampled: 09/20/21 10:10 Prepared: 09/22/21 09:07 File ID:
% Solids: 0.00 Preparation: [CALC] Analyzed: 09/22/21 13:08
Batch: [CALC] Sequence: Initial/Final: 1 / 1
Instrument: [CALC] Calibration:

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
14797-55-8	Nitrate-N	<2.00	100	2.00	2.00	U



Form I
INORGANIC ANALYSIS DATA SHEET
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MW-28_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-01 A SDG: 21I0294

Sampled: 09/20/21 10:10 Prepared: 09/22/21 09:07 File ID: 092221NO2NO3A-091

% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 09/22/21 13:08

Batch: BJI0609 Sequence: SJI0355 Initial/Final: 10 mL / 10 mL

Instrument: LACHAT2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
	Nitrate + Nitrite as N	<1.00	100	1.00	1.00	H, U
14797-65-0	Nitrite-N	<1.00	100	1.00	1.00	H, U



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 353.2

MW-24_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-03 SDG: 21I0294

Sampled: 09/20/21 11:11 Prepared: 09/22/21 09:07 File ID:

% Solids: 0.00 Preparation: [CALC] Analyzed: 09/22/21 13:19

Batch: [CALC] Sequence: Initial/Final: 1 / 1

Instrument: [CALC] Calibration:

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
14797-55-8	Nitrate-N	<2.00	100	2.00	2.00	U



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 353.2

MW-24_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-03 A SDG: 21I0294

Sampled: 09/20/21 11:11 Prepared: 09/22/21 09:07 File ID: 092221NO2NO3A-103

% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 09/22/21 13:19

Batch: BJI0609 Sequence: SJI0355 Initial/Final: 10 mL / 10 mL

Instrument: LACHAT2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
	Nitrate + Nitrite as N	1.70	100	1.00	1.00	H, D
14797-65-0	Nitrite-N	1.62	100	1.00	1.00	H, D



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 353.2

MW-60_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-05 SDG: 21I0294
Sampled: 09/20/21 11:30 Prepared: 09/22/21 09:07 File ID:
% Solids: 0.00 Preparation: [CALC] Analyzed: 09/22/21 12:23
Batch: [CALC] Sequence: Initial/Final: 1 / 1
Instrument: [CALC] Calibration:

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
14797-55-8	Nitrate-N	<0.0200	1	0.0200	0.0200	U



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 353.2

MW-60_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-05 A SDG: 21I0294

Sampled: 09/20/21 11:30 Prepared: 09/22/21 09:07 File ID: 092221NO2NO3A-039

% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 09/22/21 12:23

Batch: BJI0609 Sequence: SJI0355 Initial/Final: 10 mL / 10 mL

Instrument: LACHAT2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
	Nitrate + Nitrite as N	<0.010	1	0.010	0.010	H, U
14797-65-0	Nitrite-N	<0.010	1	0.010	0.010	H, U



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 353.2

MW-55_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-07 SDG: 21I0294
Sampled: 09/20/21 12:29 Prepared: 09/22/21 09:07 File ID:
% Solids: 0.00 Preparation: [CALC] Analyzed: 09/22/21 12:34
Batch: [CALC] Sequence: Initial/Final: 1 / 1
Instrument: [CALC] Calibration:

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
14797-55-8	Nitrate-N	0.0895	5	0.0600	0.0600	



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 353.2

MW-55_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-07 A SDG: 21I0294

Sampled: 09/20/21 12:29 Prepared: 09/22/21 09:07 File ID: 092221NO2NO3A-042

% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 09/22/21 12:24

Batch: BJI0609 Sequence: SJI0355 Initial/Final: 10 mL / 10 mL

Instrument: LACHAT2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
14797-65-0	Nitrite-N	<0.010	1	0.010	0.010	U



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 353.2

MW-55_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-07RE1 A SDG: 21I0294

Sampled: 09/20/21 12:29 Prepared: 09/22/21 09:07 File ID: 092221NO2NO3A-053

% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 09/22/21 12:34

Batch: BJI0609 Sequence: SJI0355 Initial/Final: 10 mL / 10 mL

Instrument: LACHAT2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
	Nitrate + Nitrite as N	0.090	5	0.050	0.050	H, D



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 353.2

MW-42_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-09 SDG: 21I0294
Sampled: 09/20/21 12:35 Prepared: 09/22/21 09:07 File ID:
% Solids: 0.00 Preparation: [CALC] Analyzed: 09/22/21 12:25
Batch: [CALC] Sequence: Initial/Final: 1 / 1
Instrument: [CALC] Calibration:

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
14797-55-8	Nitrate-N	0.105	1	0.0200	0.0200	



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 353.2

MW-42_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-09 A SDG: 21I0294

Sampled: 09/20/21 12:35 Prepared: 09/22/21 09:07 File ID: 092221NO2NO3A-043

% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 09/22/21 12:25

Batch: BJI0609 Sequence: SJI0355 Initial/Final: 10 mL / 10 mL

Instrument: LACHAT2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
	Nitrate + Nitrite as N	0.105	1	0.010	0.010	
14797-65-0	Nitrite-N	<0.010	1	0.010	0.010	U



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 353.2

MW-54_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-11 SDG: 21I0294

Sampled: 09/20/21 13:54 Prepared: 09/22/21 09:07 File ID:

% Solids: 0.00 Preparation: [CALC] Analyzed: 09/22/21 12:26

Batch: [CALC] Sequence: Initial/Final: 1 / 1

Instrument: [CALC] Calibration:

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
14797-55-8	Nitrate-N	<0.0200	1	0.0200	0.0200	U



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 353.2

MW-54_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-11 A SDG: 21I0294

Sampled: 09/20/21 13:54 Prepared: 09/22/21 09:07 File ID: 092221NO2NO3A-045

% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 09/22/21 12:26

Batch: BJI0609 Sequence: SJI0355 Initial/Final: 10 mL / 10 mL

Instrument: LACHAT2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
	Nitrate + Nitrite as N	0.014	1	0.010	0.010	
14797-65-0	Nitrite-N	<0.010	1	0.010	0.010	U



PREPARATION BATCH SUMMARY

EPA 353.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Batch: BJI0609

Batch Matrix: Water

Preparation: No Prep Wet Chem

SAMPLE NAME	LAB SAMPLE ID	LAB FILE ID	DATE PREPARED	OBSERVATIONS
MW-28_092021	21I0294-01	092221NO2NO3A-092	09/22/21 09:07	
MW-28_092021	21I0294-01	092221NO2NO3A-091	09/22/21 09:07	
MW-24_092021	21I0294-03	092221NO2NO3A-104	09/22/21 09:07	
MW-24_092021	21I0294-03	092221NO2NO3A-103	09/22/21 09:07	
MW-60_092021	21I0294-05	092221NO2NO3A-039	09/22/21 09:07	
MW-60_092021	21I0294-05	092221NO2NO3A-040	09/22/21 09:07	
MW-55_092021	21I0294-07	092221NO2NO3A-042	09/22/21 09:07	
MW-55_092021	21I0294-07RE1	092221NO2NO3A-053	09/22/21 09:07	Added 9/22/2021 by RMS
MW-42_092021	21I0294-09	092221NO2NO3A-044	09/22/21 09:07	
MW-42_092021	21I0294-09	092221NO2NO3A-043	09/22/21 09:07	
MW-54_092021	21I0294-11	092221NO2NO3A-045	09/22/21 09:07	
MW-54_092021	21I0294-11	092221NO2NO3A-046	09/22/21 09:07	
Blank	BJI0609-BLK1	092221NO2NO3A-066	09/22/21 09:07	
Blank	BJI0609-BLK1	092221NO2NO3A-065	09/22/21 09:07	
LCS	BJI0609-BS1	092221NO2NO3A-067	09/22/21 09:07	
LCS	BJI0609-BS2	092221NO2NO3A-070	09/22/21 09:07	
MW-28_092021	BJI0609-DUP1	092221NO2NO3A-093	09/22/21 09:07	
MW-28_092021	BJI0609-DUP1	092221NO2NO3A-094	09/22/21 09:07	
MRL Check	BJI0609-MRL1	092221NO2NO3A-055	09/22/21 09:07	
MRL Check	BJI0609-MRL2	092221NO2NO3A-058	09/22/21 09:07	
MW-28_092021	BJI0609-MS1	092221NO2NO3A-095	09/22/21 09:07	
MW-28_092021	BJI0609-MS2	092221NO2NO3A-100	09/22/21 09:07	
MW-28_092021	BJI0609-MSD1	092221NO2NO3A-097	09/22/21 09:07	
MW-28_092021	BJI0609-MSD2	092221NO2NO3A-102	09/22/21 09:07	



Form I
METHOD BLANK DATA SHEET
EPA 353.2
TotalAnalytes

Blank

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Batch: BJI0609

Laboratory ID: BJI0609-BLK1

Prepared: 09/22/21 09:07

Matrix: Water

Preparation: No Prep Wet Chem

Analyzed: 09/22/21 12:46

Sequence: SJI0355

Calibration: N/A

Instrument: LACHAT2

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
	Nitrate + Nitrite as N	ND	1	0.010	0.010	U
14797-65-0	Nitrite-N	ND	1	0.010	0.010	U



LCS / LCS DUPLICATE RECOVERY
EPA 353.2

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>09/22/21 12:47</u>
Batch:	<u>BJI0609</u>	Laboratory ID:	<u>BJI0609-BS1</u>
Preparation:	<u>No Prep Wet Chem</u>	Sequence Name:	<u>LCS</u>
Initial/Final:	<u>10 mL / 10 mL</u>		

COMPOUND	SPIKE ADDED (mg/L)	LCS CONCENTRATION (mg/L)	Q	LCS % REC. #	QC LIMITS REC.
Nitrate + Nitrite as N	0.500	0.549		110	90 - 110

* Indicates values outside of QC limits



DUPLICATES

EPA 353.2

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: BJI0609-DUP1

Batch: BJI0609

Lab Source ID: 2110294-01

Preparation: No Prep Wet Chem

Initial/Final: 10 mL / 10 mL

Source Sample Name: MW-28_092021

% Solids:

ANALYTE	CONTROL LIMIT	SAMPLE CONCENTRATION (mg/L)	C	DUPLICATE CONCENTRATION (mg/L)	C	RPD %	Q
Nitrate + Nitrite as N	20	ND	H, U	ND	H, U		
Nitrite-N	20	ND	H, U	ND	H, U		

*: Values outside of QC limits

L: Analyte concentration is <=5 times the reporting limit and the replicate control limit defaults to Dup = +/-RL instead of 20% RPD



MS / MS DUPLICATE RECOVERY
EPA 353.2

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>09/22/21 13:12</u>
Batch:	<u>BJI0609</u>	Laboratory ID:	<u>BJI0609-MS1</u>
Preparation:	<u>No Prep Wet Chem</u>	Sequence Name:	<u>Matrix Spike</u>
Initial/Final:	<u>5 mL / 5 mL</u>	Source Sample:	<u>MW-28_092021</u>

COMPOUND	SPIKE ADDED (mg/L)	SAMPLE CONCENTRATION (mg/L)	Q	MS CONCENTRATION (mg/L)	Q	MS % REC. #	QC LIMITS REC.
Nitrate + Nitrite as N	100	ND	H, U	111	E, H, D	111	75 - 125

* Values outside of QC limits



MS / MS DUPLICATE RECOVERY
EPA 353.2

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>09/22/21 13:13</u>
Batch:	<u>BJI0609</u>	Laboratory ID:	<u>BJI0609-MSD1</u>
Preparation:	<u>No Prep Wet Chem</u>	Sequence Name:	<u>Matrix Spike Dup</u>
Initial/Final:	<u>5 mL / 5 mL</u>	Source Sample:	<u>MW-28_092021</u>

COMPOUND	SPIKE ADDED (mg/L)	MSD CONCENTRATION (mg/L)	Q	MSD % REC. #	% RPD #	QC LIMITS	
						RPD	REC.
Nitrate + Nitrite as N	100	111	E, H, D	111	0.00	20	75 - 125

* Values outside of QC limits



MS / MS DUPLICATE RECOVERY
EPA 353.2

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>09/22/21 13:14</u>
Batch:	<u>BJI0609</u>	Laboratory ID:	<u>BJI0609-MS2</u>
Preparation:	<u>No Prep Wet Chem</u>	Sequence Name:	<u>Matrix Spike</u>
Initial/Final:	<u>5 mL / 5 mL</u>	Source Sample:	<u>MW-28_092021</u>

COMPOUND	SPIKE ADDED (mg/L)	SAMPLE CONCENTRATION (mg/L)	Q	MS CONCENTRATION (mg/L)	Q	MS % REC. #	QC LIMITS REC.
Nitrite-N	100	ND	H, U	100	E, H, D	100	75 - 125

* Values outside of QC limits



MS / MS DUPLICATE RECOVERY
EPA 353.2

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>09/22/21 13:17</u>
Batch:	<u>BJI0609</u>	Laboratory ID:	<u>BJI0609-MSD2</u>
Preparation:	<u>No Prep Wet Chem</u>	Sequence Name:	<u>Matrix Spike Dup</u>
Initial/Final:	<u>5 mL / 5 mL</u>	Source Sample:	<u>MW-28_092021</u>

COMPOUND	SPIKE ADDED (mg/L)	MSD CONCENTRATION (mg/L)	Q	MSD % REC. #	% RPD #	QC LIMITS	
						RPD	REC.
Nitrite-N	100	82.2	H, D	82.2	19.5	200	75 - 125

* Values outside of QC limits



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 353.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0355

Instrument: LACHAT2

Calibration: UNASSIGNED

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Cal Standard	SJI0355-CAL1	092221NO2NO3A-001	NA	09/22/21 11:55
Cal Standard	SJI0355-CAL2	092221NO2NO3A-003	NA	09/22/21 11:56
Cal Standard	SJI0355-CAL3	092221NO2NO3A-005	NA	09/22/21 11:58
Cal Standard	SJI0355-CAL4	092221NO2NO3A-007	NA	09/22/21 11:59
Cal Standard	SJI0355-CAL5	092221NO2NO3A-009	NA	09/22/21 12:00
Cal Standard	SJI0355-CAL6	092221NO2NO3A-011	NA	09/22/21 12:01
Cal Standard	SJI0355-CAL7	092221NO2NO3A-013	NA	09/22/21 12:02
Cal Standard	SJI0355-CAL8	092221NO2NO3A-015	NA	09/22/21 12:04
Cal Standard	SJI0355-CAL9	092221NO2NO3A-018	NA	09/22/21 12:05
Cal Standard	SJI0355-CALA	092221NO2NO3A-020	NA	09/22/21 12:06
Cal Standard	SJI0355-CALB	092221NO2NO3A-022	NA	09/22/21 12:07
Cal Standard	SJI0355-CALC	092221NO2NO3A-024	NA	09/22/21 12:08
Cal Standard	SJI0355-CALD	092221NO2NO3A-026	NA	09/22/21 12:10
Cal Standard	SJI0355-CALE	092221NO2NO3A-028	NA	09/22/21 12:11
Cal Standard	SJI0355-CALF	092221NO2NO3A-030	NA	09/22/21 12:12
Cal Standard	SJI0355-CALG	092221NO2NO3A-032	NA	09/22/21 12:13
Initial Cal Check	SJI0355-ICV1	092221NO2NO3A-033	NA	09/22/21 12:14
Initial Cal Check	SJI0355-ICV2	092221NO2NO3A-036	NA	09/22/21 12:17
Initial Cal Blank	SJI0355-ICB1	092221NO2NO3A-037	NA	09/22/21 12:20
Initial Cal Blank	SJI0355-ICB1	092221NO2NO3A-038	NA	09/22/21 12:20
MW-60_092021	21I0294-05	092221NO2NO3A-039	Water	09/22/21 12:23
MW-60_092021	21I0294-05	092221NO2NO3A-040	Water	09/22/21 12:23
MW-55_092021	21I0294-07	092221NO2NO3A-042	Water	09/22/21 12:24
MW-42_092021	21I0294-09	092221NO2NO3A-043	Water	09/22/21 12:25
MW-42_092021	21I0294-09	092221NO2NO3A-044	Water	09/22/21 12:25
MW-54_092021	21I0294-11	092221NO2NO3A-045	Water	09/22/21 12:26
MW-54_092021	21I0294-11	092221NO2NO3A-046	Water	09/22/21 12:26
MW-55_092021	21I0294-07RE1	092221NO2NO3A-053	Water	09/22/21 12:34
MRL Check	BJI0609-MRL1	092221NO2NO3A-055	Water	09/22/21 12:36



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 353.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0355

Instrument: LACHAT2

Calibration: UNASSIGNED

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
MRL Check	BJI0609-MRL2	092221NO2NO3A-058	Water	09/22/21 12:37
Calibration Check	SJI0355-CCV1	092221NO2NO3A-059	NA	09/22/21 12:38
Calibration Check	SJI0355-CCV2	092221NO2NO3A-062	NA	09/22/21 12:41
Calibration Blank	SJI0355-CCB1	092221NO2NO3A-063	NA	09/22/21 12:44
Calibration Blank	SJI0355-CCB1	092221NO2NO3A-064	NA	09/22/21 12:44
Blank	BJI0609-BLK1	092221NO2NO3A-065	Water	09/22/21 12:46
Blank	BJI0609-BLK1	092221NO2NO3A-066	Water	09/22/21 12:46
LCS	BJI0609-BS1	092221NO2NO3A-067	Water	09/22/21 12:47
LCS	BJI0609-BS2	092221NO2NO3A-070	Water	09/22/21 12:49
Calibration Check	SJI0355-CCV3	092221NO2NO3A-085	NA	09/22/21 12:58
Calibration Check	SJI0355-CCV4	092221NO2NO3A-088	NA	09/22/21 13:01
Calibration Blank	SJI0355-CCB2	092221NO2NO3A-090	NA	09/22/21 13:04
Calibration Blank	SJI0355-CCB2	092221NO2NO3A-089	NA	09/22/21 13:04
MW-28_092021	21I0294-01	092221NO2NO3A-091	Water	09/22/21 13:08
MW-28_092021	21I0294-01	092221NO2NO3A-092	Water	09/22/21 13:08
MW-28_092021	BJI0609-DUP1	092221NO2NO3A-093	Water	09/22/21 13:10
MW-28_092021	BJI0609-DUP1	092221NO2NO3A-093	Water	09/22/21 13:10
MW-28_092021	BJI0609-DUP1	092221NO2NO3A-094	Water	09/22/21 13:10
MW-28_092021	BJI0609-DUP1	092221NO2NO3A-094	Water	09/22/21 13:10
MW-28_092021	BJI0609-MS1	092221NO2NO3A-095	Water	09/22/21 13:12
MW-28_092021	BJI0609-MS1	092221NO2NO3A-095	Water	09/22/21 13:12
MW-28_092021	BJI0609-MSD1	092221NO2NO3A-097	Water	09/22/21 13:13
MW-28_092021	BJI0609-MSD1	092221NO2NO3A-097	Water	09/22/21 13:13
MW-28_092021	BJI0609-MS2	092221NO2NO3A-100	Water	09/22/21 13:14
MW-28_092021	BJI0609-MS2	092221NO2NO3A-100	Water	09/22/21 13:14
MW-28_092021	BJI0609-MSD2	092221NO2NO3A-102	Water	09/22/21 13:17
MW-28_092021	BJI0609-MSD2	092221NO2NO3A-102	Water	09/22/21 13:17
MW-24_092021	21I0294-03	092221NO2NO3A-103	Water	09/22/21 13:19
MW-24_092021	21I0294-03	092221NO2NO3A-104	Water	09/22/21 13:19



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 353.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0355

Instrument: LACHAT2

Calibration: UNASSIGNED

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Calibration Check	SJI0355-CCV5	092221NO2NO3A-111	NA	09/22/21 13:29
Calibration Check	SJI0355-CCV6	092221NO2NO3A-114	NA	09/22/21 13:32
Calibration Blank	SJI0355-CCB3	092221NO2NO3A-115	NA	09/22/21 13:35
Calibration Blank	SJI0355-CCB3	092221NO2NO3A-116	NA	09/22/21 13:35
Calibration Check	SJI0355-CCV7	092221NO2NO3A-135	NA	09/22/21 13:53
Calibration Check	SJI0355-CCV8	092221NO2NO3A-138	NA	09/22/21 13:56
Calibration Blank	SJI0355-CCB4	092221NO2NO3A-140	NA	09/22/21 13:58
Calibration Blank	SJI0355-CCB4	092221NO2NO3A-139	NA	09/22/21 13:58



INSTRUMENT BLANKS EPA 353.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: LACHAT2

Calibration: UNASSIGNED

Sequence: SJI0355

Date Analyzed: 09/22/21 12:20

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJI0355-ICB1	Nitrite-N	0.004	0.01	0.010	mg-N/L	
SJI0355-ICB1	Nitrate + Nitrite as N	0.001	0.01	0.010	mg-N/L	
SJI0355-CCB1	Nitrite-N	0.005	0.01	0.010	mg-N/L	
SJI0355-CCB1	Nitrate + Nitrite as N	0.002	0.01	0.010	mg-N/L	
SJI0355-CCB2	Nitrite-N	0.004	0.01	0.010	mg-N/L	
SJI0355-CCB2	Nitrate + Nitrite as N	0.002	0.01	0.010	mg-N/L	
SJI0355-CCB3	Nitrite-N	0.004	0.01	0.010	mg-N/L	
SJI0355-CCB3	Nitrate + Nitrite as N	0.002	0.01	0.010	mg-N/L	
SJI0355-CCB4	Nitrite-N	0.005	0.01	0.010	mg-N/L	
SJI0355-CCB4	Nitrate + Nitrite as N	0.002	0.01	0.010	mg-N/L	



**INITIAL AND CONTINUING
CALIBRATION CHECK**
EPA 353.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: LACHAT2

Calibration: UNASSIGNED

Control Limit: +/- 10.00%

Sequence: SJI0355

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SJI0355-ICV1	Nitrate + Nitrite as N	0.50000	0.531	106	mg-N/L	EPA 353.2
SJI0355-ICV2	Nitrite-N	0.50000	0.482	96.4	mg-N/L	EPA 353.2
SJI0355-CCV1	Nitrate + Nitrite as N	0.50000	0.549	110	mg-N/L	EPA 353.2
SJI0355-CCV2	Nitrite-N	0.50000	0.491	98.2	mg-N/L	EPA 353.2
SJI0355-CCV3	Nitrate + Nitrite as N	0.50000	0.547	109	mg-N/L	EPA 353.2
SJI0355-CCV4	Nitrite-N	0.50000	0.486	97.2	mg-N/L	EPA 353.2
SJI0355-CCV5	Nitrate + Nitrite as N	0.50000	0.543	109	mg-N/L	EPA 353.2
SJI0355-CCV6	Nitrite-N	0.50000	0.487	97.4	mg-N/L	EPA 353.2
SJI0355-CCV7	Nitrate + Nitrite as N	0.50000	0.542	108	mg-N/L	EPA 353.2
SJI0355-CCV8	Nitrite-N	0.50000	0.487	97.4	mg-N/L	EPA 353.2

* Values outside of QC limits



HOLDING TIME SUMMARY

Analysis: EPA 353.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sample Name	Date Collected	Date Received	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
MW-28_092021 21I0294-01	09/20/21 10:10	09/21/21 15:38	09/22/21 09:07	1	2	09/22/21 13:08			
MW-28_092021 21I0294-01	09/20/21 10:10	09/21/21 15:38	09/22/21 09:07	1	2	09/22/21 13:08	2	2	*
MW-28_092021 21I0294-01	09/20/21 10:10	09/21/21 15:38	09/22/21 09:07	1	28	09/22/21 13:08	2	28	
MW-24_092021 21I0294-03	09/20/21 11:11	09/21/21 15:38	09/22/21 09:07	1	2	09/22/21 13:19			
MW-24_092021 21I0294-03	09/20/21 11:11	09/21/21 15:38	09/22/21 09:07	1	28	09/22/21 13:19	2	28	
MW-24_092021 21I0294-03	09/20/21 11:11	09/21/21 15:38	09/22/21 09:07	1	2	09/22/21 13:19	2	2	*
MW-60_092021 21I0294-05	09/20/21 11:30	09/21/21 15:38	09/22/21 09:07	1	2	09/22/21 12:23	2	2	*
MW-60_092021 21I0294-05	09/20/21 11:30	09/21/21 15:38	09/22/21 09:07	1	28	09/22/21 12:23	2	28	
MW-60_092021 21I0294-05	09/20/21 11:30	09/21/21 15:38	09/22/21 09:07	1	2	09/22/21 12:23			
MW-55_092021 21I0294-07	09/20/21 12:29	09/21/21 15:38	09/22/21 09:07	1	2	09/22/21 12:24	2	2	
MW-55_092021 21I0294-07	09/20/21 12:29	09/21/21 15:38	09/22/21 09:07	1	2	09/22/21 12:34			
MW-55_092021 21I0294-07RE1	09/20/21 12:29	09/21/21 15:38	09/22/21 09:07	1	28	09/22/21 12:34	2	28	
MW-42_092021 21I0294-09	09/20/21 12:35	09/21/21 15:38	09/22/21 09:07	1	2	09/22/21 12:25	2	2	
MW-42_092021 21I0294-09	09/20/21 12:35	09/21/21 15:38	09/22/21 09:07	1	2	09/22/21 12:25			
MW-42_092021 21I0294-09	09/20/21 12:35	09/21/21 15:38	09/22/21 09:07	1	28	09/22/21 12:25	2	28	
MW-54_092021 21I0294-11	09/20/21 13:54	09/21/21 15:38	09/22/21 09:07	1	2	09/22/21 12:26	2	2	
MW-54_092021 21I0294-11	09/20/21 13:54	09/21/21 15:38	09/22/21 09:07	1	28	09/22/21 12:26	2	28	
MW-54_092021 21I0294-11	09/20/21 13:54	09/21/21 15:38	09/22/21 09:07	1	2	09/22/21 12:26			
Duplicate BJI0609-DUP1	09/20/21 10:10	09/21/21 15:38	09/22/21 09:07	1	28	09/22/21 13:10	2	28	
Duplicate BJI0609-DUP1	09/20/21 10:10	09/21/21 15:38	09/22/21 09:07	1	2	09/22/21 13:10	2	2	*
Matrix Spike BJI0609-MS1	09/20/21 10:10	09/21/21 15:38	09/22/21 09:07	1	28	09/22/21 13:12	2	28	
Matrix Spike BJI0609-MS2	09/20/21 10:10	09/21/21 15:38	09/22/21 09:07	1	2	09/22/21 13:14	2	2	*



HOLDING TIME SUMMARY

Analysis: EPA 353.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sample Name	Date Collected	Date Received	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
Matrix Spike Dup BJI0609-MSD1	09/20/21 10:10	09/21/21 15:38	09/22/21 09:07	1	28	09/22/21 13:13	2	28	
Matrix Spike Dup BJI0609-MSD2	09/20/21 10:10	09/21/21 15:38	09/22/21 09:07	1	2	09/22/21 13:17	2	2	*

* Indicates hold time exceedance.



Analytical Resources, Incorporated
Analytical Chemists and Consultants

METHOD DETECTION AND REPORTING LIMITS

EPA 353.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Instrument: LACHAT2

Analyte	MDL	RL	Units
Nitrate + Nitrite as N	0.010	0.010	mg/L
Nitrite-N	0.010	0.010	mg/L



1 Reagent Lane
Fair Lawn, NJ 07410
201.796.7100 tel
201.796.1329 fax

Certificate of Analysis

Fisher Scientific's Quality System has been found to conform to Quality Management System Standard ISO9001:2008 standard by SAI Global Certificate Number CERT - 0064970

This is to certify that units of the above mentioned lot number were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Certain products (USP/FCC/NF/EP/BP/JP grades) are sold for use in food, drug, or medical device manufacturing. Fisher does not claim regulatory coverage under 21 CFR nor maintain DMF's with the FDA. The following are the actual analytical results obtained:

Catalog Number	S343	Quality Test / Release Date 12/18/2013	
Lot Number	138231		
Description	SODIUM NITRATE, A.C.S.		
Country of Origin	Mexico	* Suggested Retest Date	Dec-2018
Chemical Origin	Inorganic-non animal		
BSE/TSE Comment	No animal products are used as starting raw material ingredients, or used in processing, including lubricants, processing aids, or any other material that might migrate to the finished product.		

Result name	Units	Specifications	Test Value
APPEARANCE		REPORT	White crystals
ASSAY	%	>= 99	99.4
CALCIUM	%	<= 0.005	0.003
CHLORIDE	%	<= 0.001	<0.0010
HEAVY METALS (as Pb)	ppm	<= 5	<5.0
IDENTIFICATION	PASS/FAIL	= PASS TEST	PASS TEST
INSOLUBLE MATTER	%	<= 0.005	0.003
IODATE	ppm	<= 5	<5.0
IRON (Fe)	ppm	<= 3	<2.0
MAGNESIUM	%	<= 0.002	<0.0002
NITRITE (NO ₂)	%	<= 0.001	<0.0010
PH 5% SOLUTION @ 25 DEG C		Inclusive Between 5.5 - 8.3	6.0
PHOSPHATE (PO ₄)	ppm	<= 5	<5.0
SULFATE (SO ₄)	%	<= 0.003	<0.0030



Edgar E. Hauer

Lab Manager Fair Lawn

Note: The data listed is valid for all package sizes of this lot of this product, expressed as an extension of this catalog number listed above. If there are any questions with this certificate, please call Chemical Services at (800) 227-6701.
*Based on suggested storage condition.



1 Reagent Lane
Fair Lawn, NJ 07410
201.796.7100 tel
201.796.1329 fax

Certificate of Analysis

Fisher Scientific's Quality System has been found to conform to Quality Management System Standard ISO9001:2008 standard by SAI Global Certificate Number CERT - 0064970

This is to certify that units of the above mentioned lot number were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Certain products (USP/FCC/NF/EP/BP/JP grades) are sold for use in food, drug, or medical device manufacturing. Fisher does not claim regulatory coverage under 21 CFR nor maintain DMF's with the FDA. The following are the actual analytical results obtained:

Catalog Number	S347	Quality Test / Release Date		5/5/2014
Lot Number	141075			
Description	SODIUM NITRITE, A.C.S.			
Country of Origin	India	* Suggested Retest Date	May-2019	
Chemical Origin	Inorganic-non animal			
BSE/TSE Comment	No animal products are used as starting raw material ingredients, or used in processing, including lubricants, processing aids, or any other material that might migrate to the finished product.			

Result name	Units	Specifications	Test Value
APPEARANCE		REPORT	Yellow-White Crystals
ASSAY	%	>= 97	99.9
CALCIUM	%	<= 0.01	<0.010
CHLORIDE	%	<= 0.005	<0.005
HEAVY METALS (as Pb)	%	<= 0.001	<0.0010
IDENTIFICATION	PASS/FAIL	= PASS TEST	PASS TEST
INSOLUBLE MATTER	%	<= 0.01	<0.010
IRON (Fe)	%	<= 0.001	<0.0010
POTASSIUM (K)	%	<= 0.005	<0.0050
SULFATE (SO4)	%	<= 0.01	<0.010



Edgar E. Hara

Lab Manager Fair Lawn

Note: The data listed is valid for all package sizes of this lot of this product, expressed as a extension of this catalog number listed above. If there are any questions with this certificate, please call Chemical Services at (800) 227-6701.
*Based on suggested storage condition.



▪ Certificate of Analysis ▪

A Waters Company

Product: 1000 mg/L Nitrite as N (NO₂-N)
Catalog Number: 053-125mL, 990-500mL
Lot No. 291020m
Starting Material: Sodium Nitrite (NaNO₂)
Matrix: 18 megohm deionized water
Density: 1.0019 ± 0.0016 g/ml at 18.4 °C and 752 mm Hg
Verification Method: Ion Chromatography
Certificate Issue Date: October 29, 2020
Expiration Date: October 21, 2022
Revision Number: Original

JØØ2419

CERTIFICATION

Parameter	Certified Value ¹	Uncertainty ²	NIST Traceability	
	mg/L		SRM Number ³	Recovery %
Nitrite as N (NO ₂ -N)	1000	0.950	-	NA



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 375.2

MW-28_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-01RE1 A SDG: 21I0294

Sampled: 09/20/21 10:10 Prepared: 10/04/21 14:17 File ID: 101121SO4A-039

% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 10/11/21 14:21

Batch: BJJ0070 Sequence: SJJ0143 Initial/Final: 10 mL / 10 mL

Instrument: LACHAT2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
14808-79-8	Sulfate	5.40	2	4.00	4.00	D



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 375.2

MW-24_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-03RE1 A SDG: 21I0294
Sampled: 09/20/21 11:11 Prepared: 10/04/21 14:17 File ID: 101121SO4A-045
% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 10/11/21 14:32
Batch: BJJ0070 Sequence: SJJ0143 Initial/Final: 10 mL / 10 mL
Instrument: LACHAT2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
14808-79-8	Sulfate	14.1	2	4.00	4.00	D



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 375.2

MW-60_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-05RE4 A SDG: 21I0294
Sampled: 09/20/21 11:30 Prepared: 10/04/21 14:17 File ID: 101121SO4B-006
% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 10/11/21 16:48
Batch: BJJ0070 Sequence: SJJ0144 Initial/Final: 10 mL / 10 mL
Instrument: LACHAT2 Calibration: EJ00030

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
14808-79-8	Sulfate	1870	80	160	160	D



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 375.2

MW-55_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-07RE1 A SDG: 21I0294

Sampled: 09/20/21 12:29 Prepared: 10/04/21 14:17 File ID: 101121SO4A-047

% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 10/11/21 14:34

Batch: BJJ0070 Sequence: SJJ0143 Initial/Final: 10 mL / 10 mL

Instrument: LACHAT2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
14808-79-8	Sulfate	47.0	2	4.00	4.00	D



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 375.2

MW-42_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-09RE3 A SDG: 21I0294

Sampled: 09/20/21 12:35 Prepared: 10/04/21 14:17 File ID: 101121SO4A-099

% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 10/11/21 15:59

Batch: BJJ0070 Sequence: SJJ0143 Initial/Final: 10 mL / 10 mL

Instrument: LACHAT2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
14808-79-8	Sulfate	988	40	80.0	80.0	D



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 375.2

MW-54_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-11RE3 A SDG: 21I0294
Sampled: 09/20/21 13:54 Prepared: 10/04/21 14:17 File ID: 101121SO4A-100
% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 10/11/21 16:01
Batch: BJJ0070 Sequence: SJJ0143 Initial/Final: 10 mL / 10 mL
Instrument: LACHAT2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
14808-79-8	Sulfate	976	40	80.0	80.0	D



Form I
METHOD BLANK DATA SHEET
EPA 375.2
TotalAnalytes

Blank

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Batch: BJJ0070

Laboratory ID: BJJ0070-BLK1

Prepared: 10/04/21 14:17

Matrix: Water

Preparation: No Prep Wet Chem

Analyzed: 10/11/21 13:18

Sequence: SJJ0143

Calibration: N/A

Instrument: LACHAT2

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
14808-79-8	Sulfate	ND	1	2.00	2.00	U



LCS / LCS DUPLICATE RECOVERY
EPA 375.2

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>10/11/21 13:19</u>
Batch:	<u>BJJ0070</u>	Laboratory ID:	<u>BJJ0070-BS1</u>
Preparation:	<u>No Prep Wet Chem</u>	Sequence Name:	<u>LCS</u>
Initial/Final:	<u>10 mL / 10 mL</u>		

COMPOUND	SPIKE ADDED (mg/L)	LCS CONCENTRATION (mg/L)	Q	LCS % REC. #	QC LIMITS REC.
Sulfate	15.0	14.1		94.0	90 - 110

* Indicates values outside of QC limits



DUPLICATES

EPA 375.2

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: BJJ0070-DUP2

Batch: BJJ0070

Lab Source ID: 2110294-01RE1

Preparation: No Prep Wet Chem

Initial/Final: 10 mL / 10 mL

Source Sample Name: MW-28_092021

% Solids:

ANALYTE	CONTROL LIMIT	SAMPLE CONCENTRATION (mg/L)	C	DUPLICATE CONCENTRATION (mg/L)	C	RPD %	Q
Sulfate	20	5.40	D	5.40	D	0.00	

*: Values outside of QC limits

L: Analyte concentration is ≤ 5 times the reporting limit and the replicate control limit defaults to Dup = +/- RL instead of 20% RPD



MS / MS DUPLICATE RECOVERY
EPA 375.2

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>10/11/21 14:23</u>
Batch:	<u>BJJ0070</u>	Laboratory ID:	<u>BJJ0070-MS2</u>
Preparation:	<u>No Prep Wet Chem</u>	Sequence Name:	<u>Matrix Spike</u>
Initial/Final:	<u>10 mL / 10 mL</u>	Source Sample:	<u>MW-28_092021</u>

COMPOUND	SPIKE ADDED (mg/L)	SAMPLE CONCENTRATION (mg/L)	Q	MS CONCENTRATION (mg/L)	Q	MS % REC. #	QC LIMITS REC.
Sulfate	100	5.40	D	94.5	D	89.1	75 - 125

* Values outside of QC limits



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 375.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0143

Instrument: LACHAT2

Calibration: UNASSIGNED

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Cal Standard	SJJ0143-CAL1	101121SO4A-001	NA	10/11/21 13:05
Cal Standard	SJJ0143-CAL2	101121SO4A-002	NA	10/11/21 13:07
Cal Standard	SJJ0143-CAL3	101121SO4A-003	NA	10/11/21 13:08
Cal Standard	SJJ0143-CAL4	101121SO4A-004	NA	10/11/21 13:09
Cal Standard	SJJ0143-CAL5	101121SO4A-005	NA	10/11/21 13:10
Cal Standard	SJJ0143-CAL6	101121SO4A-006	NA	10/11/21 13:11
Initial Cal Check	SJJ0143-ICV1	101121SO4A-007	NA	10/11/21 13:13
Initial Cal Blank	SJJ0143-ICB1	101121SO4A-008	NA	10/11/21 13:16
MRL Check	BJJ0070-MRL1	101121SO4A-009	Water	10/11/21 13:17
Blank	BJJ0070-BLK1	101121SO4A-010	Water	10/11/21 13:18
LCS	BJJ0070-BS1	101121SO4A-011	Water	10/11/21 13:19
Calibration Check	SJJ0143-CCV1	101121SO4A-019	NA	10/11/21 13:29
Calibration Blank	SJJ0143-CCB1	101121SO4A-020	NA	10/11/21 13:46
Calibration Check	SJJ0143-CCV2	101121SO4A-031	NA	10/11/21 14:01
Calibration Blank	SJJ0143-CCB2	101121SO4A-032	NA	10/11/21 14:10
MW-28_092021	21I0294-01RE1	101121SO4A-039	Water	10/11/21 14:21
MW-28_092021	BJJ0070-DUP2	101121SO4A-040	Water	10/11/21 14:22
MW-28_092021	BJJ0070-MS2	101121SO4A-041	Water	10/11/21 14:23
MW-28_092021	BJJ0070-MSD2	101121SO4A-042	Water	10/11/21 14:24
Calibration Check	SJJ0143-CCV3	101121SO4A-043	NA	10/11/21 14:25
Calibration Blank	SJJ0143-CCB3	101121SO4A-044	NA	10/11/21 14:29
MW-24_092021	21I0294-03RE1	101121SO4A-045	Water	10/11/21 14:32
MW-55_092021	21I0294-07RE1	101121SO4A-047	Water	10/11/21 14:34
Calibration Check	SJJ0143-CCV4	101121SO4A-055	NA	10/11/21 14:44
Calibration Blank	SJJ0143-CCB4	101121SO4A-056	NA	10/11/21 14:47
Calibration Check	SJJ0143-CCV5	101121SO4A-067	NA	10/11/21 15:02
Calibration Blank	SJJ0143-CCB5	101121SO4A-068	NA	10/11/21 15:05
Calibration Check	SJJ0143-CCV6	101121SO4A-079	NA	10/11/21 15:20
Calibration Blank	SJJ0143-CCB6	101121SO4A-080	NA	10/11/21 15:24



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 375.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0143

Instrument: LACHAT2

Calibration: UNASSIGNED

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Calibration Check	SJJ0143-CCV7	101121SO4A-091	NA	10/11/21 15:46
Calibration Blank	SJJ0143-CCB7	101121SO4A-092	NA	10/11/21 15:49
MW-42_092021	21I0294-09RE3	101121SO4A-099	Water	10/11/21 15:59
MW-54_092021	21I0294-11RE3	101121SO4A-100	Water	10/11/21 16:01
Calibration Check	SJJ0143-CCV8	101121SO4A-103	NA	10/11/21 16:05
Calibration Blank	SJJ0143-CCB8	101121SO4A-104	NA	10/11/21 16:18



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 375.2

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0144

Instrument: LACHAT2

Calibration: EJ00030

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Initial Cal Check	SJJ0144-ICV1	101121SO4B-001	NA	10/11/21 16:38
Initial Cal Blank	SJJ0144-ICB1	101121SO4B-002	NA	10/11/21 16:41
MW-60_092021	2110294-05RE4	101121SO4B-006	Water	10/11/21 16:48
Calibration Check	SJJ0144-CCV1	101121SO4B-007	NA	10/11/21 16:51
Calibration Blank	SJJ0144-CCB1	101121SO4B-008	NA	10/11/21 16:54



INITIAL CALIBRATION DATA

EPA 375.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EJ00030

Instrument: LACHAT2

Calibration Date: 10/11/2021 13:05

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
		RF		RF		RF		RF		RF		RF
Sulfate	30	0.1846667	20	0.1795	10	0.148	5	0.1198	2	0.099	0	0



INSTRUMENT BLANKS EPA 375.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: LACHAT2

Calibration: UNASSIGNED

Sequence: SJJ0143

Date Analyzed: 10/11/21 13:16

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0143-ICB1	Sulfate	0.23	2	2.00	mg/L	
SJJ0143-CCB1	Sulfate	0.04	2	2.00	mg/L	
SJJ0143-CCB2	Sulfate	-0.05	2	2.00	mg/L	
SJJ0143-CCB3	Sulfate	0.008	2	2.00	mg/L	
SJJ0143-CCB4	Sulfate	0.79	2	2.00	mg/L	
SJJ0143-CCB5	Sulfate	1.10	2	2.00	mg/L	
SJJ0143-CCB6	Sulfate	1.14	2	2.00	mg/L	
SJJ0143-CCB7	Sulfate	1.16	2	2.00	mg/L	
SJJ0143-CCB8	Sulfate	1.28	2	2.00	mg/L	



INSTRUMENT BLANKS EPA 375.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: LACHAT2

Calibration: EJ00030

Sequence: SJJ0144

Date Analyzed: 10/11/21 16:41

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0144-ICB1	Sulfate	1.59	2	2.00	mg/L	
SJJ0144-CCB1	Sulfate	1.72	2	2.00	mg/L	



**INITIAL AND CONTINUING
CALIBRATION CHECK**
EPA 375.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: LACHAT2

Calibration: UNASSIGNED

Control Limit: +/- 10.00%

Sequence: SJJ0143

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SJJ0143-ICV1	Sulfate	15.000	14.6	97.3	mg/L	EPA 375.2
SJJ0143-CCV1	Sulfate	15.000	14.3	95.3	mg/L	EPA 375.2
SJJ0143-CCV2	Sulfate	15.000	16.1	107	mg/L	EPA 375.2
SJJ0143-CCV3	Sulfate	15.000	14.3	95.3	mg/L	EPA 375.2
SJJ0143-CCV4	Sulfate	15.000	14.4	96.0	mg/L	EPA 375.2
SJJ0143-CCV5	Sulfate	15.000	14.5	96.7	mg/L	EPA 375.2
SJJ0143-CCV6	Sulfate	15.000	14.1	94.0	mg/L	EPA 375.2
SJJ0143-CCV7	Sulfate	15.000	14.1	94.0	mg/L	EPA 375.2
SJJ0143-CCV8	Sulfate	15.000	14.1	94.0	mg/L	EPA 375.2

* Values outside of QC limits



**INITIAL AND CONTINUING
CALIBRATION CHECK**
EPA 375.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: LACHAT2

Calibration: EJ00030

Control Limit: +/- 10.00%

Sequence: SJJ0144

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SJJ0144-ICV1	Sulfate	15.000	13.7	91.3	mg/L	EPA 375.2
SJJ0144-CCV1	Sulfate	15.000	13.8	92.0	mg/L	EPA 375.2

* Values outside of QC limits



HOLDING TIME SUMMARY

Analysis: EPA 375.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sample Name	Date Collected	Date Received	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
MW-28_092021 21I0294-01RE1	09/20/21 10:10	09/21/21 15:38	10/04/21 14:17	14	28	10/11/21 14:21	21	28	
MW-24_092021 21I0294-03RE1	09/20/21 11:11	09/21/21 15:38	10/04/21 14:17	14	28	10/11/21 14:32	21	28	
MW-60_092021 21I0294-05RE4	09/20/21 11:30	09/21/21 15:38	10/04/21 14:17	14	28	10/11/21 16:48	21	28	
MW-55_092021 21I0294-07RE1	09/20/21 12:29	09/21/21 15:38	10/04/21 14:17	14	28	10/11/21 14:34	21	28	
MW-42_092021 21I0294-09RE3	09/20/21 12:35	09/21/21 15:38	10/04/21 14:17	14	28	10/11/21 15:59	21	28	
MW-54_092021 21I0294-11RE3	09/20/21 13:54	09/21/21 15:38	10/04/21 14:17	14	28	10/11/21 16:01	21	28	
Duplicate BJJ0070-DUP2	09/20/21 10:10	09/21/21 15:38	10/04/21 14:17	14	28	10/11/21 14:22	21	28	
Matrix Spike BJJ0070-MS2	09/20/21 10:10	09/21/21 15:38	10/04/21 14:17	14	28	10/11/21 14:23	21	28	
Matrix Spike Dup BJJ0070-MSD2	09/20/21 10:10	09/21/21 15:38	10/04/21 14:17	14	28	10/11/21 14:24	21	28	

* Indicates hold time exceedance.



Analytical Resources, Incorporated
Analytical Chemists and Consultants

METHOD DETECTION AND REPORTING LIMITS

EPA 375.2

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Instrument: LACHAT2

Analyte	MDL	RL	Units
Sulfate	2.00	2.00	mg/L

Certificate of Analysis

PRODUCT:	1000 mg/L Chloride
CATALOG NUMBER:	047 -125 mL; 988 - 500 mL
LOT NUMBER:	490319m
ISSUE DATE:	April 15, 2019
REVISION DATE:	Original
STARTING MATERIAL:	Sodium Chloride (NaCl)
CERTIFIED CONCENTRATION¹:	1000 mg/L
UNCERTAINTY²:	0.6%
MATRIX:	18 megohm deionized water
DENSITY:	0.9993± 0.0008 g/mL at 19.5°C and 755 mm Hg
TRACEABILITY³:	98.5%
NIST/SRM:	3182 Chloride
VERIFICATION METHOD:	Ion Chromatography
STORAGE:	Store at 20-25°C

1. The **Certified Concentration** is the actual made-to concentration confirmed by ERA analytical verification.

2. The stated **Uncertainty** is the total propagated uncertainty at the 95% confidence interval. The uncertainty is based on the preparation of the product and includes uncertainty related to the starting material used and the volumetric and gravimetric measurements made. The method of calculating uncertainty is taken from the ISO Guide to the Expression of Uncertainty in Measurement (current version). The uncertainty applies to the product as supplied and does not take into account any required or optional dilutions and/or preparations the laboratory may perform while using this product.

3. Traceability ((% Recovery Certified Standard)/(% Recovery NIST SRM))* 100.

The traceability data shown were compiled by analyzing the ERA standards or their associated stock solutions against the applicable NIST SRMs. Where a NIST SRM is not available, the product is metrologically traceable through an unbroken chain of calibrations to NIST weights, each having stated uncertainties and utilizing measurement standards that are appropriate for the physical and/or chemical property being measured.

This standard **expires 03/26/2021**. The certified values are monitored and purchasers will be notified of any significant changes resulting in recertification or withdrawal of this certified reference material during the period of validity of this certificate.

This product is intended to be used as either a calibration standard or a quality control check of the entire analytical process for the analytes/matrix included in the standard.

If you have any questions or need technical assistance, please call ERA technical assistance at 1-800-372-0122 or email to info@eraqc.com

Certifying Officer: Brian Miller - Product Line Manager

ISO/IEC GUIDE 34:2009



REFERENCE MATERIAL PRODUCER
CERTIFICATE NO. 1539.03

ISO/IEC 17025:2005



CHEMICAL TESTING LABORATORY
CERTIFICATE NO. 1559.02

Certificate of Analysis

PRODUCT: 1000 mg/L Sulfate (SO₄)
CATALOG NUMBER: 062 -125 mL; 995 - 500 mL
LOT NUMBER: 140918
ISSUE DATE: September 18, 2018
REVISION DATE: Original

STARTING MATERIAL: Potassium Sulfate (K₂SO₄)
CERTIFIED CONCENTRATION¹: 1000 mg/L
UNCERTAINTY²: 0.6%
MATRIX: 18 megohm deionized water
DENSITY: 0.9983 ± 0.0008 g/mL at 20.8°C and 750 mm Hg

TRACEABILITY³: 103%
NIST/SRM: 3181 Sulfate
VERIFICATION METHOD: Ion Chromatography
STORAGE: Store at 20-25°C

1. The **Certified Concentration** is the actual made-to concentration confirmed by ERA analytical verification.
2. The stated **Uncertainty** is the total propagated uncertainty at the 95% confidence interval. The uncertainty is based on the preparation of the product and includes uncertainty related to the starting material used and the volumetric and gravimetric measurements made. The method of calculating uncertainty is taken from the ISO Guide to the Expression of Uncertainty in Measurement (current version). The uncertainty applies to the product as supplied and does not take into account any required or optional dilutions and/or preparations the laboratory may perform while using this product.
3. Traceability ((% Recovery Certified Standard)/(% Recovery NIST SRM))* 100.

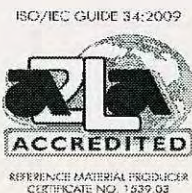
The traceability data shown were compiled by analyzing the ERA standards or their associated stock solutions against the applicable NIST SRMs. Where a NIST SRM is not available, the product is metrologically traceable through an unbroken chain of calibrations to NIST weights, each having stated uncertainties and utilizing measurement standards that are appropriate for the physical and/or chemical property being measured.

This standard **expires 9/2020**. The certified values are monitored and purchasers will be notified of any significant changes resulting in recertification or withdrawal of this certified reference material during the period of validity of this certificate.

This product is intended to be used as either a calibration standard or a quality control check of the entire analytical process for the analytes/matrix included in the standard.

If you have any questions or need technical assistance, please call ERA technical assistance at 1-800-372-0122 or email to info@eraqc.com

Certifying Officer: Brian Miller - Product Line Manager





1 Reagent Lane
Fair Lawn, NJ 07410
201.796.7100 tel
201.796.1329 fax

Certificate of Analysis

Fisher Scientific's Quality System has been found to conform to Quality Management System Standard ISO9001:2008 standard by SAI Global Certificate Number CERT - 0064970

This is to certify that units of the lot number below were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Certain products (USP/FCC/NF/EP/BP/JP grades) are sold for use in food, drug, or medical device manufacturing. Fisher does not claim regulatory coverage under 21 CFR nor maintain DMF's with the FDA. The following are the actual analytical results obtained:

Catalog Number	P304	Quality Test / Release Date 3/2/2015	
Lot Number	147276		
Description	POTASSIUM SULFATE, CRYSTAL, CERTIFIED, A.C.S.		
Country of Origin	India	* Suggested Retest Date	Feb-2020
Chemical Origin	Inorganic-non animal		
BSE/TSE Comment	This product is not manufactured from, or with, any type of animal product, nor any derivative of an animal product. As such, this product should not be considered a vector for BSE or TSE.		

Result name	Units	Specifications	Test Value
APPEARANCE		REPORT	FINE WHITE CRYSTALS
ASSAY	%	>= 99	99.4
CALCIUM	%	<= 0.01	<0.010
CHLORIDE	%	<= 0.001	<0.0010
HEAVY METALS (as Pb)	ppm	<= 5	<5.0
IDENTIFICATION	PASS/FAIL	= PASS TEST	PASS TEST
INSOLUBLE MATTER	%	<= 0.01	<0.010
IRON (Fe)	ppm	<= 5	<5.0
MAGNESIUM	%	<= 0.005	<0.0050
NITROGEN COMPOUNDS	ppm	<= 5	<5
PH 5% SOLUTION @ 25 DEG C		Inclusive Between 5.5 - 8.5	5.5
SODIUM (Na)	%	<= 0.02	<0.020



Edgar E. Hara

Lab Manager Fair Lawn

Note: The data listed is valid for all package sizes of this lot of this product, expressed as an extension of this catalog number listed above. If there are any questions with this certificate, please call Chemical Services at (800) 227-6701.

*Based on suggested storage condition.

Certificate of Analysis

PRODUCT:	1000 mg/L Sulfate (SO ₄)
CATALOG NUMBER:	062 -125 mL; 995 - 500 mL
LOT NUMBER:	1730520m
ISSUE DATE:	May 19, 2020
REVISION DATE:	Original
STARTING MATERIAL:	Potassium Sulfate (K ₂ SO ₄)
CERTIFIED CONCENTRATION ¹ :	1000 mg/L
UNCERTAINTY ² :	1.0%
MATRIX:	18 megohm deionized water
DENSITY:	1.0022 ± 0.0007 g/mL at 21.2°C and 752 mm Hg
TRACEABILITY ³ :	102%
NIST/SRM:	3181 Sulfate
VERIFICATION METHOD:	Ion Chromatography
STORAGE:	Store at 20-25°C

1. The Certified Concentration is the actual made-to concentration confirmed by ERA analytical verification.
2. The stated Uncertainty is the total propagated uncertainty at the 95% confidence interval. The uncertainty is based on the preparation of the product and includes uncertainty related to the starting material used and the volumetric and gravimetric measurements made. The method of calculating uncertainty is taken from the ISO Guide to the Expression of Uncertainty in Measurement (current version). The uncertainty applies to the product as supplied and does not take into account any required or optional dilutions and/or preparations the laboratory may perform while using this product.
3. Traceability ((% Recovery Certified Standard)/(% Recovery NIST SRM))* 100.

The traceability data shown were compiled by analyzing the ERA standards or their associated stock solutions against the applicable NIST SRMs. Where a NIST SRM is not available, the product is metrologically traceable through an unbroken chain of calibrations to NIST weights, each having stated uncertainties and utilizing measurement standards that are appropriate for the physical and/or chemical property being measured.

This standard expires 05/15/2022. The certified values are monitored and purchasers will be notified of any significant changes resulting in recertification or withdrawal of this certified reference material during the period of validity of this certificate.

This product is intended to be used as either a calibration standard or a quality control check of the entire analytical process for the analytes/matrix included in the standard.

If you have any questions or need technical assistance, please call ERA technical assistance at 1-800-372-0122 or email to info@eraqc.com

Certifying Officer: Brian Miller - Product Line Manager

ISO/IEC 17025:2005





Form I
INORGANIC ANALYSIS DATA SHEET
EPA 9014

MW-28_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-01 B SDG: 21I0294
Sampled: 09/20/21 10:10 Prepared: 09/29/21 10:33 File ID: 092921 CN CKI2-023
% Solids: 0.00 Preparation: EPA 9010C m Analyzed: 09/29/21 17:39
Batch: BJI0844 Sequence: SJI0478 Initial/Final: 50 mL / 50 mL
Instrument: UV1800-2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
57-12-5	Cyanide, Total	0.155	1	0.0050	0.0050	



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 9014

MW-24_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-03 B SDG: 21I0294
Sampled: 09/20/21 11:11 Prepared: 09/29/21 10:33 File ID: 092921 CN CKI2-029
% Solids: 0.00 Preparation: EPA 9010C m Analyzed: 09/29/21 17:43
Batch: BJI0844 Sequence: SJI0478 Initial/Final: 50 mL / 50 mL
Instrument: UV1800-2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
57-12-5	Cyanide, Total	0.158	1	0.0050	0.0050	



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 9014

MW-60_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-05 B SDG: 21I0294
Sampled: 09/20/21 11:30 Prepared: 09/29/21 10:33 File ID: 092921 CN CKI2-030
% Solids: 0.00 Preparation: EPA 9010C m Analyzed: 09/29/21 17:44
Batch: BJI0844 Sequence: SJI0478 Initial/Final: 50 mL / 50 mL
Instrument: UV1800-2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
57-12-5	Cyanide, Total	<0.0050	1	0.0050	0.0050	U



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 9014

MW-55_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-07 B SDG: 21I0294
Sampled: 09/20/21 12:29 Prepared: 09/29/21 10:33 File ID: 092921 CN CKI2-031
% Solids: 0.00 Preparation: EPA 9010C m Analyzed: 09/29/21 17:45
Batch: BJI0844 Sequence: SJI0478 Initial/Final: 50 mL / 50 mL
Instrument: UV1800-2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
57-12-5	Cyanide, Total	0.132	1	0.0050	0.0050	



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 9014

MW-42_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-09 B SDG: 21I0294
Sampled: 09/20/21 12:35 Prepared: 09/29/21 10:33 File ID: 092921 CN CKI2-032
% Solids: 0.00 Preparation: EPA 9010C m Analyzed: 09/29/21 17:46
Batch: BJI0844 Sequence: SJI0478 Initial/Final: 50 mL / 50 mL
Instrument: UV1800-2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
57-12-5	Cyanide, Total	0.0970	1	0.0050	0.0050	



Form I
INORGANIC ANALYSIS DATA SHEET
EPA 9014

MW-54_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-11 B SDG: 21I0294
Sampled: 09/20/21 13:54 Prepared: 09/29/21 10:33 File ID: 092921 CN CKI2-033
% Solids: 0.00 Preparation: EPA 9010C m Analyzed: 09/29/21 17:47
Batch: BJI0844 Sequence: SJI0478 Initial/Final: 50 mL / 50 mL
Instrument: UV1800-2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
57-12-5	Cyanide, Total	0.0210	1	0.0050	0.0050	



PREPARATION BATCH SUMMARY

EPA 9014

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Batch: BJI0844

Batch Matrix: Water

Preparation: EPA 9010C m

SAMPLE NAME	LAB SAMPLE ID	LAB FILE ID	DATE PREPARED	OBSERVATIONS
MW-28_092021	21I0294-01	092921 CN CKI2-023	09/29/21 10:33	
MW-24_092021	21I0294-03	092921 CN CKI2-029	09/29/21 10:33	
MW-60_092021	21I0294-05	092921 CN CKI2-030	09/29/21 10:33	
MW-55_092021	21I0294-07	092921 CN CKI2-031	09/29/21 10:33	
MW-42_092021	21I0294-09	092921 CN CKI2-032	09/29/21 10:33	
MW-54_092021	21I0294-11	092921 CN CKI2-033	09/29/21 10:33	
Blank	BJI0844-BLK1	092921 CN CKI2-021	09/29/21 10:33	
LCS	BJI0844-BS1	092921 CN CKI2-022	09/29/21 10:33	
MW-28_092021	BJI0844-DUP1	092921 CN CKI2-024	09/29/21 10:33	
MRL Check	BJI0844-MRL1	092921 CN CKI2-020	09/29/21 10:33	
MW-28_092021	BJI0844-MS2	092921 CN CKI2-040	09/29/21 10:33	Added 9/30/2021 by CKI
MW-28_092021	BJI0844-MSD2	092921 CN CKI2-041	09/29/21 10:33	Added 9/30/2021 by CKI



Form I
METHOD BLANK DATA SHEET
EPA 9014
TotalAnalytes

Blank

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Batch: BJI0844

Laboratory ID: BJI0844-BLK1

Prepared: 09/29/21 10:33

Matrix: Water

Preparation: EPA 9010C m

Analyzed: 09/29/21 17:37

Sequence: SJI0478

Calibration: N/A

Instrument: UV1800-2

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
57-12-5	Cyanide, Total	ND	1	0.0050	0.0050	U



LCS / LCS DUPLICATE RECOVERY
EPA 9014

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>09/29/21 17:37</u>
Batch:	<u>BJI0844</u>	Laboratory ID:	<u>BJI0844-BS1</u>
Preparation:	<u>EPA 9010C m</u>	Sequence Name:	<u>LCS</u>
Initial/Final:	<u>50 mL / 50 mL</u>		

COMPOUND	SPIKE ADDED (mg/L)	LCS CONCENTRATION (mg/L)	Q	LCS % REC. #	QC LIMITS REC.
Cyanide, Total	0.155	0.145		93.4	80 - 120

* Indicates values outside of QC limits



DUPLICATES

EPA 9014

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: BJI0844-DUP1

Batch: BJI0844

Lab Source ID: 2110294-01

Preparation: EPA 9010C m

Initial/Final: 50 mL / 50 mL

Source Sample Name: MW-28_092021

% Solids:

ANALYTE	CONTROL LIMIT	SAMPLE CONCENTRATION (mg/L)	C	DUPLICATE CONCENTRATION (mg/L)	C	RPD %	Q
Cyanide, Total	20	0.155		0.154		0.647	

*: Values outside of QC limits

L: Analyte concentration is <=5 times the reporting limit and the replicate control limit defaults to Dup = +/- RL instead of 20% RPD



MS / MS DUPLICATE RECOVERY
EPA 9014

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>09/29/21 18:12</u>
Batch:	<u>BJI0844</u>	Laboratory ID:	<u>BJI0844-MS2</u>
Preparation:	<u>EPA 9010C m</u>	Sequence Name:	<u>Matrix Spike</u>
Initial/Final:	<u>50 mL / 50 mL</u>	Source Sample:	<u>MW-28_092021</u>

COMPOUND	SPIKE ADDED (mg/L)	SAMPLE CONCENTRATION (mg/L)	Q	MS CONCENTRATION (mg/L)	Q	MS % REC. #	QC LIMITS REC.
Cyanide, Total	0.152	0.155		0.305	D	98.7	75 - 125

* Values outside of QC limits



MS / MS DUPLICATE RECOVERY
EPA 9014

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>09/29/21 18:13</u>
Batch:	<u>BJI0844</u>	Laboratory ID:	<u>BJI0844-MSD2</u>
Preparation:	<u>EPA 9010C m</u>	Sequence Name:	<u>Matrix Spike Dup</u>
Initial/Final:	<u>50 mL / 50 mL</u>	Source Sample:	<u>MW-28_092021</u>

COMPOUND	SPIKE ADDED (mg/L)	MSD CONCENTRATION (mg/L)	Q	MSD % REC. #	% RPD #	QC LIMITS	
						RPD	REC.
Cyanide, Total	0.152	0.290	D	88.9	5.04	20	75 - 125

* Values outside of QC limits



ANALYSIS BATCH (SEQUENCE) SUMMARY

EPA 9014

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJI0478

Instrument: UV1800-2

Calibration: UNASSIGNED

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
MRL Check	BJI0844-MRL1	092921 CN CK12-020	Water	09/29/21 17:36
Blank	BJI0844-BLK1	092921 CN CK12-021	Water	09/29/21 17:37
LCS	BJI0844-BS1	092921 CN CK12-022	Water	09/29/21 17:37
MW-28_092021	21I0294-01	092921 CN CK12-023	Water	09/29/21 17:39
MW-28_092021	BJI0844-DUP1	092921 CN CK12-024	Water	09/29/21 17:39
MW-24_092021	21I0294-03	092921 CN CK12-029	Water	09/29/21 17:43
MW-60_092021	21I0294-05	092921 CN CK12-030	Water	09/29/21 17:44
MW-55_092021	21I0294-07	092921 CN CK12-031	Water	09/29/21 17:45
MW-42_092021	21I0294-09	092921 CN CK12-032	Water	09/29/21 17:46
MW-54_092021	21I0294-11	092921 CN CK12-033	Water	09/29/21 17:47
MW-28_092021	BJI0844-MS2	092921 CN CK12-040	Water	09/29/21 18:12
MW-28_092021	BJI0844-MSD2	092921 CN CK12-041	Water	09/29/21 18:13



HOLDING TIME SUMMARY

Analysis: EPA 9014

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sample Name	Date Collected	Date Received	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
MW-28_092021 21I0294-01	09/20/21 10:10	09/21/21 15:38	09/29/21 10:33	9	14	09/29/21 17:39	0	4	
MW-24_092021 21I0294-03	09/20/21 11:11	09/21/21 15:38	09/29/21 10:33	8	14	09/29/21 17:43	0	4	
MW-60_092021 21I0294-05	09/20/21 11:30	09/21/21 15:38	09/29/21 10:33	8	14	09/29/21 17:44	0	4	
MW-55_092021 21I0294-07	09/20/21 12:29	09/21/21 15:38	09/29/21 10:33	8	14	09/29/21 17:45	0	4	
MW-42_092021 21I0294-09	09/20/21 12:35	09/21/21 15:38	09/29/21 10:33	8	14	09/29/21 17:46	0	4	
MW-54_092021 21I0294-11	09/20/21 13:54	09/21/21 15:38	09/29/21 10:33	8	14	09/29/21 17:47	0	4	
Duplicate BJI0844-DUP1	09/20/21 10:10	09/21/21 15:38	09/29/21 10:33	9	14	09/29/21 17:39	0	4	
Matrix Spike BJI0844-MS2	09/20/21 10:10	09/21/21 15:38	09/29/21 10:33	9	14	09/29/21 18:12	0	4	
Matrix Spike Dup BJI0844-MSD2	09/20/21 10:10	09/21/21 15:38	09/29/21 10:33	9	14	09/29/21 18:13	0	4	

* Indicates hold time exceedance.



Analytical Resources, Incorporated
Analytical Chemists and Consultants

**METHOD DETECTION
AND REPORTING LIMITS
EPA 9014**

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Instrument: UV1800-2

Analyte	MDL	RL	Units
Cyanide, Total	0.0050	0.0050	mg/L

Cyanide Titration

Buret used for titrations: CN

Analyst: CKI

Date & Time: 8/9/2021 10:37

Standardization of Cyanide Stock

Cyanide Stock ID: I011195

Silver Nitrate ID: I008487

Normality = 0.0141 grams to 1000 mL

	Blank	Blank	Blank	
mL AgNO3 =	0.04	0.04	0.04	
mL CN Stock =	1.00	1.00	1.00	
mL AgNO3 =	1.20	1.22	1.21	mg/L CN
mg/L CN Stock =				
mL required for for 10 mg/L CN Intermediate in 50 mL				0.5925



Form I
INORGANIC ANALYSIS DATA SHEET
SM 4500-CN⁻ I-97

MW-28_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-01 B SDG: 21I0294

Sampled: 09/20/21 10:10 Prepared: 09/30/21 10:26 File ID: 093021 CN CKI2-010

% Solids: 0.00 Preparation: SM 4500-CN⁻ I-99 Analyzed: 09/30/21 16:21

Batch: BJI0884 Sequence: SJJ0010 Initial/Final: 50 mL / 50 mL

Instrument: UV1800-2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
57-12-5	Cyanide, Weak Acid Dissociable	0.033	1	0.005	0.005	



Form I
INORGANIC ANALYSIS DATA SHEET
SM 4500-CN⁻ I-97

MW-24_092021

Laboratory: Analytical Resources, LLC

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water Laboratory ID: 21I0294-03 B SDG: 21I0294

Sampled: 09/20/21 11:11 Prepared: 09/30/21 10:26 File ID: 093021 CN CKI2-006

% Solids: 0.00 Preparation: SM 4500-CN⁻ I-99 Analyzed: 09/30/21 16:18

Batch: BJI0884 Sequence: SJJ0010 Initial/Final: 50 mL / 50 mL

Instrument: UV1800-2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
57-12-5	Cyanide, Weak Acid Dissociable	0.052	1	0.005	0.005	



Form I
INORGANIC ANALYSIS DATA SHEET
SM 4500-CN⁻ I-97

MW-60_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-05 B SDG: 21I0294
Sampled: 09/20/21 11:30 Prepared: 09/30/21 10:26 File ID: 093021 CN CKI2-011
% Solids: 0.00 Preparation: SM 4500-CN⁻ I-99 Analyzed: 09/30/21 16:22
Batch: BJI0884 Sequence: SJJ0010 Initial/Final: 50 mL / 50 mL
Instrument: UV1800-2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
57-12-5	Cyanide, Weak Acid Dissociable	<0.005	1	0.005	0.005	U



Form I
INORGANIC ANALYSIS DATA SHEET
SM 4500-CN⁻ I-97

MW-55_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-07 B SDG: 21I0294
Sampled: 09/20/21 12:29 Prepared: 09/30/21 10:26 File ID: 093021 CN CKI2-012
% Solids: 0.00 Preparation: SM 4500-CN⁻ I-99 Analyzed: 09/30/21 16:23
Batch: BJI0884 Sequence: SJJ0010 Initial/Final: 50 mL / 50 mL
Instrument: UV1800-2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
57-12-5	Cyanide, Weak Acid Dissociable	0.043	1	0.005	0.005	



Form I
INORGANIC ANALYSIS DATA SHEET
SM 4500-CN⁻ I-97

MW-42_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-09 B SDG: 21I0294
Sampled: 09/20/21 12:35 Prepared: 09/30/21 10:26 File ID: 093021 CN CKI2-015
% Solids: 0.00 Preparation: SM 4500-CN⁻ I-99 Analyzed: 09/30/21 16:24
Batch: BJI0884 Sequence: SJJ0010 Initial/Final: 50 mL / 50 mL
Instrument: UV1800-2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
57-12-5	Cyanide, Weak Acid Dissociable	0.039	1	0.005	0.005	



Form I
INORGANIC ANALYSIS DATA SHEET
SM 4500-CN⁻ I-97

MW-54_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-11 B SDG: 21I0294
Sampled: 09/20/21 13:54 Prepared: 09/30/21 10:26 File ID: 093021 CN CKI2-016
% Solids: 0.00 Preparation: SM 4500-CN⁻ I-99 Analyzed: 09/30/21 16:25
Batch: BJI0884 Sequence: SJJ0010 Initial/Final: 50 mL / 50 mL
Instrument: UV1800-2 Calibration: UNASSIGNED

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
57-12-5	Cyanide, Weak Acid Dissociable	0.009	1	0.005	0.005	



Form I
METHOD BLANK DATA SHEET
SM 4500-CN⁻ I-97
TotalAnalytes

Blank

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Batch: BJI0884

Laboratory ID: BJI0884-BLK1

Prepared: 09/30/21 10:26

Matrix: Water

Preparation: SM 4500-CN⁻ I-99

Analyzed: 09/30/21 16:16

Sequence: SJJ0010

Calibration: N/A

Instrument: UV1800-2

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
57-12-5	Cyanide, Weak Acid Dissociable	ND	1	0.005	0.005	U



DUPLICATES
SM 4500-CN⁻ I-97

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: BJI0884-DUP1

Batch: BJI0884

Lab Source ID: 2110294-03

Preparation: SM 4500-CN⁻ I-99

Initial/Final: 50 mL / 50 mL

Source Sample Name: MW-24_092021

% Solids:

ANALYTE	CONTROL LIMIT	SAMPLE CONCENTRATION (mg/L)	C	DUPLICATE CONCENTRATION (mg/L)	C	RPD %	Q
Cyanide, Weak Acid Dissociable	20	0.052		0.055		5.61	

*: Values outside of QC limits

L: Analyte concentration is <=5 times the reporting limit and the replicate control limit defaults to Dup = +/- RL instead of 20% RPD



MS / MS DUPLICATE RECOVERY
SM 4500-CN⁻ I-97

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>09/30/21 16:20</u>
Batch:	<u>BJI0884</u>	Laboratory ID:	<u>BJI0884-MS1</u>
Preparation:	<u>SM 4500-CN⁻ I-99</u>	Sequence Name:	<u>Matrix Spike</u>
Initial/Final:	<u>50 mL / 50 mL</u>	Source Sample:	<u>MW-24_092021</u>

COMPOUND	SPIKE ADDED (mg/L)	SAMPLE CONCENTRATION (mg/L)	Q	MS CONCENTRATION (mg/L)	Q	MS % REC. #	QC LIMITS REC.
Cyanide, Weak Acid Dissociable	0.152	0.052		0.200		97.4	75 - 125

* Values outside of QC limits



MS / MS DUPLICATE RECOVERY
SM 4500-CN⁻ I-97

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>09/30/21 16:21</u>
Batch:	<u>BJI0884</u>	Laboratory ID:	<u>BJI0884-MSD1</u>
Preparation:	<u>SM 4500-CN⁻ I-99</u>	Sequence Name:	<u>Matrix Spike Dup</u>
Initial/Final:	<u>50 mL / 50 mL</u>	Source Sample:	<u>MW-24_092021</u>

COMPOUND	SPIKE ADDED (mg/L)	MSD CONCENTRATION (mg/L)	Q	MSD % REC. #	% RPD #	QC LIMITS	
						RPD	REC.
Cyanide, Weak Acid Dissociable	0.152	0.186		88.2	7.25	200	75 - 125

* Values outside of QC limits



ANALYSIS BATCH (SEQUENCE) SUMMARY

SM 4500-CN⁻ I-97

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0010

Instrument: UV1800-2

Calibration: UNASSIGNED

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
Cal Standard	SJJ0010-CAL1	093021 CN CKI1-001	NA	09/30/21 16:08
Cal Standard	SJJ0010-CAL2	093021 CN CKI1-002	NA	09/30/21 16:09
Cal Standard	SJJ0010-CAL3	093021 CN CKI1-003	NA	09/30/21 16:09
Cal Standard	SJJ0010-CAL4	093021 CN CKI1-004	NA	09/30/21 16:10
Cal Standard	SJJ0010-CAL5	093021 CN CKI1-005	NA	09/30/21 16:11
Cal Standard	SJJ0010-CAL6	093021 CN CKI1-006	NA	09/30/21 16:12
Cal Standard	SJJ0010-CAL7	093021 CN CKI1-007	NA	09/30/21 16:12
Initial Cal Blank	SJJ0010-ICB1	093021 CN CKI2-001	NA	09/30/21 16:13
Initial Cal Check	SJJ0010-ICV1	093021 CN CKI2-002	NA	09/30/21 16:14
MRL Check	BJI0884-MRL1	093021 CN CKI2-003	Water	09/30/21 16:15
Blank	BJI0884-BLK1	093021 CN CKI2-004	Water	09/30/21 16:16
LCS	BJI0884-BS1	093021 CN CKI2-005	Water	09/30/21 16:17
MW-24_092021	21I0294-03	093021 CN CKI2-006	Water	09/30/21 16:18
MW-24_092021	BJI0884-DUP1	093021 CN CKI2-007	Water	09/30/21 16:19
MW-24_092021	BJI0884-MS1	093021 CN CKI2-008	Water	09/30/21 16:20
MW-24_092021	BJI0884-MSD1	093021 CN CKI2-009	Water	09/30/21 16:21
MW-28_092021	21I0294-01	093021 CN CKI2-010	Water	09/30/21 16:21
MW-60_092021	21I0294-05	093021 CN CKI2-011	Water	09/30/21 16:22
MW-55_092021	21I0294-07	093021 CN CKI2-012	Water	09/30/21 16:23
Calibration Blank	SJJ0010-CCB1	093021 CN CKI2-013	NA	09/30/21 16:23
Calibration Check	SJJ0010-CCV1	093021 CN CKI2-014	NA	09/30/21 16:24
MW-42_092021	21I0294-09	093021 CN CKI2-015	Water	09/30/21 16:24
MW-54_092021	21I0294-11	093021 CN CKI2-016	Water	09/30/21 16:25
Calibration Blank	SJJ0010-CCB2	093021 CN CKI2-021	NA	09/30/21 16:29
Calibration Check	SJJ0010-CCV2	093021 CN CKI2-022	NA	09/30/21 16:29



INSTRUMENT BLANKS

SM 4500-CN⁻ I-97

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: UV1800-2

Calibration: UNASSIGNED

Sequence: SJJ0010

Date Analyzed: 09/30/21 16:13

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0010-ICB1	Cyanide, Weak Acid Dissociable	0.00	0.005	0.005	mg/L	
SJJ0010-CCB1	Cyanide, Weak Acid Dissociable	0.00	0.005	0.005	mg/L	
SJJ0010-CCB2	Cyanide, Weak Acid Dissociable	0.00	0.005	0.005	mg/L	



INITIAL AND CONTINUING CALIBRATION CHECK

SM 4500-CN⁻ I-97

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: UV1800-2

Calibration: UNASSIGNED

Control Limit: +/- 10.00%

Sequence: SJJ0010

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SJJ0010-ICV1	Cyanide, Weak Acid Dissociable	0.10352	0.101	97.6	mg/L	SM 4500-CN ⁻ I-97
SJJ0010-CCV1	Cyanide, Weak Acid Dissociable	0.10352	0.098	94.7	mg/L	SM 4500-CN ⁻ I-97
SJJ0010-CCV2	Cyanide, Weak Acid Dissociable	0.10352	0.099	95.6	mg/L	SM 4500-CN ⁻ I-97

* Values outside of QC limits



HOLDING TIME SUMMARY

Analysis: SM 4500-CN⁻ I-97

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sample Name	Date Collected	Date Received	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
MW-28_092021 21I0294-01	09/20/21 10:10	09/21/21 15:38	09/30/21 10:26	10	14	09/30/21 16:21	0	4	
MW-24_092021 21I0294-03	09/20/21 11:11	09/21/21 15:38	09/30/21 10:26	9	14	09/30/21 16:18	0	4	
MW-60_092021 21I0294-05	09/20/21 11:30	09/21/21 15:38	09/30/21 10:26	9	14	09/30/21 16:22	0	4	
MW-55_092021 21I0294-07	09/20/21 12:29	09/21/21 15:38	09/30/21 10:26	9	14	09/30/21 16:23	0	4	
MW-42_092021 21I0294-09	09/20/21 12:35	09/21/21 15:38	09/30/21 10:26	9	14	09/30/21 16:24	0	4	
MW-54_092021 21I0294-11	09/20/21 13:54	09/21/21 15:38	09/30/21 10:26	9	14	09/30/21 16:25	0	4	
Duplicate BJI0884-DUP1	09/20/21 11:11	09/21/21 15:38	09/30/21 10:26	9	14	09/30/21 16:19	0	4	
Matrix Spike BJI0884-MS1	09/20/21 11:11	09/21/21 15:38	09/30/21 10:26	9	14	09/30/21 16:20	0	4	
Matrix Spike Dup BJI0884-MSD1	09/20/21 11:11	09/21/21 15:38	09/30/21 10:26	9	14	09/30/21 16:21	0	4	

* Indicates hold time exceedance.



Analytical Resources, Incorporated
Analytical Chemists and Consultants

**METHOD DETECTION
AND REPORTING LIMITS**
SM 4500-CN⁻ I-97

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Instrument: UV1800-2

Analyte	MDL	RL	Units
Cyanide, Weak Acid Dissociable	0.005	0.005	mg/L

Cyanide Titration

Buret used for titrations: CN

Analyst: CKI

Date & Time: 8/9/2021 10:37

Standardization of Cyanide Stock

Cyanide Stock ID: I011195

Silver Nitrate ID: I008487

Normality = 0.0141 grams to 1000 mL

	Blank	Blank	Blank	
mL AgNO3 =	0.04	0.04	0.04	
mL CN Stock =	1.00	1.00	1.00	
mL AgNO3 =	1.20	1.22	1.21	mg/L CN
mg/L CN Stock =				
mL required for for 10 mg/L CN Intermediate in 50 mL				0.5925



Form I
INORGANIC ANALYSIS DATA SHEET
SM 5310 B-00

MW-28_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-01 C SDG: 21I0294
Sampled: 09/20/21 10:10 Prepared: 10/08/21 15:27 File ID: ShimadzuData_10112021@0926-041
% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 10/09/21 09:00
Batch: BJJ0250 Sequence: SJJ0128 Initial/Final: 20 mL / 20 mL
Instrument: TOC-LCSH Calibration: EC00089

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
	Total Organic Carbon	18.97	1	0.50	0.50	



Form I
INORGANIC ANALYSIS DATA SHEET
SM 5310 B-00

MW-24_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-03 C SDG: 21I0294
Sampled: 09/20/21 11:11 Prepared: 10/08/21 15:27 File ID: ShimadzuData_10112021@0926-045
% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 10/09/21 10:22
Batch: BJJ0250 Sequence: SJJ0128 Initial/Final: 20 mL / 20 mL
Instrument: TOC-LCSH Calibration: EC00089

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
	Total Organic Carbon	6.07	1	0.50	0.50	



Form I
INORGANIC ANALYSIS DATA SHEET
SM 5310 B-00

MW-60_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-05 C SDG: 21I0294
Sampled: 09/20/21 11:30 Prepared: 10/08/21 15:27 File ID: ShimadzuData_10112021@0926-046
% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 10/09/21 10:49
Batch: BJJ0250 Sequence: SJJ0128 Initial/Final: 20 mL / 20 mL
Instrument: TOC-LCSH Calibration: EC00089

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
	Total Organic Carbon	4.18	1	0.50	0.50	



Form I
INORGANIC ANALYSIS DATA SHEET
SM 5310 B-00

MW-55_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-07 C SDG: 21I0294
Sampled: 09/20/21 12:29 Prepared: 10/08/21 15:27 File ID: ShimadzuData_10112021@0926-047
% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 10/09/21 11:08
Batch: BJJ0250 Sequence: SJJ0128 Initial/Final: 20 mL / 20 mL
Instrument: TOC-LCSH Calibration: EC00089

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
	Total Organic Carbon	4.20	1	0.50	0.50	



Form I
INORGANIC ANALYSIS DATA SHEET
SM 5310 B-00

MW-42_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-09 C SDG: 21I0294
Sampled: 09/20/21 12:35 Prepared: 10/08/21 15:27 File ID: ShimadzuData_10112021@0926-048
% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 10/09/21 11:32
Batch: BJJ0250 Sequence: SJJ0128 Initial/Final: 20 mL / 20 mL
Instrument: TOC-LCSH Calibration: EC00089

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
	Total Organic Carbon	4.48	1	0.50	0.50	



Form I
INORGANIC ANALYSIS DATA SHEET
SM 5310 B-00

MW-54_092021

Laboratory: Analytical Resources, LLC
Client: GeoEngineers
Project: South State Street PRDI
Matrix: Water Laboratory ID: 21I0294-11 C SDG: 21I0294
Sampled: 09/20/21 13:54 Prepared: 10/08/21 15:27 File ID: ShimadzuData_10112021@0926-049
% Solids: 0.00 Preparation: No Prep Wet Chem Analyzed: 10/09/21 11:55
Batch: BJJ0250 Sequence: SJJ0128 Initial/Final: 20 mL / 20 mL
Instrument: TOC-LCSH Calibration: EC00089

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
	Total Organic Carbon	2.60	1	0.50	0.50	



Form I
METHOD BLANK DATA SHEET
SM 5310 B-00
TotalAnalytes

Blank

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Batch: BJJ0250

Laboratory ID: BJJ0250-BLK1

Prepared: 10/08/21 15:27

Matrix: Water

Preparation: No Prep Wet Chem

Analyzed: 10/09/21 07:33

Sequence: SJJ0128

Calibration: EC00089

Instrument: TOC-LCSH

CAS NO.	Analyte	Concentration (mg/L)	Dilution Factor	MDL	MRL	Q
	Total Organic Carbon	ND	1	0.50	0.50	U



LCS / LCS DUPLICATE RECOVERY
SM 5310 B-00

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>10/09/21 08:41</u>
Batch:	<u>BJJ0250</u>	Laboratory ID:	<u>BJJ0250-BS1</u>
Preparation:	<u>No Prep Wet Chem</u>	Sequence Name:	<u>LCS</u>
Initial/Final:	<u>20 mL / 20 mL</u>		

COMPOUND	SPIKE ADDED (mg/L)	LCS CONCENTRATION (mg/L)	Q	LCS % REC. #	QC LIMITS REC.
Total Organic Carbon	20.00	19.35		96.8	90 - 110

* Indicates values outside of QC limits



DUPLICATES
SM 5310 B-00

Laboratory: Analytical Resources, LLC

SDG: 2110294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Laboratory ID: BJJ0250-DUP1

Batch: BJJ0250

Lab Source ID: 2110294-01

Preparation: No Prep Wet Chem

Initial/Final: 20 mL / 20 mL

Source Sample Name: MW-28_092021

% Solids:

ANALYTE	CONTROL LIMIT	SAMPLE CONCENTRATION (mg/L)	C	DUPLICATE CONCENTRATION (mg/L)	C	RPD %	Q
Total Organic Carbon	20	18.97		19.09		0.631	

*: Values outside of QC limits

L: Analyte concentration is ≤ 5 times the reporting limit and the replicate control limit defaults to Dup = +/- RL instead of 20% RPD



MS / MS DUPLICATE RECOVERY
SM 5310 B-00

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>10/09/21 09:42</u>
Batch:	<u>BJJ0250</u>	Laboratory ID:	<u>BJJ0250-MS1</u>
Preparation:	<u>No Prep Wet Chem</u>	Sequence Name:	<u>Matrix Spike</u>
Initial/Final:	<u>20 mL / 20 mL</u>	Source Sample:	<u>MW-28_092021</u>

COMPOUND	SPIKE ADDED (mg/L)	SAMPLE CONCENTRATION (mg/L)	Q	MS CONCENTRATION (mg/L)	Q	MS % REC. #	QC LIMITS REC.
Total Organic Carbon	20.00	18.97		37.01		90.2	75 - 125

* Values outside of QC limits



MS / MS DUPLICATE RECOVERY
SM 5310 B-00

Laboratory:	<u>Analytical Resources, LLC</u>	SDG:	<u>2110294</u>
Client:	<u>GeoEngineers</u>	Project:	<u>South State Street PRDI</u>
Matrix:	<u>Water</u>	Analyzed:	<u>10/09/21 10:02</u>
Batch:	<u>BJJ0250</u>	Laboratory ID:	<u>BJJ0250-MSD1</u>
Preparation:	<u>No Prep Wet Chem</u>	Sequence Name:	<u>Matrix Spike Dup</u>
Initial/Final:	<u>20 mL / 20 mL</u>	Source Sample:	<u>MW-28_092021</u>

COMPOUND	SPIKE ADDED (mg/L)	MSD CONCENTRATION (mg/L)	Q	MSD % REC. #	% RPD #	QC LIMITS	
						RPD	REC.
Total Organic Carbon	20.00	37.01		90.2	0.00	20	75 - 125

* Values outside of QC limits



ANALYSIS BATCH (SEQUENCE) SUMMARY

SM 5310 B-00

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJC0472

Instrument: TOC-LCSH

Calibration: EC00089

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
1	SJC0472-CAL1	ShimadzuData_03302021@1039-002	NA	03/29/21 14:39
10	SJC0472-CAL2	ShimadzuData_03302021@1039-003	NA	03/29/21 14:56
5	SJC0472-CAL3	ShimadzuData_03302021@1039-004	NA	03/29/21 15:15
2	SJC0472-CAL4	ShimadzuData_03302021@1039-005	NA	03/29/21 15:32
1	SJC0472-CAL5	ShimadzuData_03302021@1039-006	NA	03/29/21 15:49
5	SJC0472-CAL6	ShimadzuData_03302021@1039-007	NA	03/29/21 16:09
2	SJC0472-CAL7	ShimadzuData_03302021@1039-008	NA	03/29/21 16:27
1	SJC0472-CAL8	ShimadzuData_03302021@1039-009	NA	03/29/21 16:46
1	SJC0472-ICV1	ShimadzuData_03302021@1039-010	NA	03/29/21 17:06
1	SJC0472-ICB1	ShimadzuData_03302021@1039-011	NA	03/29/21 17:24
1	SJC0472-CCV1	ShimadzuData_03302021@1039-022	NA	03/29/21 21:32
1	SJC0472-CCB1	ShimadzuData_03302021@1039-023	NA	03/29/21 21:53



ANALYSIS BATCH (SEQUENCE) SUMMARY

SM 5310 B-00

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sequence: SJJ0128

Instrument: TOC-LCSH

Calibration: EC00089

Sample Name	Lab Sample ID	Lab File ID	Matrix	Analysis Date/Time
1	SJJ0128-ICV1	ShimadzuData_10112021@0926-002	NA	10/08/21 17:52
1	SJJ0128-ICB1	ShimadzuData_10112021@0926-003	NA	10/08/21 18:17
1	SJJ0128-IFA1	ShimadzuData_10112021@0926-004	NA	10/08/21 18:35
1	SJJ0128-CCV1	ShimadzuData_10112021@0926-014	NA	10/08/21 22:40
1	SJJ0128-CCB1	ShimadzuData_10112021@0926-015	NA	10/08/21 22:58
1	SJJ0128-CCV2	ShimadzuData_10112021@0926-026	NA	10/09/21 03:21
1	SJJ0128-CCB2	ShimadzuData_10112021@0926-027	NA	10/09/21 03:43
MRL Check	BJJ0250-MRL1	ShimadzuData_10112021@0926-036	Water	10/09/21 07:15
Blank	BJJ0250-BLK1	ShimadzuData_10112021@0926-037	Water	10/09/21 07:33
1	SJJ0128-CCV3	ShimadzuData_10112021@0926-038	NA	10/09/21 07:59
1	SJJ0128-CCB3	ShimadzuData_10112021@0926-039	NA	10/09/21 08:23
LCS	BJJ0250-BS1	ShimadzuData_10112021@0926-040	Water	10/09/21 08:41
MW-28_092021	21I0294-01	ShimadzuData_10112021@0926-041	Water	10/09/21 09:00
MW-28_092021	BJJ0250-DUP1	ShimadzuData_10112021@0926-042	Water	10/09/21 09:21
MW-28_092021	BJJ0250-MS1	ShimadzuData_10112021@0926-043	Water	10/09/21 09:42
MW-28_092021	BJJ0250-MSD1	ShimadzuData_10112021@0926-044	Water	10/09/21 10:02
MW-24_092021	21I0294-03	ShimadzuData_10112021@0926-045	Water	10/09/21 10:22
MW-60_092021	21I0294-05	ShimadzuData_10112021@0926-046	Water	10/09/21 10:49
MW-55_092021	21I0294-07	ShimadzuData_10112021@0926-047	Water	10/09/21 11:08
MW-42_092021	21I0294-09	ShimadzuData_10112021@0926-048	Water	10/09/21 11:32
MW-54_092021	21I0294-11	ShimadzuData_10112021@0926-049	Water	10/09/21 11:55
1	SJJ0128-CCV4	ShimadzuData_10112021@0926-050	NA	10/09/21 12:14
1	SJJ0128-CCB4	ShimadzuData_10112021@0926-051	NA	10/09/21 12:35
1	SJJ0128-CCV5	ShimadzuData_10112021@0926-062	NA	10/09/21 16:29
1	SJJ0128-CCB5	ShimadzuData_10112021@0926-063	NA	10/09/21 16:54
1	SJJ0128-CCV6	ShimadzuData_10112021@0926-073	NA	10/09/21 20:45
1	SJJ0128-CCB6	ShimadzuData_10112021@0926-074	NA	10/09/21 21:11



INITIAL CALIBRATION DATA

SM 5310 B-00

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EC00089

Instrument: TOC-LCSH

Calibration Date: 03/30/2021 10:38

Compound	Level 01		Level 02		Level 03		Level 04		Level 05		Level 06	
		RF		RF		RF		RF		RF		RF
Total Organic Carbon	0	0	0.4999	11.24425	0.9998	10.93219	2.4995	10.18604	4.999	9.847969	9.998	9.941989



INITIAL CALIBRATION DATA

SM 5310 B-00

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Calibration: EC00089

Instrument: TOC-LCSH

Calibration Date: 03/30/2021 10:38

Compound	Level 07		Level 08		Level 09		Level 10		Level 11		Level 12	
		RF		RF		RF		RF		RF		RF
Total Organic Carbon	24.995	10.09802	49.99	10.20404								



INSTRUMENT BLANKS SM 5310 B-00

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: TOC-LCSH

Calibration: EC00089

Sequence: SJC0472

Date Analyzed: 03/29/21 17:24

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJC0472-ICB1	Total Organic Carbon	0.32	0.5	0.50	mg/L	
SJC0472-CCB1	Total Organic Carbon	0.18	0.5	0.50	mg/L	



INSTRUMENT BLANKS SM 5310 B-00

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: TOC-LCSH

Calibration: EC00089

Sequence: SJJ0128

Date Analyzed: 10/08/21 18:17

Lab Sample ID	Analyte	Found	MDL	MRL	Units	C
SJJ0128-ICB1	Total Organic Carbon	0.17	0.5	0.50	mg/L	
SJJ0128-CCB1	Total Organic Carbon	0.37	0.5	0.50	mg/L	
SJJ0128-CCB2	Total Organic Carbon	0.44	0.5	0.50	mg/L	
SJJ0128-CCB3	Total Organic Carbon	0.20	0.5	0.50	mg/L	
SJJ0128-CCB4	Total Organic Carbon	0.28	0.5	0.50	mg/L	
SJJ0128-CCB5	Total Organic Carbon	0.21	0.5	0.50	mg/L	
SJJ0128-CCB6	Total Organic Carbon	0.34	0.5	0.50	mg/L	



INITIAL AND CONTINUING CALIBRATION CHECK

SM 5310 B-00

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: TOC-LCSH

Calibration: EC00089

Control Limit: +/- 10.00%

Sequence: SJC0472

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SJC0472-ICV1	Total Organic Carbon	20.000	20.36	102	mg/L	SM 5310 B-00
SJC0472-CCV1	Total Organic Carbon	20.000	19.72	98.6	mg/L	SM 5310 B-00

* Values outside of QC limits



INITIAL AND CONTINUING CALIBRATION CHECK

SM 5310 B-00

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Instrument ID: TOC-LCSH

Calibration: EC00089

Control Limit: +/- 10.00%

Sequence: SJJ0128

Lab Sample ID	Analyte	True	Found	%R	Units	Method
SJJ0128-ICV1	Total Organic Carbon	20.000	19.46	97.3	mg/L	SM 5310 B-00
SJJ0128-CCV1	Total Organic Carbon	20.000	20.00	100	mg/L	SM 5310 B-00
SJJ0128-CCV2	Total Organic Carbon	20.000	20.18	101	mg/L	SM 5310 B-00
SJJ0128-CCV3	Total Organic Carbon	20.000	19.67	98.4	mg/L	SM 5310 B-00
SJJ0128-CCV4	Total Organic Carbon	20.000	19.05	95.3	mg/L	SM 5310 B-00
SJJ0128-CCV5	Total Organic Carbon	20.000	19.39	97.0	mg/L	SM 5310 B-00
SJJ0128-CCV6	Total Organic Carbon	20.000	21.34	107	mg/L	SM 5310 B-00

* Values outside of QC limits



HOLDING TIME SUMMARY

Analysis: SM 5310 B-00

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Sample Name	Date Collected	Date Received	Date Prepared	Days to Prep	Max Days to Prep	Date Analyzed	Days to Analysis	Max Days to Analysis	Q
MW-28_092021 21I0294-01	09/20/21 10:10	09/21/21 15:38	10/08/21 15:27	18	28	10/09/21 09:00	19	28	
MW-24_092021 21I0294-03	09/20/21 11:11	09/21/21 15:38	10/08/21 15:27	18	28	10/09/21 10:22	19	28	
MW-60_092021 21I0294-05	09/20/21 11:30	09/21/21 15:38	10/08/21 15:27	18	28	10/09/21 10:49	19	28	
MW-55_092021 21I0294-07	09/20/21 12:29	09/21/21 15:38	10/08/21 15:27	18	28	10/09/21 11:08	19	28	
MW-42_092021 21I0294-09	09/20/21 12:35	09/21/21 15:38	10/08/21 15:27	18	28	10/09/21 11:32	19	28	
MW-54_092021 21I0294-11	09/20/21 13:54	09/21/21 15:38	10/08/21 15:27	18	28	10/09/21 11:55	19	28	
Duplicate BJJ0250-DUP1	09/20/21 10:10	09/21/21 15:38	10/08/21 15:27	18	28	10/09/21 09:21	19	28	
Matrix Spike BJJ0250-MS1	09/20/21 10:10	09/21/21 15:38	10/08/21 15:27	18	28	10/09/21 09:42	19	28	
Matrix Spike Dup BJJ0250-MSD1	09/20/21 10:10	09/21/21 15:38	10/08/21 15:27	18	28	10/09/21 10:02	19	28	

* Indicates hold time exceedance.



Analytical Resources, Incorporated
Analytical Chemists and Consultants

**METHOD DETECTION
AND REPORTING LIMITS**
SM 5310 B-00

Laboratory: Analytical Resources, LLC

SDG: 21I0294

Client: GeoEngineers

Project: South State Street PRDI

Matrix: Water

Instrument: TOC-LCSH

Analyte	MDL	RL	Units
Total Organic Carbon	0.50	0.50	mg/L



H000245

Certificate of Analysis

Sulfuric Acid (Conc.)

Expires 12/31/2030

Prepared By William Wheeler 1/8/2019

1 Reagent Lane
Fair Lawn, NJ 07410
201.796.7100 tel
201.796.1329 fax

ThermoFisher Scientific's Quality System has been found to conform to Quality Management System
Standard ISO9001:2015 by SAI Global Certificate Number CERT - 0120632

This is to certify that units of the lot number below were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. ThermoFisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Products are for research use or further manufacturing. Not for direct administration to humans or animals. It is the responsibility of the manufacturer to determine suitability based upon the intended use of the end product. Products are tested to meet the analytical requirements of the noted grade. The following information is the actual analytical results obtained.

Catalog Number	A300	Quality Test / Release Date	10/23/2018
Lot Number	187190		
Description	SULFURIC ACID, CERTIFIED ACS		
Country of Origin	United States	Suggested Retest Date	Oct/2023
Chemical Origin	Inorganic-non animal		
BSE/TSE Comment	No animal products are used as starting raw material ingredients, or used in processing, including lubricants, processing aids, or any other material that might migrate to the finished product.		
Chemical Comment			

N/A

Result Name	Units	Specifications	Test Value
APPEARANCE		REPORT	Colorless and free from suspended or insoluble matter
ALUMINUM	ppm	<= 0.2	<0.1
ZINC (Zn)	ppm	<= 0.2	<0.1
ARSENIC (As)	ppm	<= 0.004	<0.001
ASSAY	w/w %	Inclusive Between 95.0 - 98.0	96.1
BORON (B)	ppm	<= 0.05	<0.05
CALCIUM (Ca)	ppm	<= 0.3	<0.1
CHLORIDE	ppm	<= 0.1	<0.1
CHROMIUM (Cr)	ppm	<= 0.2	<0.1
COLOR	APHA	<= 10	<5
COPPER (Cu)	ppm	<= 0.1	<0.1
GOLD (Au)	ppm	<= 0.3	<0.1
HEAVY METALS (as Pb)	ppm	<= 0.8	<0.005
IDENTIFICATION	PASS/FAIL	= PASS TEST	PASS TEST
IRON (Fe)	ppm	<= 0.2	<0.2
SUBSTANCES REDUCING KMNO4	ppm	<= 2	<2
LEAD (Pb)	ppm	<= 0.3	<0.1
MAGNESIUM (Mg)	ppm	<= 0.3	<0.1
MANGANESE (Mn)	ppm	<= 0.2	<0.1
MERCURY (Hg)	ppb	<= 5	<5

Note: The data listed is valid for all package sizes of this lot of this product, expressed as an extension of this catalog number listed above. If there are any questions with this certificate, please call at (800) 227-6701.

*Based on suggested storage condition.



Certificate of Analysis

1 Reagent Lane
 Fair Lawn, NJ 07410
 201.796.7100 tel
 201.796.1329 fax

ThermoFisher Scientific's Quality System has been found to conform to Quality Management System
 Standard ISO9001:2015 by SAI Global Certificate Number CERT - 0120632

NICKEL (Ni)	ppm	<= 0.1	<0.1
NITRATE (NO3)	ppm	<= 0.2	<0.1
PHOSPHATE (PO4)	ppm	<= 0.5	<0.1
POTASSIUM (K)	ppm	<= 0.3	<0.1
RESIDUE AFTER IGNITION	ppm	<= 3	<3
SODIUM (Na)	ppm	<= 0.3	<0.1
TIN (Sn)	ppm	<= 0.2	<0.1
TITANIUM (Ti)	ppm	<= 0.3	<0.1
AMMONIUM (NH4)	ppm	<= 1	<1

Residual Solvents	
-------------------	--

Jerisa Bailey-Wyche

Quality Assurance Specialist - Certificate of Analysis Fair Lawn

Note: The data listed is valid for all package sizes of this lot of this product, expressed as an extension of this catalog number listed above.
 If there are any questions with this certificate, please call at (800) 227-6701.

*Based on suggested storage condition.

Certificate of Analysis

Organic Carbon Standard, 5000 ppm C

Lot Number: 1007929

Product Number: R1849500

Manufacture Date: JUL 13, 2020

Expiration Date: JUL 2021

The certified value reported is the prepared value based upon the method of preparation of the material. The uncertainty in the prepared value is based upon the volumetric method of preparation.

Name	CAS#	Grade
Water	7732-18-5	ACS/ASTM/USP/EP
Potassium Acid Phthalate	877-24-7	ACS Acidimetric

Test	Specification	Result
Appearance	Colorless liquid	Passed
Carbon (C)	4990-5010 ppm	5000 ppm

Specification	Reference
Potassium Hydrogen Phthalate, Stock Solution	EPA (SW-846) (9060)

Volumetric glassware complies with Class A tolerance requirements of ASTM E 288 and NIST Circular 434; it is calibrated before first use and recalibrated regularly in accordance with ASTM E 542 and NIST Procedure NBSIR 74-461. Balances are calibrated regularly with weights certified traceable to the NIST national mass standard. Thermometers and temperature probes are calibrated before first use and recalibrated regularly with a thermometer traceable to NIST standards. All products are prepared according to master documents that assure manufacture according to validated methods. Batch records document raw material traceability and production and testing history for each lot manufactured.

Part Number	Size / Package Type	Shelf Life (Unopened Container)
R1849500-500C	500 mL amber glass	12 months

Recommended Storage: 15°C - 30°C (59°F - 86°F)



Israel Alamudun (07/13/2020)

Quality Control Supervisor

This Certificate of Analysis is designed to comply with ISO Guide 31 "Reference Materials -- Contents of Certificates and Labels."

This test report shall not be reproduced, except in full, without the written approval of Ricca Chemical Company.



1 Reagent Lane
 Fair Lawn, NJ 07410
 201.796.7100 tel
 201.796.1329 fax

Certificate of Analysis

Fisher Scientific's Quality System has been found to conform to Quality Management System Standard ISO9001:2008 standard by SAI Global Certificate Number CERT - 0090918

This is to certify that units of the lot number below were tested and found to comply with the specifications of the grade listed. Certain data have been supplied by third parties. Fisher Scientific expressly disclaims all warranties, expressed or implied, including the implied warranties of merchantability and fitness for a particular purpose. Certain products (USP/FCC/NF/EP/BP/JP grades) are sold for use in food, drug, or medical device manufacturing. Fisher does not claim regulatory coverage under 21 CFR nor maintain DMF's with the FDA. The following are the actual analytical results obtained:

Catalog Number	S263	Quality Test / Release Date 9/28/2016	
Lot Number	164101		
Description	SODIUM CARBONATE, ANHYDROUS, CERTIFIED A.C.S.		
Country of Origin	China	* Suggested Retest Date	Sep-2021
Chemical Origin	Inorganic-non animal		
BSE/TSE Comment	No animal products are used as starting raw material ingredients, or used in processing, including lubricants, processing aids, or any other material that might migrate to the finished product.		

Result name	Units	Specifications	Test Value
APPEARANCE		REPORT	White crystalline powder.
ASSAY	%	>= 99.5	99.8
CALCIUM	%	<= 0.03	0.010
CHLORIDE	%	<= 0.001	<0.0010
HEAVY METALS (as Pb)	ppm	<= 5	<5.0
IDENTIFICATION	PASS/FAIL	= PASS TEST	PASS TEST
INSOLUBLE MATTER	%	<= 0.01	<0.010
IRON (Fe)	ppm	<= 5	<5.0
LOSS ON HEATING @ 285 DEG C	%	<= 1.0	0.2
MAGNESIUM	%	<= 0.005	<0.005
PHOSPHATE (PO4)	%	<= 0.001	<0.0010
POTASSIUM (K)	%	<= 0.005	0.001
SILICA (SiO2)	%	<= 0.005	<0.005
SULFUR COMPOUNDS	%	<= 0.003	<0.0030



Jerisa Bailey-Wyche

Quality Assurance Specialist - Certificate of Analysis Fair Lawn

Note: The data listed is valid for all package sizes of this lot of this product, expressed as a extension of this catalog number listed above. If there are any questions with this certificate, please call Chemical Services at (800) 227-6701.

*Based on suggested storage condition.



Aqua Solutions, Inc.
 Ph: 281-479-2569
 Fax: 281-479-2790
 P.O. Box 70
 Deer Park, TX 77536
 Website: www.aquasolutions.org

Page: 1

Date: 06/08/21 at 2:19 PM

Aqua Solutions, Inc.
6913 Highway 225
Deer Park, TX, 77536
281/479-2569

J007393

Organic Carbon Standard, 5000 ppm C
 Expires 12/30/2021
 Prepared By Brandon Fisk 7/16/2021

Certificate of Analysis / QC Results

Customer PO # :

Packaged Product:			
	P 8 T 6 9 6 S 9		
Test	Target/UOM	Range	Result
PREPARED TO FORMULATION ON FILE	YES YES		YES
Sample ID			
Tested 06/08/21			
Tester CNOL			
Recorded 06/08/21			
APPEARANCE AND COLOR	CLEAR WATER WHITE LIQUID APPEARANCE		PASS
Sample ID			
Tested 06/08/21			
Tester CNOL			
Recorded 06/08/21			
INSTRUMENTS USED DURING PREPARATION	INSTRUMENT		M21,VF3-J11,M66
Sample ID			
Tested 06/08/21			
Tester CNOL			
Recorded 06/08/21			
EXPIRATION DATE	MM/DD/YY MM/DD/YYYY		12/30/21
Sample ID			
Tested 06/08/21			
Tester CNOL			
Recorded 06/08/21			
SHELF LIFE OF PRODUCT	SHELF LIFE TIME		6 MONTHS
Sample ID			
Tested 06/08/21			
Tester CNOL			
Recorded 06/08/21			
PPM TOC NO DEC PLACES	5000 PPM	4750 - 5250	5129
Sample ID			
Tested 06/08/21			
Tester CNOL			
Recorded 06/08/21			
Lot #			
Made			

This is to certify that the product listed above has been prepared according to the agreed upon formulation. The solutions producer has a Quality Management System which governs each step of the manufacturing process to insure the production of a consistent product. Traceability from the producer's lot numbers to the original manufacturer's lot number is maintained. Certificates of Analysis for the raw materials used to prepare this product are available upon request.

The weights and/or volumes used to prepare this product are N.I.S.T. Traceable. All balances used in the preparation of product are calibrated daily against N.I.S.T. Traceable weights. The balances are maintained and serviced on a regular basis by an outside certified company. All volumetric glassware used is N.I.S.T. Traceable and certified as meeting Class A specifications.



Aqua Solutions, Inc.
Ph: 281-479-2569
Fax: 281-479-2790
P.O. Box 70
Deer Park, TX 77536
Website: www.aquasolutions.org

Page: 2

Date: 06/08/21 at 2:19 PM

Aqua Solutions, Inc.
6913 Highway 225
Deer Park, TX, 77536
281/479-2569
Certificate of Analysis / QC Results
Customer PO # :

Unless otherwise agreed to, all chemicals used in the preparation of this product are Reagent ACS grade.

Quality Manager



22 July 2021

Brian Tracy
GeoEngineers
17425 Union Hill Road Suite 250
Redmond, WA 98052

RE: South State Street PRDI

Please find enclosed sample receipt documentation and analytical results for samples from the project referenced above.

Sample analyses were performed according to ARI's Quality Assurance Plan and any provided project specific Quality Assurance Plan. Each analytical section of this report has been approved and reviewed by an analytical peer, the appropriate Laboratory Supervisor or qualified substitute, and a technical reviewer.

Should you have any questions or problems, please feel free to contact us at your convenience.

Associated Work Order(s)
21F0419

Associated SDG ID(s)
N/A

I certify that this data package is in compliance with the terms and conditions of the contract, both technically and for completeness, for other than the conditions detailed in the enclose Narrative. ARI, an accredited laboratory, certifies that the report results for which ARI is accredited meets all the requirements of the accrediting body. A list of certified analyses, accreditations, and expiration dates is included in this report.

Release of the data contained in this hardcopy data package has been authorized by the Laboratory Manager or his/her designee, as verified by the following signature.

Analytical Resources, Inc.

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety.



Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: 21F0419	Turn-around Requested: Standard
ARI Client Company: GeoEngineers	Phone: 206-728-2674
Client Contact: Brian Tracy	

Date: 6/25/21
Page: 1 of 6
No. of Coolers: Cooler Temps:



Analytical Resources, Incorporated
Analytical Chemists and Consultants
4611 South 134th Place, Suite 100
Tukwila, WA 98168
206-695-6200 206-695-6201 (fax)

Client Project Name: South State Street Boulevard Park					Analysis Requested						Notes/Comments		
Client Project #: 0186-890-03		Samplers: KRA & DC			NWTPH-Gx	NWTPH-Dx	Benzene (EPA 8260D)	Naphthalen (EPA 8260D)	Total Cyanide (EPA 9014) for water	WAD Cyanide (SM4500) for water			
Sample ID	Date	Time	Matrix	No. Containers									
PRDI-1-PW-	6/23/21	0940	pw	8	X	X	X	X	X	X			
PRDI-2-PW-	6/23/21	1040	pw	8	X	X	X	X	X	X			
PRDI-3-PW-	6/22/21	1315	pw	8	X	X	X	X	X	X			
PRDI-4-PW-	6/24/21	1000	pw	8	X	X	X	X	X	X			
PRDI-5-PW-	6/24/21	1200	pw	8	X	X	X	X	X	X			
PRDI-6-PW-	6/22/21	1030	pw	8	X	X	X	X	X	X			
PRDI-7-PW-	6/23/21	1250	pw	8	X	X	X	X	X	X			
PRDI-8-PW-	6/24/21	0920	pw	8	X	X	X	X	X	X			
PRDI-9-PW-	6/ /21		pw		X	X	X	X	X	X			
PRDI-10-PW-	6/24/21	1300	pw	8	X	X	X	X	X	X			
Comments/Special Instructions	Relinquished by: (Signature) <i>Katy Ataktirk</i>		Received by: (Signature) <i>Samantha Cohen</i>		Relinquished by: (Signature)		Received by: (Signature)		Received by: (Signature)		Received by: (Signature)		
	Printed Name: <i>Katy Ataktirk</i>		Printed Name: <i>Samantha Cohen</i>		Printed Name:		Printed Name:		Printed Name:		Printed Name:		
	Company: <i>GEI</i>		Company: <i>ARI</i>		Company:		Company:		Company:		Company:		
	Date & Time: <i>6/25/21 15:30</i>		Date & Time: <i>6/25/21 1530</i>		Date & Time:		Date & Time:		Date & Time:		Date & Time:		

Limits of Liability: ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

Sample Retention Policy: Unless specified by workorder or contract, all water/soil samples submitted to ARI will be discarded or returned, no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer. Sediment samples submitted under PSDDA/PSEP/SMS protocol will be stored frozen for up to one year and then discarded.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: 21F0419	Turn-around Requested: Standard	Date: 6/25/21
ARI Client Company: GeoEngineers	Phone: 206-728-2674	Page: 2 of 6
Client Contact: Brian Tracy	No. of Coolers:	Cooler Temps:



Analytical Resources, Incorporated
 Analytical Chemists and Consultants
 4611 South 134th Place, Suite 100
 Tukwila, WA 98168
 206-695-6200 206-695-6201 (fax)

Client Project Name: South State Street Boulevard Park					Analysis Requested							Notes/Comments		
Client Project #: 0186-890-03		Samplers: KRA & DC			NWTPH-Gx	NWTPH-DX	Benzene (EPA 8260D)	Naphthalen (EPA 8260D)	Total Cyanide (EPA 9014) for water	WAD Cyanide (SM4500) for water				
Sample ID	Date	Time	Matrix	No. Containers										
PRDI-11-PW-	6/25/21	1110	pw	8	X	X	X	X	X	X				
PRDI-12-PW-	6/25/21	1010	pw	8	X	X	X	X	X	X				
Dup-1-PW-06/21	6/23/21	1120	pw	8	X	X	X	X	X	X				
Comments/Special Instructions	Relinquished by: (Signature) <i>Katy Adalberto</i>		Received by: (Signature) <i>Samantha Colon</i>		Relinquished by: (Signature)			Received by: (Signature)						
	Printed Name: <i>Katy Adalberto</i>		Printed Name: <i>Samantha Colon</i>		Printed Name:			Printed Name:						
	Company: <i>GEI</i>		Company: <i>ARI</i>		Company:			Company:						
	Date & Time: <i>6/25/21 15:30</i>		Date & Time: <i>6/25/21 15:30</i>		Date & Time:			Date & Time:						

Limits of Liability: ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

Sample Retention Policy: Unless specified by workorder or contract, all water/soil samples submitted to ARI will be discarded or returned, no sooner than 90 days after receipt or 60 days after submission of

Chain of Custody Record & Laboratory Analysis Request



Analytical Resources, Incorporated
 Analytical Chemists and Consultants
 4611 South 134th Place, Suite 100
 Tukwila, WA 98168
 206-695-6200 206-695-6201 (fax)

ARI Assigned Number: 21F0419	Turn-around Requested: Standard	Date: 6/25/21
ARI Client Company: GeoEngineers	Phone: 206-728-2674	Page: 3 of 6
Client Contact: Brian Tracy	No. of Coolers:	Cooler Temps:

Client Project Name: South State Street Boulevard Park	Analysis Requested							Notes/Comments		
Client Project #: 0186-890-03	Samplers: KRA & DC	NWTPH-Gx	NWTPH-Dx	Benzene (EPA 826)	Naphthalen (EPA 8)	Total Cyanide for Soil (EPA 9014)	TOC in solids (SW 9060A)	Grain Size (ASTM D6913/7928)	cPAHs (EPA 8270D-SIM)	Archive

Sample ID	Date	Time	Matrix	No. Containers	NWTPH-Gx	NWTPH-Dx	Benzene (EPA 826)	Naphthalen (EPA 8)	Total Cyanide for Soil (EPA 9014)	TOC in solids (SW 9060A)	Grain Size (ASTM D6913/7928)	cPAHs (EPA 8270D-SIM)	Archive	Notes/Comments
PRDI-1-SC-0-15	6/23/21	1000	S	8	X	X	X	X	X	X				
PRDI-1-SC-15-60	6/23/21	1020	S	9	X	X	X	X	X	X	X			
PRDI-2-SC-0-15	6/23/21	1100	S	8	X	X	X	X	X	X				
PRDI-2-SC-15-60	6/23/21	1110	S	9	X	X	X	X	X	X	X			
PRDI-3-SC-0-15	6/22/21	1310	S	8	X	X	X	X	X	X				
PRDI-3-SC-15-60	6/22/21	1330	S	9	X	X	X	X	X	X	X			
PRDI-4-SC-0-15	6/24/21	1010	S	8	X	X	X	X	X	X				
PRDI-4-SC-15-60	6/24/21	1020	S	9	X	X	X	X	X	X	X			
PRDI-5-SC-0-15	6/22/21	1150	S	8	X	X	X	X	X	X				
PRDI-5-SC-15-60	6/22/21	1240	S	9	X	X	X	X	X	X	X			

Comments/Special Instructions	Relinquished by: (Signature) <i>[Signature]</i>	Received by: (Signature) <i>[Signature]</i>	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Katy Atakuturk	Printed Name: Samantha Colan	Printed Name:	Printed Name:
	Company: GEI	Company: ARI	Company:	Company:
	Date & Time: 6/25/21 15:30	Date & Time: 6/25/21 1530	Date & Time:	Date & Time:

Limits of Liability: ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

Sample Retention Policy: Unless specified by workorder or contract, all water/soil samples submitted to ARI will be discarded or returned, no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer. Sediment samples submitted under PSDDA/PSEP/SMS protocol will be stored frozen for up to one year and then discarded.

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: 21F0419	Turn-around Requested: Standard	Date: 6/25/21
ARI Client Company: GeoEngineers	Phone: 206-728-2674	Page: 4 of 6
Client Contact: Brian Tracy	No. of Coolers:	Cooler Temps:



Analytical Resources, Incorporated
 Analytical Chemists and Consultants
 4611 South 134th Place, Suite 100
 Tukwila, WA 98168
 206-695-6200 206-695-6201 (fax)

Client Project Name: South State Street Boulevard Park	Analysis Requested	Notes/Comments
Client Project #: 0186-890-03	Samplers: KRA & DC	

Sample ID	Date	Time	Matrix	No. Containers	NWTPH-Gx	NWTPH-Dx	Benzene (EPA 826)	Naphthalen (EPA 8)	Total Cyanide for Soil (EPA 9014)	TOC in solids (SW 9060A)	Grain Size (ASTM D6913/7928)	cPAHs (EPA 8270D-SIM)	Archive	Notes/Comments
PRDI-6-SC-0-15	6/22/21	1045	S	8	X	X	X	X	X	X				
PRDI-6-SC-15-60	6/22/21	1050	S	9	X	X	X	X	X	X	X			
PRDI-7-SC-0-15	6/23/21	1300	S	8	X	X	X	X	X	X				
PRDI-7-SC-15-60	6/23/21	1320	S	9	X	X	X	X	X	X	X			
PRDI-8-SC-0-15	6/24/21	0930	S	8	X	X	X	X	X	X				
PRDI-8-SC-15-60	6/24/21	0940	S	9	X	X	X	X	X	X	X			
PRDI-9-SC-0-15	6/24/21	1200	S	8	X	X	X	X	X	X				
PRDI-9-SC-15-60	6/24/21	1210	S	9	X	X	X	X	X	X	X			
PRDI-9-SS-0-12	6/24/21	1200	S	1								X		
PRDI-9-SC-0-45	6/24/21	1200	S	1								X		

Comments/Special Instructions	Relinquished by: (Signature) <i>Katy Habtirk</i>	Received by: (Signature) <i>Samantha Colan</i>	Relinquished by: (Signature)	Received by: (Signature)
	Printed Name: Katy Habtirk	Printed Name: Samantha Colan	Printed Name:	Printed Name:
	Company: GEI	Company: ARI	Company:	Company:
	Date & Time: 6/25/21 15:30	Date & Time: 6/25/21 1530	Date & Time:	Date & Time:

Limits of Liability: ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

Sample Retention Policy: Unless specified by workorder or contract, all water/soil samples submitted to ARI will be discarded or returned, no sooner than 90 days after receipt or 60 days after submission of

Chain of Custody Record & Laboratory Analysis Request

ARI Assigned Number: 21F0419	Turn-around Requested: Standard	Date: 6/25/21
ARI Client Company: GeoEngineers	Phone: 206-728-2674	Page: 5 of 6
Client Contact: Brian Tracy		No. of Coolers: Cooler Temps:



Analytical Resources, Incorporated
 Analytical Chemists and Consultants
 4611 South 134th Place, Suite 100
 Tukwila, WA 98168
 206-695-6200 206-695-6201 (fax)

Client Project Name: South State Street Boulevard Park					Analysis Requested									Notes/Comments
Client Project #: 0186-890-03		Samplers: KRA & DC			NWTPH-Gx	NWTPH-DX	Benzene (EPA 826)	Naphthalen (EPA 8)	Total Cyanide for Soil (EPA 9014)	TOC in solids (SW 9060A)	Grain Size (ASTM D6913/7928)	cPAHs (EPA 8270D-SIM)	Archive	
Sample ID	Date	Time	Matrix	No. Containers										
PRDI-10-SC-0-15	6/24/21	1310	S	8	X	X	X	X	X	X				
PRDI-10-SC-15-60	6/24/21	1320	S	9	X	X	X	X	X	X				
PRDI-10-SS-0-12	6/24/21	1330	S	1								X		
PRDI-10-SC-0-45	6/24/21	1340	S	1								X		
PRDI-11-SC-0-15	6/25/21	1120	S	8	X	X	X	X	X	X				
PRDI-11-SC-15-60	6/25/21	1130	S	9	X	X	X	X	X	X				
PRDI-11-SS-0-12	6/25/21	1140	S	1								X		
PRDI-11-SC-0-45	6/25/21	1150	S	1								X		
PRDI-12-SC-0-15	6/25/21	1020	S	8	X	X	X	X	X	X				
PRDI-12-SC-15-60	6/25/21	1030	S	9	X	X	X	X	X	X				
Comments/Special Instructions	Relinquished by: (Signature) <i>Kathy A...</i>		Received by: (Signature) <i>Smartina Colon</i>		Relinquished by: (Signature)				Received by: (Signature)					
	Printed Name: <i>Kathy A. Harkirk</i>		Printed Name: <i>Smartina Colon</i>		Printed Name:				Printed Name:					
	Company: <i>GEI</i>		Company: <i>ARI</i>		Company:				Company:					
	Date & Time: <i>6/25/21 15:30</i>		Date & Time: <i>6/25/21 1530</i>		Date & Time:				Date & Time:					

Limits of Liability: ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.

Sample Retention Policy: Unless specified by workorder or contract, all water/soil samples submitted to ARI will be discarded or returned, no sooner than 90 days after receipt or 60 days after submission of hardcopy data, whichever is longer. Sediment samples submitted under PSDDA/PSEP/SMS protocol will be stored frozen for up to one year and then discarded.

Chain of Custody Record & Laboratory Analysis Request



Analytical Resources, Incorporated
 Analytical Chemists and Consultants
 4611 South 134th Place, Suite 100
 Tukwila, WA 98168
 206-695-6200 206-695-6201 (fax)

ARI Assigned Number: 21F0419	Turn-around Requested: Standard	Date: 6/25/21
ARI Client Company: GeoEngineers	Phone: 206-728-2674	Page: 6 of 6
Client Contact: Brian Tracy	No. of Coolers:	Cooler Temps:

Client Project Name: South State Street Boulevard Park					Analysis Requested										Notes/Comments
Client Project #: 0186-890-03		Samplers: KRA & DC			NWTPH-Gx	NWTPH-Dx	Benzene (EPA 826)	Naphthalen (EPA 8)	Total Cyanide for Soil (EPA 9014)	TOC in solids (SW 9060A)	Grain Size (ASTM D6913/7928)	cPAHs (EPA 8270D-SIM)	Archive		
Sample ID	Date	Time	Matrix	No. Containers											
PRDI-12-SS-0-12	6/25/21	1040	S	1								X			
PRDI-12-SC-0-45	6/25/21	1050	S	1								X			
Dup-1-SC-06421	6/23/21	1105	S	8	X	X	X	X	X	X					
Dup-3-SC-06421	6/24/21	1220	S	8	X	X	X	X							
TBLONK-1-062521	6/25/21	—	W	1	X		X	X							
Comments/Special Instructions															
Relinquished by: (Signature) <i>Kay Anctin</i>		Received by: (Signature) <i>Emmanuel Colon</i>			Relinquished by: (Signature)					Received by: (Signature)					
Printed Name: Kay Anctin		Printed Name: Emmanuel Colon			Printed Name:					Printed Name:					
Company: SEI		Company: ARI			Company:					Company:					
Date & Time: 6/25/21 1530		Date & Time: 6/25/21 1530			Date & Time:					Date & Time:					

Limits of Liability: ARI will perform all requested services in accordance with appropriate methodology following ARI Standard Operating Procedures and the ARI Quality Assurance Program. This program meets standards for the industry. The total liability of ARI, its officers, agents, employees, or successors, arising out of or in connection with the requested services, shall not exceed the Invoiced amount for said services. The acceptance by the client of a proposal for services by ARI release ARI from any liability in excess thereof, notwithstanding any provision to the contrary in any contract, purchase order or co-signed agreement between ARI and the Client.



GeoEngineers
17425 Union Hill Road Suite 250
Redmond WA, 98052

Project: South State Street PRDI
Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
22-Jul-2021 19:04

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
PRDI-1-PW-	21F0419-01	Water	23-Jun-2021 09:40	25-Jun-2021 15:30
PRDI-2-PW-	21F0419-02	Water	23-Jun-2021 10:40	25-Jun-2021 15:30
PRDI-3-PW-	21F0419-03	Water	22-Jun-2021 13:15	25-Jun-2021 15:30
PRDI-4-PW-	21F0419-04	Water	24-Jun-2021 10:00	25-Jun-2021 15:30
PRDI-5-PW-	21F0419-05	Water	22-Jun-2021 12:00	25-Jun-2021 15:30
PRDI-6-PW-	21F0419-06	Water	22-Jun-2021 10:30	25-Jun-2021 15:30
PRDI-7-PW-	21F0419-07	Water	23-Jun-2021 12:50	25-Jun-2021 15:30
PRDI-8-PW-	21F0419-08	Water	24-Jun-2021 09:20	25-Jun-2021 15:30
PRDI-10-PW-	21F0419-09	Water	24-Jun-2021 13:00	25-Jun-2021 15:30
PRDI-11-PW-	21F0419-10	Water	25-Jun-2021 11:10	25-Jun-2021 15:30
PRDI-12-PW-	21F0419-11	Water	25-Jun-2021 10:10	25-Jun-2021 15:30
Dup-1-PW-	21F0419-12	Water	23-Jun-2021 11:20	25-Jun-2021 15:30
PRDI-1-SC-0-15	21F0419-13	Solid	23-Jun-2021 10:00	25-Jun-2021 15:30
PRDI-1-SC-15-60	21F0419-14	Solid	23-Jun-2021 10:20	25-Jun-2021 15:30
PRDI-2-SC-0-15	21F0419-15	Solid	23-Jun-2021 11:00	25-Jun-2021 15:30
PRDI-2-SC-15-60	21F0419-16	Solid	23-Jun-2021 11:10	25-Jun-2021 15:30
PRDI-3-SC-0-15	21F0419-17	Solid	22-Jun-2021 13:10	25-Jun-2021 15:30
PRDI-3-SC-15-60	21F0419-18	Solid	22-Jun-2021 13:30	25-Jun-2021 15:30
PRDI-4-SC-0-15	21F0419-19	Solid	24-Jun-2021 10:10	25-Jun-2021 15:30
PRDI-4-SC-15-60	21F0419-20	Solid	24-Jun-2021 10:20	25-Jun-2021 15:30
PRDI-5-SC-0-15	21F0419-21	Solid	22-Jun-2021 11:50	25-Jun-2021 15:30
PRDI-5-SC-15-60	21F0419-22	Solid	22-Jun-2021 12:40	25-Jun-2021 15:30
PRDI-6-SC-0-15	21F0419-23	Solid	22-Jun-2021 10:45	25-Jun-2021 15:30
PRDI-6-SC-15-60	21F0419-24	Solid	22-Jun-2021 10:50	25-Jun-2021 15:30
PRDI-7-SC-0-15	21F0419-25	Solid	23-Jun-2021 13:00	25-Jun-2021 15:30
PRDI-7-SC-15-60	21F0419-26	Solid	23-Jun-2021 13:20	25-Jun-2021 15:30
PRDI-8-SC-0-15	21F0419-27	Solid	24-Jun-2021 09:30	25-Jun-2021 15:30
PRDI-8-SC-15-60	21F0419-28	Solid	24-Jun-2021 09:40	25-Jun-2021 15:30
PRDI-9-SC-0-15	21F0419-29	Solid	24-Jun-2021 12:00	25-Jun-2021 15:30
PRDI-9-SC-15-60	21F0419-30	Solid	24-Jun-2021 12:10	25-Jun-2021 15:30
PRDI-9-SS-0-12	21F0419-31	Solid	24-Jun-2021 12:00	25-Jun-2021 15:30
PRDI-9-SC-0-45	21F0419-32	Solid	24-Jun-2021 12:00	25-Jun-2021 15:30
PRDI-10-SC-0-15	21F0419-33	Solid	24-Jun-2021 13:10	25-Jun-2021 15:30
PRDI-10-SC-15-60	21F0419-34	Solid	24-Jun-2021 13:20	25-Jun-2021 15:30
PRDI-10-SS-0-12	21F0419-35	Solid	24-Jun-2021 13:30	25-Jun-2021 15:30
PRDI-10-SC-0-45	21F0419-36	Solid	24-Jun-2021 13:40	25-Jun-2021 15:30
PRDI-11-SC-0-15	21F0419-37	Solid	25-Jun-2021 11:20	25-Jun-2021 15:30
PRDI-11-SC-15-60	21F0419-38	Solid	25-Jun-2021 11:30	25-Jun-2021 15:30
PRDI-11-SS-0-12	21F0419-39	Solid	25-Jun-2021 11:40	25-Jun-2021 15:30



GeoEngineers 17425 Union Hill Road Suite 250 Redmond WA, 98052	Project: South State Street PRDI Project Number: Project #186-890-03 Tsk 300 Project Manager: Brian Tracy	Reported: 22-Jul-2021 19:04
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PRDI-11-SC-0-45	21F0419-40	Solid	25-Jun-2021 11:50	25-Jun-2021 15:30
PRDI-12-SC-0-15	21F0419-41	Solid	25-Jun-2021 10:20	25-Jun-2021 15:30
PRDI-12-SC-15-60	21F0419-42	Solid	25-Jun-2021 10:30	25-Jun-2021 15:30
PRDI-12-SS-0-12	21F0419-43	Solid	25-Jun-2021 10:40	25-Jun-2021 15:30
PRDI-12-SC-0-45	21F0419-44	Solid	25-Jun-2021 10:50	25-Jun-2021 15:30
Dup-2-SC	21F0419-45	Solid	23-Jun-2021 11:05	25-Jun-2021 15:30
Dup-3-SC	21F0419-46	Solid	24-Jun-2021 12:20	25-Jun-2021 15:30
TBlank-1_062521	21F0419-47	Water	22-Jun-2021 10:30	25-Jun-2021 15:30



GeoEngineers
17425 Union Hill Road Suite 250
Redmond WA, 98052

Project: South State Street PRDI
Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
22-Jul-2021 19:04

Work Order Case Narrative

Client: GeoEngineers
Project: South State Street PRDI
Work Order: 21F0419

Sample receipt

Samples as listed on the preceding page were received 25-Jun-2021 15:30 under ARI work order 21F0419. For details regarding sample receipt, please refer to the Cooler Receipt Form.

Gasoline by NWTPH-Gx (GC/MS)

The sample(s) were analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Volatiles - EPA Method SW8260D

The sample(s) were analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

Internal standard areas were within limits except sample 21F0419-37. Both internal standard and surrogates were out of control low. Analysis from both preserved vials were attempted with similar failures. The analyst suspected that the vials had possible leaks. The sample was re-analyzed out of the Total Solids container, which was not properly preserved, as 21F0419-37RE1 where all internal standards and surrogates met method control limits. Both data sets have been reported.

The surrogate percent recoveries were within control limits except 1,2-Dichloroethane-d4 and 4-Bromofluorobenzene which were out of control low in sample 21F0419-37 and has been flagged. Analysis from both preserved vials were attempted with similar failures. The analyst suspected that the vials had possible leaks. The sample was re-analyzed out of the Total Solids container, which was not properly preserved, as 21F0419-37RE1 where all surrogates met method control limits. Both data sets have been reported.

The method blank(s) were clean at the reporting limits.



GeoEngineers
17425 Union Hill Road Suite 250
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Project: South State Street PRDI
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Project Manager: Brian Tracy

Reported:
22-Jul-2021 19:04

The blank spike and blank spike duplicate (BS/LCS and BSD/LCSD) spike recoveries and relative percent difference (RPD) were within control limits.

Wet Chemistry

The sample(s) were prepared and analyzed within the recommended holding times.

The Cyanide water samples were not sufficiently preserved.

Initial and continuing calibrations were within method requirements.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Sample specific QC was performed in association with samples 21F0419-13 and 21F0419-37 in Total Cyanide batches and in association with sample 21F0419-30 in Total Organic Carbon batch BJJ0118. The duplicate (DUP) relative percent difference (RPD) were within advisory control limits. The matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and the relative percent difference (RPD) were within advisory control limits except Total Cyanide after Distillation which were out of advisory limits low and have been flagged.

Diesel/Heavy Oil Range Organics - WA-Ecology Method NW-TPHDx

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements.

The surrogate percent recoveries were within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Grainsize

The samples were submitted to Materials Testing & Consulting, Inc. (MTC) for grainsize analysis. The MTC report is included here in its entirety.

Polynuclear Aromatic Hydrocarbons (PAH) - EPA Method SW8270E-SIM

The sample(s) were extracted and analyzed within the recommended holding times.

Initial and continuing calibrations were within method requirements except Dibenzo(a,h)anthracene-d14 which was out of



GeoEngineers
17425 Union Hill Road Suite 250
Redmond WA, 98052

Project: South State Street PRDI
Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
22-Jul-2021 19:04

control high in the ICV in association with the dilutions. All associated samples which contain analyte have been flagged with a "Q" qualifier.

Internal standard areas were within limits.

The surrogate percent recoveries were within control limits except Dibenzo(a,h)anthracene-d14 which was out of control high in original analysis of samples 21F0419-31 and 21F0419-32 as well as the matrix spike and matrix spike duplicate and have been flagged. Upon dilution the sample surrogate recovery fell within control limits.

The method blank(s) were clean at the reporting limits.

The blank spike (BS/LCS) percent recoveries were within control limits.

Sample specific QC was performed in association with sample 21F0419-31 in batch BJK0176. The matrix spike/matrix spike duplicate (MS/MSD) percent recoveries and relative percent difference (RPD) were within advisory control limits except as flagged. Probable homogeneity issue.



WORK ORDER

21F0419

Client: GeoEngineers
Project: South State Street PRDI

Project Manager: Shelly Fishel
Project Number: Project #186-890-03 Tsk 300

Preservation Confirmation

Container ID	Container Type	pH	
21F0419-01 A	Glass NM, Amber, 500 mL		
21F0419-01 B	Glass NM, Amber, 500 mL		
21F0419-01 C	Glass NM, Amber, 500 mL		
21F0419-01 D	Glass NM, Amber, 500 mL		
21F0419-01 E	Small OJ, 500 mL, NaOH	<12	Fail
21F0419-01 F	VOA Vial, Clear, 40 mL, HCL		
21F0419-01 G	VOA Vial, Clear, 40 mL, HCL		
21F0419-01 H	VOA Vial, Clear, 40 mL, HCL		
21F0419-02 A	Glass NM, Amber, 500 mL		
21F0419-02 B	Glass NM, Amber, 500 mL		
21F0419-02 C	Glass NM, Amber, 500 mL		
21F0419-02 D	Glass NM, Amber, 500 mL		
21F0419-02 E	Small OJ, 500 mL, NaOH	>12	Pass
21F0419-02 F	VOA Vial, Clear, 40 mL, HCL		
21F0419-02 G	VOA Vial, Clear, 40 mL, HCL		
21F0419-02 H	VOA Vial, Clear, 40 mL, HCL		
21F0419-03 A	Glass NM, Amber, 500 mL		
21F0419-03 B	Glass NM, Amber, 500 mL		
21F0419-03 C	Glass NM, Amber, 500 mL		
21F0419-03 D	Glass NM, Amber, 500 mL		
21F0419-03 E	Small OJ, 500 mL, NaOH	<12	Fail
21F0419-03 F	VOA Vial, Clear, 40 mL, HCL		
21F0419-03 G	VOA Vial, Clear, 40 mL, HCL		
21F0419-03 H	VOA Vial, Clear, 40 mL, HCL		
21F0419-04 A	Glass NM, Amber, 500 mL		
21F0419-04 B	Glass NM, Amber, 500 mL		
21F0419-04 C	Glass NM, Amber, 500 mL		
21F0419-04 D	Glass NM, Amber, 500 mL		
21F0419-04 E	Small OJ, 500 mL, NaOH	<12	Fail
21F0419-04 F	VOA Vial, Clear, 40 mL, HCL		
21F0419-04 G	VOA Vial, Clear, 40 mL, HCL		
21F0419-04 H	VOA Vial, Clear, 40 mL, HCL		
21F0419-05 A	Glass NM, Amber, 500 mL		
21F0419-05 B	Glass NM, Amber, 500 mL		
21F0419-05 C	Glass NM, Amber, 500 mL		



WORK ORDER

21F0419

Client: GeoEngineers	Project Manager: Shelly Fishel
Project: South State Street PRDI	Project Number: Project #186-890-03 Tsk 300

21F0419-05 D	Glass NM, Amber, 500 mL		
21F0419-05 E	Small OJ, 500 mL, NaOH	SI2	Fail
21F0419-05 F	VOA Vial, Clear, 40 mL, HCL	Bubble	
21F0419-05 G	VOA Vial, Clear, 40 mL, HCL		
21F0419-05 H	VOA Vial, Clear, 40 mL, HCL		
21F0419-06 A	Glass NM, Amber, 500 mL		
21F0419-06 B	Glass NM, Amber, 500 mL		
21F0419-06 C	Glass NM, Amber, 500 mL		
21F0419-06 D	Glass NM, Amber, 500 mL		
21F0419-06 E	Small OJ, 500 mL, NaOH	SI2	Fail
21F0419-06 F	VOA Vial, Clear, 40 mL, HCL		
21F0419-06 G	VOA Vial, Clear, 40 mL, HCL		
21F0419-06 H	VOA Vial, Clear, 40 mL, HCL		
21F0419-07 A	Glass NM, Amber, 500 mL		
21F0419-07 B	Glass NM, Amber, 500 mL		
21F0419-07 C	Glass NM, Amber, 500 mL		
21F0419-07 D	Glass NM, Amber, 500 mL		
21F0419-07 E	Small OJ, 500 mL, NaOH	SI2	Fail
21F0419-07 F	VOA Vial, Clear, 40 mL, HCL		
21F0419-07 G	VOA Vial, Clear, 40 mL, HCL		
21F0419-07 H	VOA Vial, Clear, 40 mL, HCL		
21F0419-08 A	Glass NM, Amber, 500 mL		
21F0419-08 B	Glass NM, Amber, 500 mL		
21F0419-08 C	Glass NM, Amber, 500 mL		
21F0419-08 D	Glass NM, Amber, 500 mL		
21F0419-08 E	Small OJ, 500 mL, NaOH	SI2	Fail
21F0419-08 F	VOA Vial, Clear, 40 mL, HCL	Bubble	
21F0419-08 G	VOA Vial, Clear, 40 mL, HCL	Bubble	
21F0419-08 H	VOA Vial, Clear, 40 mL, HCL		
21F0419-09 A	Glass NM, Amber, 500 mL		
21F0419-09 B	Glass NM, Amber, 500 mL		
21F0419-09 C	Glass NM, Amber, 500 mL		
21F0419-09 D	Glass NM, Amber, 500 mL		
21F0419-09 E	Small OJ, 500 mL, NaOH	SI2	Fail
21F0419-09 F	VOA Vial, Clear, 40 mL, HCL	Bubble	
21F0419-09 G	VOA Vial, Clear, 40 mL, HCL		
21F0419-09 H	VOA Vial, Clear, 40 mL, HCL		



WORK ORDER

21F0419

Client: GeoEngineers	Project Manager: Shelly Fishel
Project: South State Street PRDI	Project Number: Project #186-890-03 Tsk 300

21F0419-10 A	Glass NM, Amber, 500 mL		
21F0419-10 B	Glass NM, Amber, 500 mL		
21F0419-10 C	Glass NM, Amber, 500 mL		
21F0419-10 D	Glass NM, Amber, 500 mL		
21F0419-10 E	Small OJ, 500 mL, NaOH	SI2	Fail
21F0419-10 F	VOA Vial, Clear, 40 mL, HCL	Bubble	
21F0419-10 G	VOA Vial, Clear, 40 mL, HCL		
21F0419-10 H	VOA Vial, Clear, 40 mL, HCL		
21F0419-11 A	Glass NM, Amber, 500 mL		
21F0419-11 B	Glass NM, Amber, 500 mL		
21F0419-11 C	Glass NM, Amber, 500 mL		
21F0419-11 D	Glass NM, Amber, 500 mL		
21F0419-11 E	Small OJ, 500 mL, NaOH	SI2	Fail
21F0419-11 F	VOA Vial, Clear, 40 mL, HCL	Bubble	
21F0419-11 G	VOA Vial, Clear, 40 mL, HCL		
21F0419-11 H	VOA Vial, Clear, 40 mL, HCL		
21F0419-12 A	Glass NM, Amber, 500 mL		
21F0419-12 B	Glass NM, Amber, 500 mL		
21F0419-12 C	Glass NM, Amber, 500 mL		
21F0419-12 D	Glass NM, Amber, 500 mL		
21F0419-12 E	Small OJ, 500 mL, NaOH	SI2	Fail
21F0419-12 F	VOA Vial, Clear, 40 mL, HCL		
21F0419-12 G	VOA Vial, Clear, 40 mL, HCL		
21F0419-12 H	VOA Vial, Clear, 40 mL, HCL		
21F0419-13 A	Glass WM, Clear, 8 oz		
21F0419-13 B	Glass WM, Clear, 4 oz		
21F0419-13 C	Glass WM w/septa, Clear, 2 oz		
21F0419-13 D	VOA Vial, Clear, 40 mL, NaHSO4		
21F0419-13 E	VOA Vial, Clear, 40 mL, NaHSO4		
21F0419-13 F	VOA Vial, Clear, 40 mL, MeOH		
21F0419-13 G	VOA Vial, Clear, 40 mL, MeOH		
21F0419-13 H	VOA Vial, Clear, 40 mL, MeOH		
21F0419-14 A	HDPE WM, 16 oz		
21F0419-14 B	Glass WM, Clear, 8 oz		
21F0419-14 C	Glass WM, Clear, 4 oz		
21F0419-14 D	Glass WM w/septa, Clear, 2 oz		
21F0419-14 E	VOA Vial, Clear, 40 mL, NaHSO4		



WORK ORDER

21F0419

Client: GeoEngineers	Project Manager: Shelly Fishel
Project: South State Street PRDI	Project Number: Project #186-890-03 Tsk 300

21F0419-14 F	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-14 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-14 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-14 I	VOA Vial, Clear, 40 mL, MeOH
21F0419-15 A	Glass WM, Clear, 8 oz
21F0419-15 B	Glass WM, Clear, 4 oz
21F0419-15 C	Glass WM w/septa, Clear, 2 oz
21F0419-15 D	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-15 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-15 F	VOA Vial, Clear, 40 mL, MeOH
21F0419-15 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-15 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-16 A	HDPE WM, 16 oz
21F0419-16 B	Glass WM, Clear, 8 oz
21F0419-16 C	Glass WM, Clear, 4 oz
21F0419-16 D	Glass WM w/septa, Clear, 2 oz
21F0419-16 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-16 F	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-16 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-16 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-16 I	VOA Vial, Clear, 40 mL, MeOH
21F0419-17 A	Glass WM, Clear, 8 oz
21F0419-17 B	Glass WM, Clear, 4 oz
21F0419-17 C	Glass WM w/septa, Clear, 2 oz
21F0419-17 D	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-17 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-17 F	VOA Vial, Clear, 40 mL, MeOH
21F0419-17 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-17 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-18 A	HDPE WM, 16 oz
21F0419-18 B	Glass WM, Clear, 8 oz
21F0419-18 C	Glass WM, Clear, 4 oz
21F0419-18 D	Glass WM w/septa, Clear, 2 oz
21F0419-18 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-18 F	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-18 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-18 H	VOA Vial, Clear, 40 mL, MeOH



WORK ORDER

21F0419

Client: GeoEngineers	Project Manager: Shelly Fishel
Project: South State Street PRDI	Project Number: Project #186-890-03 Tsk 300

21F0419-18 I	VOA Vial, Clear, 40 mL, MeOH
21F0419-19 A	Glass WM, Clear, 8 oz
21F0419-19 B	Glass WM, Clear, 4 oz
21F0419-19 C	Glass WM w/septa, Clear, 2 oz
21F0419-19 D	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-19 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-19 F	VOA Vial, Clear, 40 mL, MeOH
21F0419-19 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-19 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-20 A	HDPE WM, 16 oz
21F0419-20 B	Glass WM, Clear, 8 oz
21F0419-20 C	Glass WM, Clear, 4 oz
21F0419-20 D	Glass WM w/septa, Clear, 2 oz
21F0419-20 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-20 F	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-20 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-20 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-20 I	VOA Vial, Clear, 40 mL, MeOH
21F0419-21 A	Glass WM, Clear, 8 oz
21F0419-21 B	Glass WM, Clear, 4 oz
21F0419-21 C	Glass WM w/septa, Clear, 2 oz
21F0419-21 D	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-21 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-21 F	VOA Vial, Clear, 40 mL, MeOH
21F0419-21 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-21 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-22 A	HDPE WM, 16 oz
21F0419-22 B	Glass WM, Clear, 8 oz
21F0419-22 C	Glass WM, Clear, 4 oz
21F0419-22 D	Glass WM w/septa, Clear, 2 oz
21F0419-22 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-22 F	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-22 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-22 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-22 I	VOA Vial, Clear, 40 mL, MeOH
21F0419-23 A	Glass WM, Clear, 8 oz
21F0419-23 B	Glass WM, Clear, 4 oz



WORK ORDER

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Client: GeoEngineers	Project Manager: Shelly Fishel
Project: South State Street PRDI	Project Number: Project #186-890-03 Tsk 300

21F0419-23 C	Glass WM w/septa, Clear, 2 oz
21F0419-23 D	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-23 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-23 F	VOA Vial, Clear, 40 mL, MeOH
21F0419-23 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-23 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-24 A	HDPE WM, 16 oz
21F0419-24 B	Glass WM, Clear, 8 oz
21F0419-24 C	Glass WM, Clear, 4 oz
21F0419-24 D	Glass WM w/septa, Clear, 2 oz
21F0419-24 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-24 F	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-24 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-24 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-24 I	VOA Vial, Clear, 40 mL, MeOH
21F0419-25 A	Glass WM, Clear, 8 oz
21F0419-25 B	Glass WM, Clear, 4 oz
21F0419-25 C	Glass WM w/septa, Clear, 2 oz
21F0419-25 D	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-25 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-25 F	VOA Vial, Clear, 40 mL, MeOH
21F0419-25 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-25 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-26 A	HDPE WM, 16 oz
21F0419-26 B	Glass WM, Clear, 8 oz
21F0419-26 C	Glass WM, Clear, 4 oz
21F0419-26 D	Glass WM w/septa, Clear, 2 oz
21F0419-26 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-26 F	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-26 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-26 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-26 I	VOA Vial, Clear, 40 mL, MeOH
21F0419-27 A	Glass WM, Clear, 8 oz
21F0419-27 B	Glass WM, Clear, 4 oz
21F0419-27 C	Glass WM w/septa, Clear, 2 oz
21F0419-27 D	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-27 E	VOA Vial, Clear, 40 mL, NaHSO4



WORK ORDER

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Client: GeoEngineers	Project Manager: Shelly Fishel
Project: South State Street PRDI	Project Number: Project #186-890-03 Tsk 300

21F0419-27 F	VOA Vial, Clear, 40 mL, MeOH
21F0419-27 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-27 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-28 A	HDPE WM, 16 oz
21F0419-28 B	Glass WM, Clear, 8 oz
21F0419-28 C	Glass WM, Clear, 4 oz
21F0419-28 D	Glass WM w/septa, Clear, 2 oz
21F0419-28 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-28 F	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-28 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-28 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-28 I	VOA Vial, Clear, 40 mL, MeOH
21F0419-29 A	Glass WM, Clear, 8 oz
21F0419-29 B	Glass WM, Clear, 4 oz
21F0419-29 C	Glass WM w/septa, Clear, 2 oz
21F0419-29 D	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-29 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-29 F	VOA Vial, Clear, 40 mL, MeOH
21F0419-29 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-29 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-30 A	HDPE WM, 16 oz
21F0419-30 B	Glass WM, Clear, 8 oz
21F0419-30 C	Glass WM, Clear, 4 oz
21F0419-30 D	Glass WM w/septa, Clear, 2 oz
21F0419-30 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-30 F	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-30 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-30 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-30 I	VOA Vial, Clear, 40 mL, MeOH
21F0419-31 A	Glass WM, Clear, 8 oz
21F0419-32 A	Glass WM, Clear, 8 oz
21F0419-33 A	Glass WM, Clear, 8 oz
21F0419-33 B	Glass WM, Clear, 4 oz
21F0419-33 C	Glass WM w/septa, Clear, 2 oz
21F0419-33 D	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-33 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-33 F	VOA Vial, Clear, 40 mL, MeOH



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Client: GeoEngineers	Project Manager: Shelly Fishel
Project: South State Street PRDI	Project Number: Project #186-890-03 Tsk 300

21F0419-33 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-33 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-34 A	HDPE WM, 16 oz
21F0419-34 B	Glass WM, Clear, 8 oz
21F0419-34 C	Glass WM, Clear, 4 oz
21F0419-34 D	Glass WM w/septa, Clear, 2 oz
21F0419-34 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-34 F	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-34 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-34 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-34 I	VOA Vial, Clear, 40 mL, MeOH
21F0419-35 A	Glass WM, Clear, 8 oz
21F0419-36 A	Glass WM, Clear, 8 oz
21F0419-37 A	Glass WM, Clear, 8 oz
21F0419-37 B	Glass WM, Clear, 4 oz
21F0419-37 C	Glass WM w/septa, Clear, 2 oz
21F0419-37 D	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-37 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-37 F	VOA Vial, Clear, 40 mL, MeOH
21F0419-37 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-37 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-38 A	HDPE WM, 16 oz
21F0419-38 B	Glass WM, Clear, 8 oz
21F0419-38 C	Glass WM, Clear, 4 oz
21F0419-38 D	Glass WM w/septa, Clear, 2 oz
21F0419-38 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-38 F	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-38 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-38 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-38 I	VOA Vial, Clear, 40 mL, MeOH
21F0419-39 A	Glass WM, Clear, 8 oz
21F0419-40 A	Glass WM, Clear, 8 oz
21F0419-41 A	Glass WM, Clear, 8 oz
21F0419-41 B	Glass WM, Clear, 4 oz
21F0419-41 C	Glass WM w/septa, Clear, 2 oz
21F0419-41 D	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-41 E	VOA Vial, Clear, 40 mL, NaHSO4



WORK ORDER

21F0419

Client: GeoEngineers	Project Manager: Shelly Fishel
Project: South State Street PRDI	Project Number: Project #186-890-03 Tsk 300

21F0419-41 F	VOA Vial, Clear, 40 mL, MeOH
21F0419-41 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-41 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-42 A	HDPE WM, 16 oz
21F0419-42 B	Glass WM, Clear, 8 oz
21F0419-42 C	Glass WM, Clear, 4 oz
21F0419-42 D	Glass WM w/septa, Clear, 2 oz
21F0419-42 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-42 F	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-42 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-42 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-42 I	VOA Vial, Clear, 40 mL, MeOH
21F0419-43 A	Glass WM, Clear, 8 oz
21F0419-44 A	Glass WM, Clear, 8 oz
21F0419-45 A	Glass WM, Clear, 8 oz
21F0419-45 B	Glass WM, Clear, 4 oz
21F0419-45 C	Glass WM w/septa, Clear, 2 oz
21F0419-45 D	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-45 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-45 F	VOA Vial, Clear, 40 mL, MeOH
21F0419-45 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-45 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-46 A	Glass WM, Clear, 8 oz
21F0419-46 B	Glass WM, Clear, 4 oz
21F0419-46 C	Glass WM w/septa, Clear, 2 oz
21F0419-46 D	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-46 E	VOA Vial, Clear, 40 mL, NaHSO4
21F0419-46 F	VOA Vial, Clear, 40 mL, MeOH
21F0419-46 G	VOA Vial, Clear, 40 mL, MeOH
21F0419-46 H	VOA Vial, Clear, 40 mL, MeOH
21F0419-47 A	VOA Vial, Clear, 40 mL, HCL
21F0419-47 B	VOA Vial, Clear, 40 mL, HCL
21F0419-47 C	VOA Vial, Clear, 40 mL, HCL
21F0419-47 D	VOA Vial, Clear, 40 mL, HCL
21F0419-47 E	VOA Vial, Clear, 40 mL, HCL
21F0419-47 F	VOA Vial, Clear, 40 mL, HCL
21F0419-47 G	VOA Vial, Clear, 40 mL, HCL



Cooler Receipt Form

ARI Client: Geo Engineers

Project Name: South State St. Boulevard Park

COC No(s): _____ (NA)

Delivered by: Fed-Ex UPS Courier Hand Delivered Other: _____

Assigned ARI Job No: 21F0419

Tracking No: _____ (NA)

Preliminary Examination Phase:

Were intact, properly signed and dated custody seals attached to the outside of the cooler? YES (NO)

Were custody papers included with the cooler? (YES) NO

Were custody papers properly filled out (ink, signed, etc.) (YES) NO

Temperature of Cooler(s) (°C) (recommended 2.0-6.0 °C for chemistry)

Time 1637 17.3 5.2 5.0 3.6 4.8 1.7 4.9 2.2

If cooler temperature is out of compliance fill out form 00070F Temp Gun ID#: DOO5204

Cooler Accepted by: SC Date: 6/25/21 Time: 1530

Complete custody forms and attach all shipping documents

Log-In Phase:

Was a temperature blank included in the cooler? YES (NO)

What kind of packing material was used? ... Bubble Wrap/Vet Ice/Gel Packs/Baggies/Foam Block Paper Other: _____

Was sufficient ice used (if appropriate)? NA YES (NO)

How were bottles sealed in plastic bags? Individually (Grouped) Not

Did all bottles arrive in good condition (unbroken)? (YES) NO

Were all bottle labels complete and legible? (YES) NO

Did the number of containers listed on COC match with the number of containers received? (YES) NO

Did all bottle labels and tags agree with custody papers? (YES) NO

Were all bottles used correct for the requested analyses? (YES) NO

Do any of the analyses (bottles) require preservation? (attach preservation sheet, excluding VOCs) ... NA (YES) NO

Were all VOC vials free of air bubbles? NA YES (NO)

Was sufficient amount of sample sent in each bottle? (YES) NO

Date VOC Trip Blank was made at ARI... NA 06/25/2021

Were the sample(s) split by ARI? (NA) YES Date/Time: _____ Equipment: _____ Split by: _____

Samples Logged by: JSM Date: 06/25/2021 Time: 1509 Labels checked by: JSM

**** Notify Project Manager of discrepancies or concerns ****

Sample ID on Bottle	Sample ID on COC	Sample ID on Bottle	Sample ID on COC

Additional Notes, Discrepancies, & Resolutions:

NO vials w/ air bubbles marked on preservation sheet, lab to determine sizes.

By: JSM Date: 06/25/2021



Client: Analytical Resources, Inc.
Address: 4611 S. 134th Place, Suite 240
Tukwila, WA 98168
Attn: Shelly Fishel
Revised on: _____

Date: July 13, 2021
Project: Q.C. - 21F0419 South State Street PRDI
Project #: 21S023-26
Sample #: B21-0998-1011
Date sampled: 6-22-21 through 6-25-21

As requested MTC, Inc. has performed the following test(s) on the sample referenced above. The testing was performed in accordance with current applicable AASHTO or ASTM standards as indicated below. The results obtained in our laboratory were as follows below or on the attached pages:

	Test(s) Performed:	Test Results	Test(s) Performed:	Test Results
X	Sieve Analysis	Please See Attached Reports	Sulfate Soundness	
	Proctor		Bulk Density & Voids	
	Sand Equivalent		WSDOT Degradation	
	Fracture Count		LA Abrasion	
	Moisture Content			
	Specific Gravity, Coarse			
	Specific Gravity, Fine			
X	Hydrometer Analysis	Please See Attached Reports		
	Atterberg Limits			

If you have any questions concerning the test results, the procedures used, or if we can be of any further assistance please call on us at the number below.

Respectfully Submitted,
 Meghan Blodgett-Carrillo
 WABO Supervising Laboratory Technician



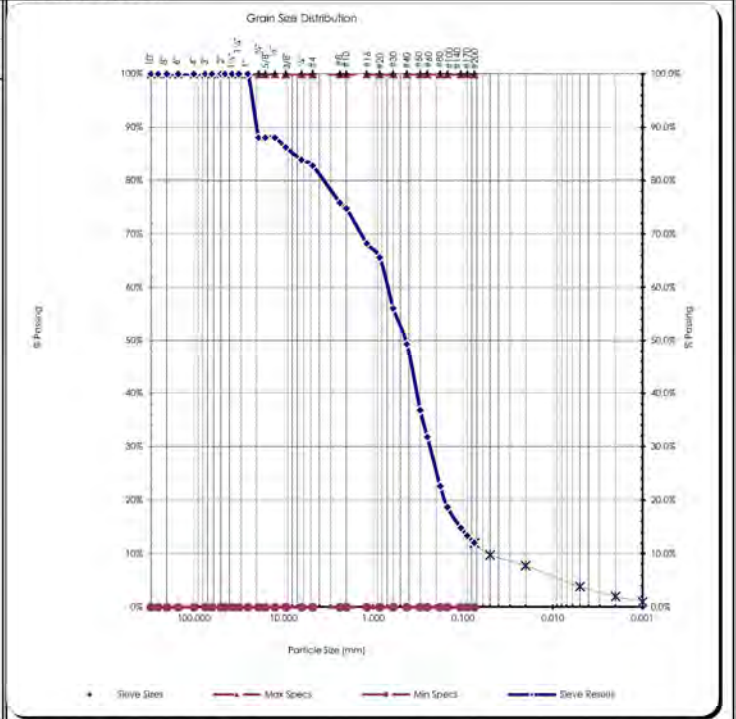
Sieve Report

Project: Q.C. - 21F0419 South State Street PRDI Project #: 21S023-26 Client: Analytical Resources, Inc. Source: 21F0419-14 A Triplicate #1 Sample#: B21-0998	Date Received: 2-Jul-21 Sampled By: Client Date Tested: 6-Jul-21 Tested By: M. Carrillo	Unified Soil Classification System, ASTM-2487 SM, Silty Sand with Gravel Sample Color: brown	ACCREDITED Certificate #: 1366.01
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ASTM D2216, ASTM D2419, ASTM D4318, ASTM D5281			
Specifications No Specs Sample Meets Specs ? N/A	$D_{15} = 0.009$ mm $D_{10} = 0.054$ mm $D_{15} = 0.108$ mm $D_{30} = 0.236$ mm $D_{50} = 0.441$ mm $D_{60} = 0.703$ mm $D_{90} = 19.972$ mm Dust Ratio = 11/45	% Gravel = 17.2% % Sand = 70.8% % Silt & Clay = 12.1% Liquid Limit = n/a Plasticity Index = n/a Sand Equivalent = n/a Fracture %, 1 Face = n/a Fracture %, 2+ Faces = n/a	Coeff. of Curvature, $C_c = 1.47$ Coeff. of Uniformity, $C_u = 13.08$ Fineness Modulus = 2.87 Plastic Limit = n/a Moisture %, as sampled = n/a Req'd Sand Equivalent = Req'd Fracture %, 1 Face = Req'd Fracture %, 2+ Faces =

ASTM C136, ASTM D6913, ASTM C117

Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00	100%	100%	100.0%	0.0%
3/4"	19.00	88%	88%	100.0%	0.0%
5/8"	16.00		88%	100.0%	0.0%
1/2"	12.50	88%	88%	100.0%	0.0%
3/8"	9.50	86%	86%	100.0%	0.0%
1/4"	6.30	84%	84%	100.0%	0.0%
#4	4.75	83%	83%	100.0%	0.0%
#8	2.36		76%	100.0%	0.0%
#10	2.00	75%	75%	100.0%	0.0%
#16	1.18		68%	100.0%	0.0%
#20	0.850	66%	66%	100.0%	0.0%
#30	0.600		56%	100.0%	0.0%
#40	0.425	49%	49%	100.0%	0.0%
#50	0.300		37%	100.0%	0.0%
#60	0.250	32%	32%	100.0%	0.0%
#80	0.180		23%	100.0%	0.0%
#100	0.150	19%	19%	100.0%	0.0%
#140	0.106		15%	100.0%	0.0%
#170	0.090		13%	100.0%	0.0%
#200	0.075	12.1%	12.1%	100.0%	0.0%



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 All results apply only to actual locations and materials tested. As a mutual protection to clients, the public and ourselves, all reports are submitted as the confidential property of clients, and authorization for publication of statements, conclusions or extracts from or regarding our reports is reserved pending our written approval.

Comments: _____

Reviewed by: _____
 Meghan Blodgett-Carrillo



Hydrometer Report

Project: Q.C. - 21F0419 South State Street PRDI Date Received: 2-Jul-21 Project #: 21S023-26 Sampled By: Client Client: Analytical Resources, Inc. Date Tested: 6-Jul-21 Source: 21F0419-14 A Triplicate #1 Tested By: M. Carrillo Sample#: B21-0998		Unified Soil Classification System, ASTM-2487 SM, Silty Sand with Gravel Sample Color brown																																																																					
ASTM D7928, HYDROMETER ANALYSIS		ASTM D6913																																																																					
Assumed Sp Gr : 2.65 Sample Weight: 100.04 grams Hydroscopic Moist.: 0.53% Adj. Sample Wgt : 99.51 grams		Sieve Analysis Grain Size Distribution <table border="1" style="width: 100%; border-collapse: collapse; font-size: small;"> <thead> <tr> <th>Sieve Size</th> <th>Percent Passing</th> <th>Soils Particle Diameter</th> </tr> </thead> <tbody> <tr><td>3.0"</td><td>100%</td><td>75.000 mm</td></tr> <tr><td>2.0"</td><td>100%</td><td>50.000 mm</td></tr> <tr><td>1.5"</td><td>100%</td><td>37.500 mm</td></tr> <tr><td>1.25"</td><td>100%</td><td>31.500 mm</td></tr> <tr><td>1.0"</td><td>100%</td><td>25.000 mm</td></tr> <tr><td>3/4"</td><td>88%</td><td>19.000 mm</td></tr> <tr><td>5/8"</td><td>88%</td><td>16.000 mm</td></tr> <tr><td>1/2"</td><td>88%</td><td>12.500 mm</td></tr> <tr><td>3/8"</td><td>86%</td><td>9.500 mm</td></tr> <tr><td>1/4"</td><td>84%</td><td>6.300 mm</td></tr> <tr><td>#4</td><td>83%</td><td>4.750 mm</td></tr> <tr><td>#10</td><td>75%</td><td>2.000 mm</td></tr> <tr><td>#20</td><td>66%</td><td>0.850 mm</td></tr> <tr><td>#40</td><td>49%</td><td>0.425 mm</td></tr> <tr><td>#100</td><td>19%</td><td>0.150 mm</td></tr> <tr><td>#200</td><td>12.1%</td><td>0.075 mm</td></tr> <tr><td>Silts</td><td>12.0%</td><td>0.074 mm</td></tr> <tr><td></td><td>9.8%</td><td>0.050 mm</td></tr> <tr><td></td><td>7.8%</td><td>0.020 mm</td></tr> <tr><td>Clays</td><td>3.9%</td><td>0.005 mm</td></tr> <tr><td></td><td>2.0%</td><td>0.002 mm</td></tr> <tr><td>Colloids</td><td>1.0%</td><td>0.001 mm</td></tr> </tbody> </table>	Sieve Size	Percent Passing	Soils Particle Diameter	3.0"	100%	75.000 mm	2.0"	100%	50.000 mm	1.5"	100%	37.500 mm	1.25"	100%	31.500 mm	1.0"	100%	25.000 mm	3/4"	88%	19.000 mm	5/8"	88%	16.000 mm	1/2"	88%	12.500 mm	3/8"	86%	9.500 mm	1/4"	84%	6.300 mm	#4	83%	4.750 mm	#10	75%	2.000 mm	#20	66%	0.850 mm	#40	49%	0.425 mm	#100	19%	0.150 mm	#200	12.1%	0.075 mm	Silts	12.0%	0.074 mm		9.8%	0.050 mm		7.8%	0.020 mm	Clays	3.9%	0.005 mm		2.0%	0.002 mm	Colloids	1.0%	0.001 mm
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Comments: _____

Reviewed by:

 Meghan Blodgett-Carrillo

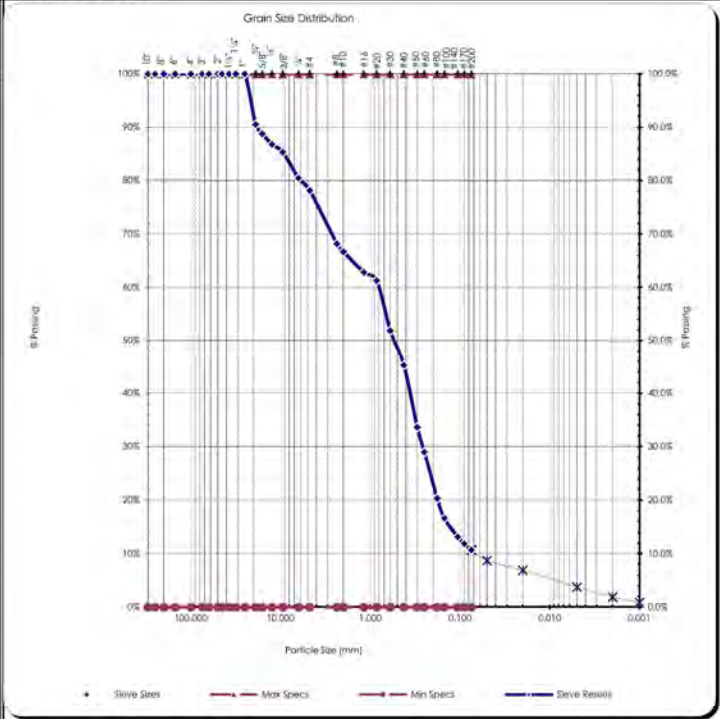


Sieve Report

Project: Q.C. - 21F0419 South State Street PRDI Project #: 21S023-26 Client: Analytical Resources, Inc. Source: 21F0419-14 A Triplicate #2 Sample#: B21-0999	Date Received: 2-Jul-21 Sampled By: Client Date Tested: 6-Jul-21 Tested By: M. Carrillo	Unified Soil Classification System, ASTM-2487 SW-SC, Well-graded Sand with Silty Clay and Gravel Sample Color: brown	 Certificate #: 1366.01
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ASTM D2216, ASTM D2419, ASTM D4318, ASTM D5281			
Specifications No Specs Sample Meets Specs ? N/A	D ₍₅₎ = 0.009 mm D ₍₁₀₎ = 0.062 mm D ₍₁₅₎ = 0.129 mm D ₍₃₀₎ = 0.261 mm D ₍₅₀₎ = 0.550 mm D ₍₆₀₎ = 0.816 mm D ₍₉₀₎ = 18.051 mm Dust Ratio = 9/38	% Gravel = 21.8% % Sand = 67.5% % Silt & Clay = 10.7% Liquid Limit = n/a Plasticity Index = n/a Sand Equivalent = n/a Fracture %, 1 Face = n/a Fracture %, 2+ Faces = n/a	Coeff. of Curvature, C _c = 1.34 Coeff. of Uniformity, C _u = 13.09 Fineness Modulus = 3.13 Plastic Limit = n/a Moisture %, as sampled = n/a Req'd Sand Equivalent = Req'd Fracture %, 1 Face = Req'd Fracture %, 2+ Faces =

ASTM C136, ASTM D6913, ASTM C117					
		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
Sieve Size	Metric				
US					
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00	100%	100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00	100%	100%	100.0%	0.0%
3/4"	19.00	91%	91%	100.0%	0.0%
5/8"	16.00		89%	100.0%	0.0%
1/2"	12.50	87%	87%	100.0%	0.0%
3/8"	9.50	85%	85%	100.0%	0.0%
1/4"	6.30		81%	100.0%	0.0%
#4	4.75	78%	78%	100.0%	0.0%
#8	2.36		68%	100.0%	0.0%
#10	2.00	67%	67%	100.0%	0.0%
#16	1.18		63%	100.0%	0.0%
#20	0.850	61%	61%	100.0%	0.0%
#30	0.600		52%	100.0%	0.0%
#40	0.425	45%	45%	100.0%	0.0%
#50	0.300		34%	100.0%	0.0%
#60	0.250	29%	29%	100.0%	0.0%
#80	0.180		20%	100.0%	0.0%
#100	0.150	17%	17%	100.0%	0.0%
#140	0.106		13%	100.0%	0.0%
#170	0.090		12%	100.0%	0.0%
#200	0.075	10.7%	10.7%	100.0%	0.0%




Copyright: Sperry Engineering & Technical Services PS, 1996-98
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Comments: _____

Reviewed by:
 Meghan Blodgett-Carrillo



Hydrometer Report

<p>Project: Q.C. - 21F0419 South State Street PRDI Date Received: 2-Jul-21 Project #: 21S023-26 Sampled By: Client Client: Analytical Resources, Inc. Date Tested: 6-Jul-21 Source: 21F0419-14 A Triplicate #2 Tested By: M. Carrillo Sample#: B21-0999</p>	<p>Unified Soil Classification System, ASTM-2487 SW-SC, Well-graded Sand with Silty Clay and Gravel Sample Color brown</p>																																																																																																									
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Comments: _____

Reviewed by: 

Meghan Blodgett-Carrillo



Sieve Report

Project: Q.C. - 21F0419 South State Street PRDI Project #: 21S023-26 Client: Analytical Resources, Inc. Source: 21F0419-14 A Triplicate #3 Sample#: B21-1000	Date Received: 2-Jul-21 Sampled By: Client Date Tested: 6-Jul-21 Tested By: M. Carrillo	Unified Soil Classification System, ASTM-2487 SM, Silty Sand Sample Color: brown	ACCREDITED Certificate #: 1366.01
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ASTM D2216, ASTM D2419, ASTM D4318, ASTM D5281			
Specifications No Specs Sample Meets Specs ? N/A	D ₍₅₎ = 0.016 mm D ₍₁₀₎ = 0.064 mm D ₍₁₅₎ = 0.094 mm D ₍₃₀₎ = 0.211 mm D ₍₅₀₎ = 0.379 mm D ₍₆₀₎ = 0.563 mm D ₍₉₀₎ = 7.975 mm Dust Ratio = 4/17	% Gravel = 12.7% % Sand = 74.4% % Silt & Clay = 13.0% Liquid Limit = n/a Plasticity Index = n/a Sand Equivalent = n/a Fracture %, 1 Face = n/a Fracture %, 2+ Faces = n/a	Coeff. of Curvature, C _c = 1.24 Coeff. of Uniformity, C _u = 8.85 Fineness Modulus = 2.52 Plastic Limit = n/a Moisture %, as sampled = n/a Req'd Sand Equivalent = Req'd Fracture %, 1 Face = Req'd Fracture %, 2+ Faces =

ASTM C136, ASTM D6913, ASTM C117					
Sieve Size	Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min	
US	Metric				
12.00"	300.00	100%	100.0%	0.0%	
10.00"	250.00	100%	100.0%	0.0%	
8.00"	200.00	100%	100.0%	0.0%	
6.00"	150.00	100%	100.0%	0.0%	
4.00"	100.00	100%	100.0%	0.0%	
3.00"	75.00	100%	100.0%	0.0%	
2.50"	63.00	100%	100.0%	0.0%	
2.00"	50.00	100%	100.0%	0.0%	
1.75"	45.00	100%	100.0%	0.0%	
1.50"	37.50	100%	100.0%	0.0%	
1.25"	31.50	100%	100.0%	0.0%	
1.00"	25.00	100%	100.0%	0.0%	
3/4"	19.00	93%	100.0%	0.0%	
5/8"	16.00	93%	100.0%	0.0%	
1/2"	12.50	93%	100.0%	0.0%	
3/8"	9.50	91%	100.0%	0.0%	
1/4"	6.30	89%	100.0%	0.0%	
#4	4.75	87%	100.0%	0.0%	
#8	2.36	80%	100.0%	0.0%	
#10	2.00	78%	100.0%	0.0%	
#16	1.18	73%	100.0%	0.0%	
#20	0.850	70%	100.0%	0.0%	
#30	0.600	61%	100.0%	0.0%	
#40	0.425	55%	100.0%	0.0%	
#50	0.300	41%	100.0%	0.0%	
#60	0.250	36%	100.0%	0.0%	
#80	0.180	25%	100.0%	0.0%	
#100	0.150	21%	100.0%	0.0%	
#140	0.106	16%	100.0%	0.0%	
#170	0.090	15%	100.0%	0.0%	
#200	0.075	13.0%	100.0%	0.0%	

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All results apply only to actual locations and materials tested. As a mutual protection to clients, the public and ourselves, all reports are submitted as the confidential property of clients, and authorization for publication of statements, conclusions or extracts from or regarding our reports is reserved pending our written approval.

Comments: _____

Reviewed by: _____
 Meghan Blodgett-Carrillo



Hydrometer Report

<p>Project: Q.C. - 21F0419 South State Street PRDI Date Received: 2-Jul-21 Project #: 21S023-26 Sampled By: Client Client : Analytical Resources, Inc. Date Tested: 6-Jul-21 Source: 21F0419-14 A Triplicate #3 Tested By: M. Carrillo Sample#: B21-1000</p>	<p>Unified Soil Classification System, ASTM-2487 SM, Silty Sand Sample Color brown</p>																																																																																																									
ASTM D7928, HYDROMETER ANALYSIS	ASTM D6913																																																																																																									
<p>Assumed Sp Gr : 2.65 Sample Weight: 100.37 grams Hydroscopic Moist.: 0.55% Adj. Sample Wgt : 99.82 grams</p> <div style="text-align: center;">  </div> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Hydrometer Reading Minutes</th> <th style="text-align: left;">Corrected Reading</th> <th style="text-align: left;">Percent Passing</th> <th style="text-align: left;">Soils Particle Diameter</th> </tr> </thead> <tbody> <tr><td>1</td><td>9</td><td>7.1%</td><td>0.0525 mm</td></tr> <tr><td>2</td><td>8</td><td>6.3%</td><td>0.0374 mm</td></tr> <tr><td>5</td><td>8</td><td>6.3%</td><td>0.0236 mm</td></tr> <tr><td>15</td><td>6</td><td>4.7%</td><td>0.0138 mm</td></tr> <tr><td>30</td><td>4</td><td>3.1%</td><td>0.0098 mm</td></tr> <tr><td>60</td><td>3</td><td>2.4%</td><td>0.0070 mm</td></tr> <tr><td>240</td><td>1</td><td>0.8%</td><td>0.0035 mm</td></tr> <tr><td>1440</td><td>1</td><td>0.8%</td><td>0.0014 mm</td></tr> </tbody> </table> <p>% Gravel: 12.7% Liquid Limit: n/a % Sand: 74.4% Plastic Limit: n/a % Silt: 11.5% Plasticity Index: n/a % Clay: 1.4%</p>	Hydrometer Reading Minutes	Corrected Reading	Percent Passing	Soils Particle Diameter	1	9	7.1%	0.0525 mm	2	8	6.3%	0.0374 mm	5	8	6.3%	0.0236 mm	15	6	4.7%	0.0138 mm	30	4	3.1%	0.0098 mm	60	3	2.4%	0.0070 mm	240	1	0.8%	0.0035 mm	1440	1	0.8%	0.0014 mm	<p style="text-align: center;">Sieve Analysis Grain Size Distribution</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Sieve Size</th> <th style="text-align: left;">Percent Passing</th> <th style="text-align: left;">Soils Particle Diameter</th> </tr> </thead> <tbody> <tr><td>3.0"</td><td>100%</td><td>75.000 mm</td></tr> <tr><td>2.0"</td><td>100%</td><td>50.000 mm</td></tr> <tr><td>1.5"</td><td>100%</td><td>37.500 mm</td></tr> <tr><td>1.25"</td><td>100%</td><td>31.500 mm</td></tr> <tr><td>1.0"</td><td>100%</td><td>25.000 mm</td></tr> <tr><td>3/4"</td><td>93%</td><td>19.000 mm</td></tr> <tr><td>5/8"</td><td>93%</td><td>16.000 mm</td></tr> <tr><td>1/2"</td><td>93%</td><td>12.500 mm</td></tr> <tr><td>3/8"</td><td>91%</td><td>9.500 mm</td></tr> <tr><td>1/4"</td><td>89%</td><td>6.300 mm</td></tr> <tr><td>#4</td><td>87%</td><td>4.750 mm</td></tr> <tr><td>#10</td><td>78%</td><td>2.000 mm</td></tr> <tr><td>#20</td><td>70%</td><td>0.850 mm</td></tr> <tr><td>#40</td><td>55%</td><td>0.425 mm</td></tr> <tr><td>#100</td><td>21%</td><td>0.150 mm</td></tr> <tr><td>#200</td><td>13.0%</td><td>0.075 mm</td></tr> <tr><td>Silts</td><td>12.7%</td><td>0.074 mm</td></tr> <tr><td></td><td>6.3%</td><td>0.050 mm</td></tr> <tr><td></td><td>5.7%</td><td>0.020 mm</td></tr> <tr><td>Clays</td><td>1.4%</td><td>0.005 mm</td></tr> <tr><td></td><td>0.8%</td><td>0.002 mm</td></tr> <tr><td>Colloids</td><td>0.5%</td><td>0.001 mm</td></tr> </tbody> </table>	Sieve Size	Percent Passing	Soils Particle Diameter	3.0"	100%	75.000 mm	2.0"	100%	50.000 mm	1.5"	100%	37.500 mm	1.25"	100%	31.500 mm	1.0"	100%	25.000 mm	3/4"	93%	19.000 mm	5/8"	93%	16.000 mm	1/2"	93%	12.500 mm	3/8"	91%	9.500 mm	1/4"	89%	6.300 mm	#4	87%	4.750 mm	#10	78%	2.000 mm	#20	70%	0.850 mm	#40	55%	0.425 mm	#100	21%	0.150 mm	#200	13.0%	0.075 mm	Silts	12.7%	0.074 mm		6.3%	0.050 mm		5.7%	0.020 mm	Clays	1.4%	0.005 mm		0.8%	0.002 mm	Colloids	0.5%	0.001 mm
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Comments: _____

Reviewed by: 

 Meghan Blodgett-Carrillo

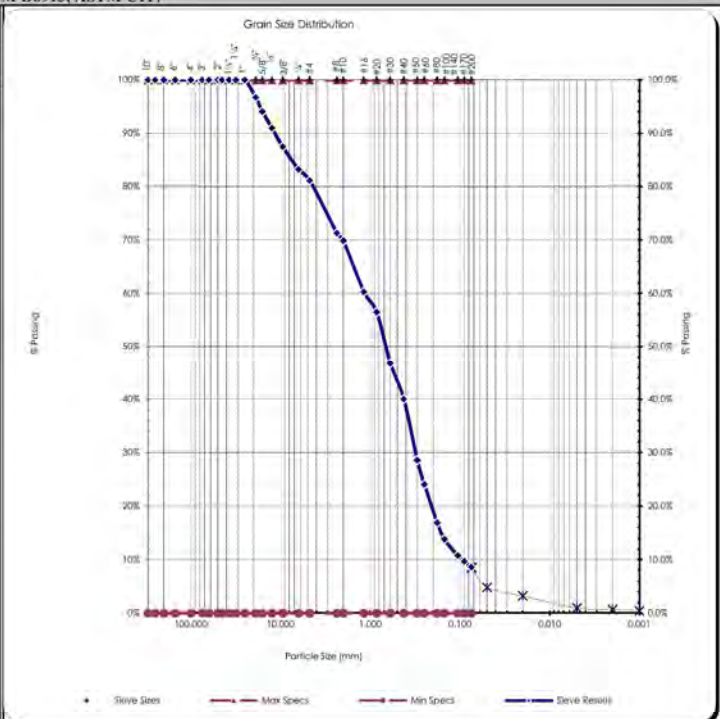


Sieve Report

Project: Q.C. - 21F0419 South State Street PRDI Project #: 21S023-26 Client: Analytical Resources, Inc. Source: 21F0419-16 A Sample#: B21-1001	Date Received: 2-Jul-21 Sampled By: Client Date Tested: 6-Jul-21 Tested By: M. Carrillo	Unified Soil Classification System, ASTM-2487 SP-SM, Poorly graded Sand with Silt and Gravel Sample Color: brown	ACCREDITED Certificate #: 1366.01
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ASTM D2216, ASTM D2419, ASTM D4318, ASTM D5281			
Specifications No Specs Sample Meets Specs ? N/A	D ₍₅₎ = 0.046 mm D ₍₁₀₎ = 0.095 mm D ₍₁₅₎ = 0.161 mm D ₍₃₀₎ = 0.315 mm D ₍₅₀₎ = 0.683 mm D ₍₆₀₎ = 1.153 mm D ₍₉₀₎ = 11.642 mm Dust Ratio = 14/65	% Gravel = 18.8% % Sand = 72.5% % Silt & Clay = 8.6% Liquid Limit = n/a Plasticity Index = n/a Sand Equivalent = n/a Fracture %, 1 Face = n/a Fracture %, 2+ Faces = n/a	Coeff. of Curvature, C _c = 0.91 Coeff. of Uniformity, C _u = 12.17 Fineness Modulus = 3.14 Plastic Limit = n/a Moisture %, as sampled = Req'd Sand Equivalent = Req'd Fracture %, 1 Face = Req'd Fracture %, 2+ Faces =

ASTM C136, ASTM D6913, ASTM C117					
Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00	100%	100%	100.0%	0.0%
3/4"	19.00	97%	97%	100.0%	0.0%
5/8"	16.00		94%	100.0%	0.0%
1/2"	12.50	91%	91%	100.0%	0.0%
3/8"	9.50	88%	88%	100.0%	0.0%
1/4"	6.30		83%	100.0%	0.0%
#4	4.75	81%	81%	100.0%	0.0%
#8	2.36		71%	100.0%	0.0%
#10	2.00	70%	70%	100.0%	0.0%
#16	1.18		60%	100.0%	0.0%
#20	0.850	56%	56%	100.0%	0.0%
#30	0.600		47%	100.0%	0.0%
#40	0.425	40%	40%	100.0%	0.0%
#50	0.300	29%	29%	100.0%	0.0%
#60	0.250	24%	24%	100.0%	0.0%
#80	0.180		17%	100.0%	0.0%
#100	0.150	14%	14%	100.0%	0.0%
#140	0.106		11%	100.0%	0.0%
#170	0.090		10%	100.0%	0.0%
#200	0.075	8.6%	8.6%	100.0%	0.0%




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Comments: _____

Reviewed by:
 Meghan Blodgett-Carrillo



Hydrometer Report

<p>Project: Q.C. - 21F0419 South State Street PRDI Date Received: 2-Jul-21 Project #: 21S023-26 Sampled By: Client Client: Analytical Resources, Inc. Date Tested: 6-Jul-21 Source: 21F0419-16 A Tested By: M. Carrillo Sample#: B21-1001</p>	<p>Unified Soil Classification System, ASTM-2487 SP-SM, Poorly graded Sand with Silt and Gravel Sample Color brown</p>																																																																																																									
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Comments: _____

Reviewed by: 

 Meghan Blodgett-Carrillo

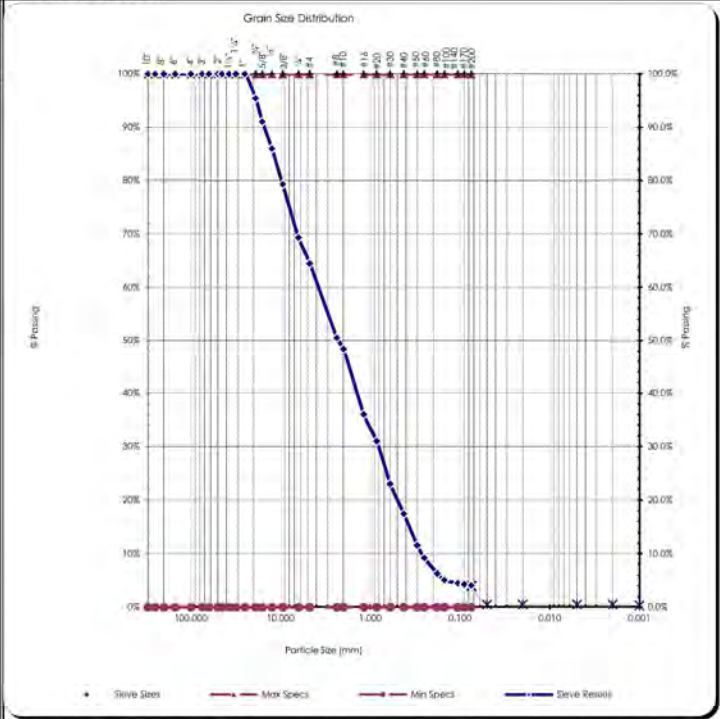


Sieve Report

Project: Q.C. - 21F0419 South State Street PRDI Project #: 21S023-26 Client: Analytical Resources, Inc. Source: 21F0419-18 A Sample#: B21-1002	Date Received: 2-Jul-21 Sampled By: Client Date Tested: 6-Jul-21 Tested By: M. Carrillo	Unified Soil Classification System, ASTM-2487 SP, Poorly graded Sand with Gravel Sample Color: grayish-brown	ACCREDITED Certificate #: 1366.01
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ASTM D2216, ASTM D2419, ASTM D4318, ASTM D5281			
Specifications No Specs Sample Meets Specs ? N/A	D ₍₅₎ = 0.141 mm D ₍₁₀₎ = 0.266 mm D ₍₁₅₎ = 0.372 mm D ₍₃₀₎ = 0.817 mm D ₍₅₀₎ = 2.265 mm D ₍₆₀₎ = 3.977 mm D ₍₉₀₎ = 15.255 mm Dust Ratio = 11/47	% Gravel = 35.5% % Sand = 60.4% % Silt & Clay = 4.1% Liquid Limit = n/a Plasticity Index = n/a Sand Equivalent = n/a Fracture %, 1 Face = n/a Fracture %, 2+ Faces = n/a	Coeff. of Curvature, C _c = 0.63 Coeff. of Uniformity, C _u = 14.93 Fineness Modulus = 4.34 Plastic Limit = n/a Moisture %, as sampled = n/a Req'd Sand Equivalent = Req'd Fracture %, 1 Face = Req'd Fracture %, 2+ Faces =

ASTM C136, ASTM D6913, ASTM C117					
Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00	100%	100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00	100%	100%	100.0%	0.0%
3/4"	19.00	95%	95%	100.0%	0.0%
5/8"	16.00		91%	100.0%	0.0%
1/2"	12.50	86%	86%	100.0%	0.0%
3/8"	9.50	79%	79%	100.0%	0.0%
1/4"	6.30	69%	69%	100.0%	0.0%
#4	4.75	65%	65%	100.0%	0.0%
#8	2.36		51%	100.0%	0.0%
#10	2.00	48%	48%	100.0%	0.0%
#16	1.18		36%	100.0%	0.0%
#20	0.850	31%	31%	100.0%	0.0%
#30	0.600		23%	100.0%	0.0%
#40	0.425	17%	17%	100.0%	0.0%
#50	0.300		12%	100.0%	0.0%
#60	0.250	9%	9%	100.0%	0.0%
#80	0.180		6%	100.0%	0.0%
#100	0.150	5%	5%	100.0%	0.0%
#140	0.106		5%	100.0%	0.0%
#170	0.090		4%	100.0%	0.0%
#200	0.075	4.1%	4.1%	100.0%	0.0%



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Comments: _____

Reviewed by: _____
 Meghan Blodgett-Carrillo

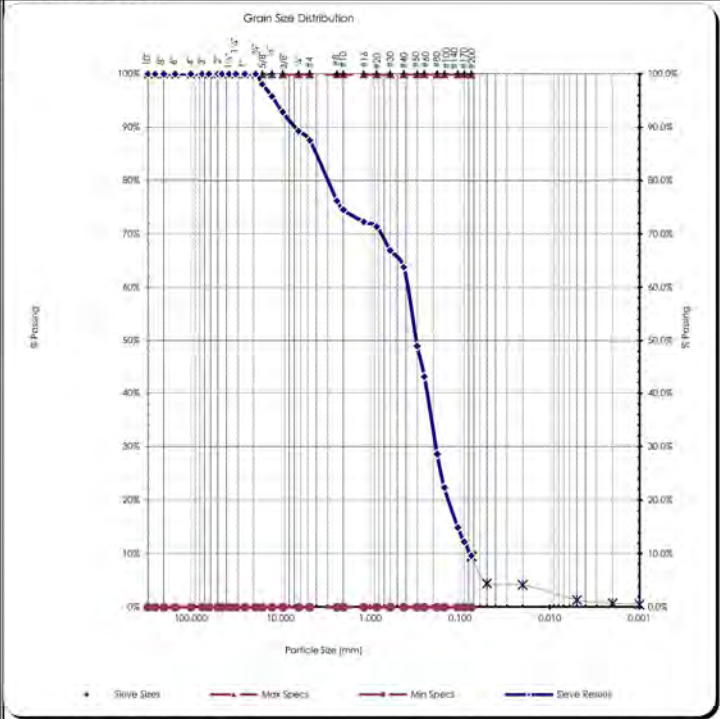


Sieve Report

Project: Q.C. - 21F0419 South State Street PRDI Project #: 21S023-26 Client: Analytical Resources, Inc. Source: 21F0419-20 A Sample#: B21-1003	Date Received: 2-Jul-21 Sampled By: Client Date Tested: 6-Jul-21 Tested By: M. Carrillo	Unified Soil Classification System, ASTM-2487 SP-SM, Poorly graded Sand with Silt Sample Color: brown	ACCREDITED Certificate #: 1366.01
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ASTM D2216, ASTM D2419, ASTM D4318, ASTM D5281			
Specifications No Specs Sample Meets Specs ? N/A	D ₍₅₎ = 0.056 mm D ₍₁₀₎ = 0.077 mm D ₍₁₅₎ = 0.106 mm D ₍₃₀₎ = 0.187 mm D ₍₅₀₎ = 0.308 mm D ₍₆₀₎ = 0.393 mm D ₍₉₀₎ = 6.924 mm Dust Ratio = 5/33	% Gravel = 12.4% % Sand = 77.9% % Silt & Clay = 9.7% Liquid Limit = n/a Plasticity Index = n/a Sand Equivalent = n/a Fracture %, 1 Face = n/a Fracture %, 2+ Faces = n/a	Coeff. of Curvature, C _c = 1.15 Coeff. of Uniformity, C _u = 5.10 Fineness Modulus = 2.33 Plastic Limit = n/a Moisture %, as sampled = n/a Req'd Sand Equivalent = Req'd Fracture %, 1 Face = Req'd Fracture %, 2+ Faces =

ASTM C136, ASTM D6913, ASTM C117					
Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00	100%	100%	100.0%	0.0%
3/4"	19.00	100%	100%	100.0%	0.0%
5/8"	16.00		98%	100.0%	0.0%
1/2"	12.50	96%	96%	100.0%	0.0%
3/8"	9.50	93%	93%	100.0%	0.0%
1/4"	6.30		89%	100.0%	0.0%
#4	4.75	88%	88%	100.0%	0.0%
#8	2.36		76%	100.0%	0.0%
#10	2.00	75%	75%	100.0%	0.0%
#16	1.18		72%	100.0%	0.0%
#20	0.850	71%	71%	100.0%	0.0%
#30	0.600		67%	100.0%	0.0%
#40	0.425	64%	64%	100.0%	0.0%
#50	0.300		49%	100.0%	0.0%
#60	0.250	43%	43%	100.0%	0.0%
#80	0.180		29%	100.0%	0.0%
#100	0.150	22%	22%	100.0%	0.0%
#140	0.106		15%	100.0%	0.0%
#170	0.090		12%	100.0%	0.0%
#200	0.075	9.7%	9.7%	100.0%	0.0%




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Comments: _____

Reviewed by:
 Meghan Blodgett-Carrillo



Hydrometer Report

<p>Project: Q.C. - 21F0419 South State Street PRDI Date Received: 2-Jul-21 Project #: 21S023-26 Sampled By: Client Client: Analytical Resources, Inc. Date Tested: 6-Jul-21 Source: 21F0419-20 A Tested By: M. Carrillo Sample#: B21-1003</p>	<p>Unified Soil Classification System, ASTM-2487 SP-SM, Poorly graded Sand with Silt Sample Color brown</p>																																																																																																									
ASTM D7928, HYDROMETER ANALYSIS	ASTM D6913																																																																																																									
<p>Assumed Sp Gr : 2.65 Sample Weight: 100.08 grams Hydrosopic Moist.: 0.31% Adj. Sample Wgt : 99.77 grams</p> <div style="text-align: center;">  ACCREDITED Certificate #: 1366.01 </div> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Hydrometer Reading Minutes</th> <th style="text-align: left;">Corrected Reading</th> <th style="text-align: left;">Percent Passing</th> <th style="text-align: left;">Soils Particle Diameter</th> </tr> </thead> <tbody> <tr><td>1</td><td>6</td><td>4.5%</td><td>0.0534 mm</td></tr> <tr><td>2</td><td>6</td><td>4.5%</td><td>0.0378 mm</td></tr> <tr><td>5</td><td>6</td><td>4.5%</td><td>0.0239 mm</td></tr> <tr><td>15</td><td>5</td><td>3.7%</td><td>0.0139 mm</td></tr> <tr><td>30</td><td>3.5</td><td>2.6%</td><td>0.0099 mm</td></tr> <tr><td>60</td><td>3</td><td>2.2%</td><td>0.0070 mm</td></tr> <tr><td>240</td><td>1</td><td>0.7%</td><td>0.0035 mm</td></tr> <tr><td>1440</td><td>1</td><td>0.7%</td><td>0.0014 mm</td></tr> </tbody> </table> <p>% Gravel: 12.4% Liquid Limit: n/a % Sand: 77.9% Plastic Limit: n/a % Silt: 8.3% Plasticity Index: n/a % Clay: 1.4%</p>	Hydrometer Reading Minutes	Corrected Reading	Percent Passing	Soils Particle Diameter	1	6	4.5%	0.0534 mm	2	6	4.5%	0.0378 mm	5	6	4.5%	0.0239 mm	15	5	3.7%	0.0139 mm	30	3.5	2.6%	0.0099 mm	60	3	2.2%	0.0070 mm	240	1	0.7%	0.0035 mm	1440	1	0.7%	0.0014 mm	<p style="text-align: center;">Sieve Analysis</p> <p style="text-align: center;">Grain Size Distribution</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Sieve Size</th> <th style="text-align: left;">Percent Passing</th> <th style="text-align: left;">Soils Particle Diameter</th> </tr> </thead> <tbody> <tr><td>3.0"</td><td>100%</td><td>75.000 mm</td></tr> <tr><td>2.0"</td><td>100%</td><td>50.000 mm</td></tr> <tr><td>1.5"</td><td>100%</td><td>37.500 mm</td></tr> <tr><td>1.25"</td><td>100%</td><td>31.500 mm</td></tr> <tr><td>1.0"</td><td>100%</td><td>25.000 mm</td></tr> <tr><td>3/4"</td><td>100%</td><td>19.000 mm</td></tr> <tr><td>5/8"</td><td>98%</td><td>16.000 mm</td></tr> <tr><td>1/2"</td><td>96%</td><td>12.500 mm</td></tr> <tr><td>3/8"</td><td>93%</td><td>9.500 mm</td></tr> <tr><td>1/4"</td><td>89%</td><td>6.300 mm</td></tr> <tr><td>#4</td><td>88%</td><td>4.750 mm</td></tr> <tr><td>#10</td><td>75%</td><td>2.000 mm</td></tr> <tr><td>#20</td><td>71%</td><td>0.850 mm</td></tr> <tr><td>#40</td><td>64%</td><td>0.425 mm</td></tr> <tr><td>#100</td><td>22%</td><td>0.150 mm</td></tr> <tr><td>#200</td><td>9.7%</td><td>0.075 mm</td></tr> <tr><td>Silts</td><td>9.4%</td><td>0.074 mm</td></tr> <tr><td></td><td>4.5%</td><td>0.050 mm</td></tr> <tr><td></td><td>4.2%</td><td>0.020 mm</td></tr> <tr><td>Clays</td><td>1.4%</td><td>0.005 mm</td></tr> <tr><td></td><td>0.7%</td><td>0.002 mm</td></tr> <tr><td>Colloids</td><td>0.5%</td><td>0.001 mm</td></tr> </tbody> </table>	Sieve Size	Percent Passing	Soils Particle Diameter	3.0"	100%	75.000 mm	2.0"	100%	50.000 mm	1.5"	100%	37.500 mm	1.25"	100%	31.500 mm	1.0"	100%	25.000 mm	3/4"	100%	19.000 mm	5/8"	98%	16.000 mm	1/2"	96%	12.500 mm	3/8"	93%	9.500 mm	1/4"	89%	6.300 mm	#4	88%	4.750 mm	#10	75%	2.000 mm	#20	71%	0.850 mm	#40	64%	0.425 mm	#100	22%	0.150 mm	#200	9.7%	0.075 mm	Silts	9.4%	0.074 mm		4.5%	0.050 mm		4.2%	0.020 mm	Clays	1.4%	0.005 mm		0.7%	0.002 mm	Colloids	0.5%	0.001 mm
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Comments: _____

Reviewed by: 

 Meghan Blodgett-Carrillo

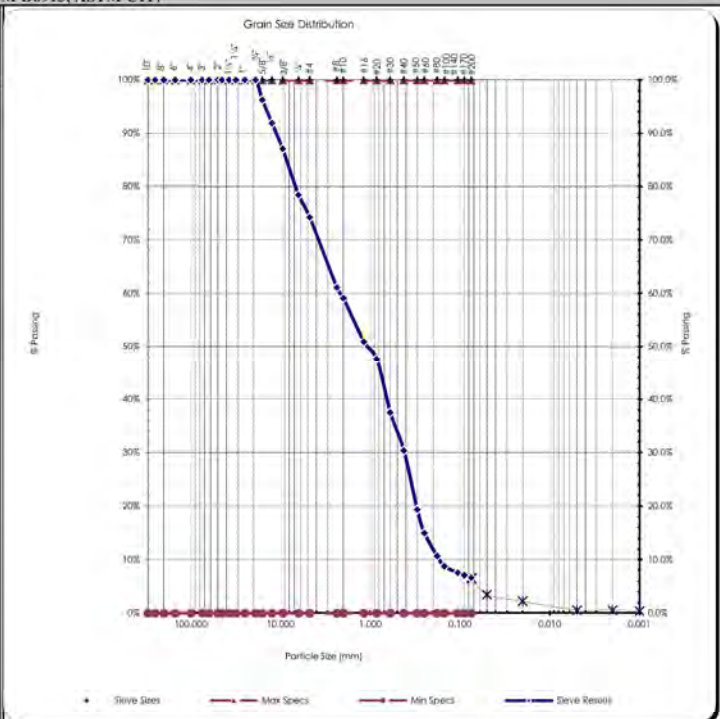


Sieve Report

Project: Q.C. - 21F0419 South State Street PRDI Project #: 21S023-26 Client: Analytical Resources, Inc. Source: 21F0419-22 A Sample#: B21-1004	Date Received: 2-Jul-21 Sampled By: Client Date Tested: 6-Jul-21 Tested By: M. Carrillo	Unified Soil Classification System, ASTM-2487 SP-SM, Poorly graded Sand with Silt and Gravel Sample Color: brown	ACCREDITED Certificate #: 1366.01
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ASTM D2216, ASTM D2419, ASTM D4318, ASTM D5281			
Specifications No Specs Sample Meets Specs ? N/A	$D_{15} = 0.065$ mm $D_{100} = 0.169$ mm $D_{150} = 0.250$ mm $D_{300} = 0.420$ mm $D_{500} = 1.084$ mm $D_{600} = 2.159$ mm $D_{900} = 11.298$ mm Dust Ratio = 9/41	% Gravel = 25.7% % Sand = 67.6% % Silt & Clay = 6.7% Liquid Limit = n/a Plasticity Index = n/a Sand Equivalent = n/a Fracture %, 1 Face = n/a Fracture %, 2+ Faces = n/a	Coeff. of Curvature, $C_c = 0.48$ Coeff. of Uniformity, $C_u = 12.76$ Fineness Modulus = 3.61 Plastic Limit = n/a Moisture %, as sampled = n/a Req'd Sand Equivalent = Req'd Fracture %, 1 Face = Req'd Fracture %, 2+ Faces =

ASTM C136, ASTM D6913, ASTM C117					
Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00	100%	100%	100.0%	0.0%
3/4"	19.00	100%	100%	100.0%	0.0%
5/8"	16.00		96%	100.0%	0.0%
1/2"	12.50	92%	92%	100.0%	0.0%
3/8"	9.50	87%	87%	100.0%	0.0%
1/4"	6.30		78%	100.0%	0.0%
#4	4.75	74%	74%	100.0%	0.0%
#8	2.36		61%	100.0%	0.0%
#10	2.00	59%	59%	100.0%	0.0%
#16	1.18		51%	100.0%	0.0%
#20	0.850	48%	48%	100.0%	0.0%
#30	0.600		38%	100.0%	0.0%
#40	0.425	30%	30%	100.0%	0.0%
#50	0.300	19%	19%	100.0%	0.0%
#60	0.250	15%	15%	100.0%	0.0%
#80	0.180		11%	100.0%	0.0%
#100	0.150	9%	9%	100.0%	0.0%
#140	0.106		8%	100.0%	0.0%
#170	0.090		7%	100.0%	0.0%
#200	0.075	6.7%	6.7%	100.0%	0.0%




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Comments: _____

Reviewed by:
 Meghan Blodgett-Carrillo



Hydrometer Report

<p>Project: Q.C. - 21F0419 South State Street PRDI Date Received: 2-Jul-21 Project #: 21S023-26 Sampled By: Client Client : Analytical Resources, Inc. Date Tested: 6-Jul-21 Source: 21F0419-22 A Tested By: M. Carrillo Sample#: B21-1004</p>	<p>Unified Soil Classification System, ASTM-2487 SP-SM, Poorly graded Sand with Silt and Gravel Sample Color brown</p>																																																																																																									
ASTM D7928, HYDROMETER ANALYSIS	ASTM D6913																																																																																																									
<p>Assumed Sp Gr : 2.65 Sample Weight: 100.12 grams Hydrosopic Moist.: 0.54% Adj. Sample Wgt : 99.58 grams</p> <div style="text-align: center;">  </div> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Hydrometer Reading</th> <th style="text-align: left;">Corrected Reading</th> <th style="text-align: left;">Percent Passing</th> <th style="text-align: left;">Soils Particle Diameter</th> </tr> </thead> <tbody> <tr><td>1</td><td>5</td><td>3.0%</td><td>0.0537 mm</td></tr> <tr><td>2</td><td>5</td><td>3.0%</td><td>0.0380 mm</td></tr> <tr><td>5</td><td>4</td><td>2.4%</td><td>0.0241 mm</td></tr> <tr><td>15</td><td>3.5</td><td>2.1%</td><td>0.0140 mm</td></tr> <tr><td>30</td><td>3</td><td>1.8%</td><td>0.0099 mm</td></tr> <tr><td>60</td><td>1</td><td>0.6%</td><td>0.0071 mm</td></tr> <tr><td>240</td><td>1</td><td>0.6%</td><td>0.0035 mm</td></tr> <tr><td>1440</td><td>1</td><td>0.6%</td><td>0.0014 mm</td></tr> </tbody> </table> <p>% Gravel: 25.7% Liquid Limit: n/a % Sand: 67.6% Plastic Limit: n/a % Silt: 6.1% Plasticity Index: n/a % Clay: 0.6%</p>	Hydrometer Reading	Corrected Reading	Percent Passing	Soils Particle Diameter	1	5	3.0%	0.0537 mm	2	5	3.0%	0.0380 mm	5	4	2.4%	0.0241 mm	15	3.5	2.1%	0.0140 mm	30	3	1.8%	0.0099 mm	60	1	0.6%	0.0071 mm	240	1	0.6%	0.0035 mm	1440	1	0.6%	0.0014 mm	<p style="text-align: center;">Sieve Analysis</p> <p style="text-align: center;">Grain Size Distribution</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Sieve Size</th> <th style="text-align: left;">Percent Passing</th> <th style="text-align: left;">Soils Particle Diameter</th> </tr> </thead> <tbody> <tr><td>3.0"</td><td>100%</td><td>75.000 mm</td></tr> <tr><td>2.0"</td><td>100%</td><td>50.000 mm</td></tr> <tr><td>1.5"</td><td>100%</td><td>37.500 mm</td></tr> <tr><td>1.25"</td><td>100%</td><td>31.500 mm</td></tr> <tr><td>1.0"</td><td>100%</td><td>25.000 mm</td></tr> <tr><td>3/4"</td><td>100%</td><td>19.000 mm</td></tr> <tr><td>5/8"</td><td>96%</td><td>16.000 mm</td></tr> <tr><td>1/2"</td><td>92%</td><td>12.500 mm</td></tr> <tr><td>3/8"</td><td>87%</td><td>9.500 mm</td></tr> <tr><td>1/4"</td><td>78%</td><td>6.300 mm</td></tr> <tr><td>#4</td><td>74%</td><td>4.750 mm</td></tr> <tr><td>#10</td><td>59%</td><td>2.000 mm</td></tr> <tr><td>#20</td><td>48%</td><td>0.850 mm</td></tr> <tr><td>#40</td><td>30%</td><td>0.425 mm</td></tr> <tr><td>#100</td><td>9%</td><td>0.150 mm</td></tr> <tr><td>#200</td><td>6.7%</td><td>0.075 mm</td></tr> <tr><td>Silts</td><td>6.5%</td><td>0.074 mm</td></tr> <tr><td></td><td>3.5%</td><td>0.050 mm</td></tr> <tr><td></td><td>2.3%</td><td>0.020 mm</td></tr> <tr><td>Clays</td><td>0.6%</td><td>0.005 mm</td></tr> <tr><td></td><td>0.6%</td><td>0.002 mm</td></tr> <tr><td>Colloids</td><td>0.4%</td><td>0.001 mm</td></tr> </tbody> </table>	Sieve Size	Percent Passing	Soils Particle Diameter	3.0"	100%	75.000 mm	2.0"	100%	50.000 mm	1.5"	100%	37.500 mm	1.25"	100%	31.500 mm	1.0"	100%	25.000 mm	3/4"	100%	19.000 mm	5/8"	96%	16.000 mm	1/2"	92%	12.500 mm	3/8"	87%	9.500 mm	1/4"	78%	6.300 mm	#4	74%	4.750 mm	#10	59%	2.000 mm	#20	48%	0.850 mm	#40	30%	0.425 mm	#100	9%	0.150 mm	#200	6.7%	0.075 mm	Silts	6.5%	0.074 mm		3.5%	0.050 mm		2.3%	0.020 mm	Clays	0.6%	0.005 mm		0.6%	0.002 mm	Colloids	0.4%	0.001 mm
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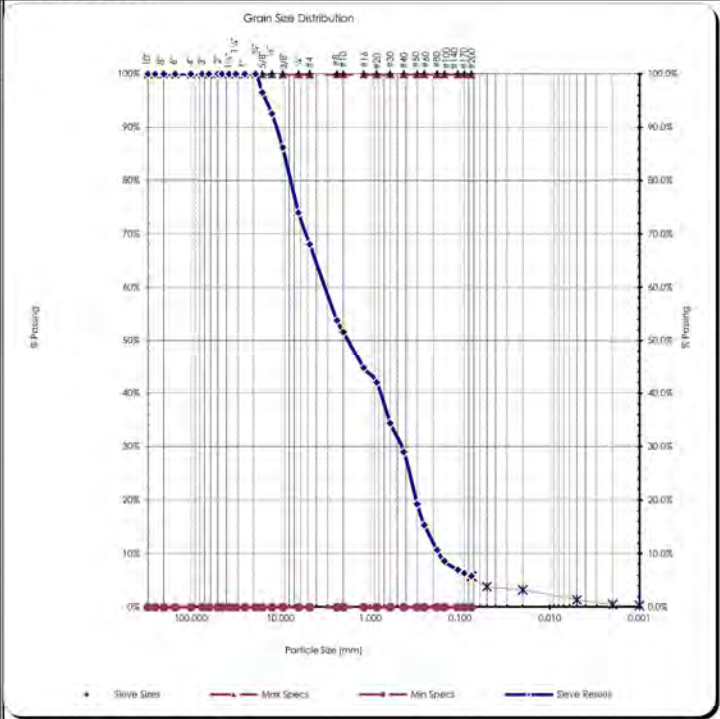


Sieve Report

Project: Q.C. - 21F0419 South State Street PRDI Project #: 21S023-26 Client: Analytical Resources, Inc. Source: 21F0419-24 A Sample#: B21-1005	Date Received: 2-Jul-21 Sampled By: Client Date Tested: 6-Jul-21 Tested By: M. Carrillo	Unified Soil Classification System, ASTM-2487 SP-SM, Poorly graded Sand with Silt and Gravel Sample Color: gray	 Certificate #: 1366.01
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ASTM D2216, ASTM D2419, ASTM D4318, ASTM D5281			
Specifications No Specs Sample Meets Specs ? N/A	D ₍₅₎ = 0.067 mm D ₍₁₀₎ = 0.170 mm D ₍₁₅₎ = 0.244 mm D ₍₃₀₎ = 0.456 mm D ₍₅₀₎ = 1.802 mm D ₍₆₀₎ = 3.396 mm D ₍₉₀₎ = 11.298 mm Dust Ratio = 1/5	% Gravel = 31.9% % Sand = 62.3% % Silt & Clay = 5.8% Liquid Limit = n/a Plasticity Index = n/a Sand Equivalent = n/a Fracture %, 1 Face = n/a Fracture %, 2+ Faces = n/a	Coeff. of Curvature, C _c = 0.36 Coeff. of Uniformity, C _u = 19.93 Fineness Modulus = 3.85 Plastic Limit = n/a Moisture %, as sampled = n/a Req'd Sand Equivalent = Req'd Fracture %, 1 Face = Req'd Fracture %, 2+ Faces =

ASTM C136, ASTM D6913, ASTM C117					
		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
Sieve Size	Metric				
US					
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00	100%	100%	100.0%	0.0%
3/4"	19.00	100%	100%	100.0%	0.0%
5/8"	16.00		97%	100.0%	0.0%
1/2"	12.50	93%	93%	100.0%	0.0%
3/8"	9.50	86%	86%	100.0%	0.0%
1/4"	6.30	74%	74%	100.0%	0.0%
#4	4.75	68%	68%	100.0%	0.0%
#8	2.36	54%	54%	100.0%	0.0%
#10	2.00	52%	52%	100.0%	0.0%
#16	1.18	45%	45%	100.0%	0.0%
#20	0.850	42%	42%	100.0%	0.0%
#30	0.600	34%	34%	100.0%	0.0%
#40	0.425	29%	29%	100.0%	0.0%
#50	0.300	19%	19%	100.0%	0.0%
#60	0.250	15%	15%	100.0%	0.0%
#80	0.180	11%	11%	100.0%	0.0%
#100	0.150	9%	9%	100.0%	0.0%
#140	0.106	7%	7%	100.0%	0.0%
#170	0.090	6%	6%	100.0%	0.0%
#200	0.075	5.8%	5.8%	100.0%	0.0%



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All results apply only to actual locations and materials tested. As a mutual protection to clients, the public and ourselves, all reports are submitted as the confidential property of clients, and authorization for publication of statements, conclusions or extracts from or regarding our reports is reserved pending our written approval.

Comments: _____

Reviewed by:

 Meghan Blodgett-Carrillo

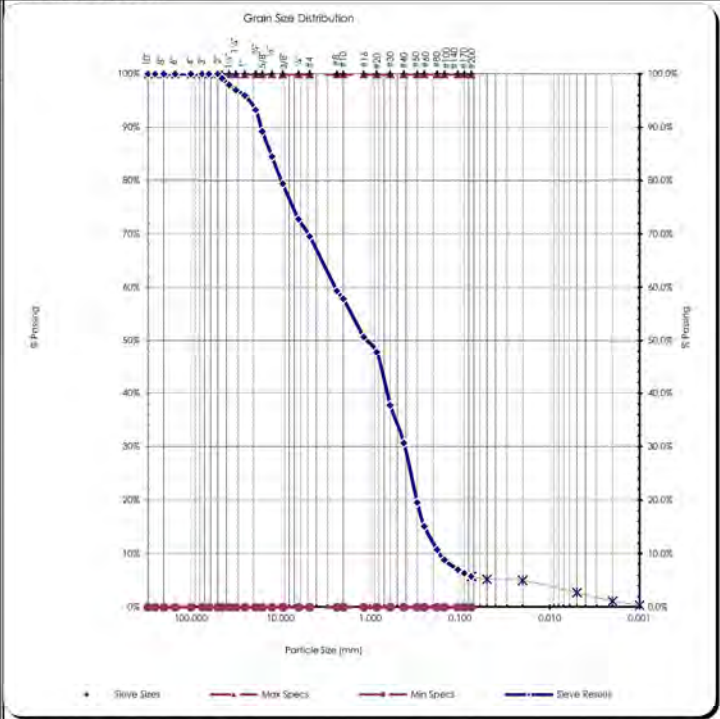


Sieve Report

Project: Q.C. - 21F0419 South State Street PRDI Project #: 21S023-26 Client: Analytical Resources, Inc. Source: 21F0419-26 A Sample#: B21-1006	Date Received: 2-Jul-21 Sampled By: Client Date Tested: 6-Jul-21 Tested By: M. Carrillo	Unified Soil Classification System, ASTM-2487 SP-SM, Poorly graded Sand with Silt and Gravel Sample Color: brown	 Certificate #: 1366.01
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ASTM D2216, ASTM D2419, ASTM D4318, ASTM D5281			
Specifications No Specs Sample Meets Specs ? N/A	$D_{15} = 0.020$ mm $D_{100} = 0.168$ mm $D_{150} = 0.248$ mm $D_{300} = 0.417$ mm $D_{500} = 1.097$ mm $D_{600} = 2.507$ mm $D_{900} = 16.562$ mm Dust Ratio = 3/16	% Gravel = 30.5% % Sand = 63.8% % Silt & Clay = 5.8% Liquid Limit = n/a Plasticity Index = n/a Sand Equivalent = n/a Fracture %, 1 Face = n/a Fracture %, 2+ Faces = n/a	Coeff. of Curvature, $C_c = 0.41$ Coeff. of Uniformity, $C_u = 14.91$ Fineness Modulus = 3.81 Plastic Limit = n/a Moisture %, as sampled = n/a Req'd Sand Equivalent = Req'd Fracture %, 1 Face = Req'd Fracture %, 2+ Faces =

ASTM C136, ASTM D6913, ASTM C117					
		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
Sieve Size	Metric				
US					
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00		99%	100.0%	0.0%
1.50"	37.50		98%	100.0%	0.0%
1.25"	31.50		97%	100.0%	0.0%
1.00"	25.00	96%	96%	100.0%	0.0%
3/4"	19.00	93%	93%	100.0%	0.0%
5/8"	16.00		89%	100.0%	0.0%
1/2"	12.50	85%	85%	100.0%	0.0%
3/8"	9.50	79%	79%	100.0%	0.0%
1/4"	6.30		73%	100.0%	0.0%
#4	4.75	70%	70%	100.0%	0.0%
#8	2.36		59%	100.0%	0.0%
#10	2.00	58%	58%	100.0%	0.0%
#16	1.18		51%	100.0%	0.0%
#20	0.850	48%	48%	100.0%	0.0%
#30	0.600		38%	100.0%	0.0%
#40	0.425	31%	31%	100.0%	0.0%
#50	0.300		20%	100.0%	0.0%
#60	0.250	15%	15%	100.0%	0.0%
#80	0.180		11%	100.0%	0.0%
#100	0.150	9%	9%	100.0%	0.0%
#140	0.106		7%	100.0%	0.0%
#170	0.090		6%	100.0%	0.0%
#200	0.075	5.8%	5.8%	100.0%	0.0%




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Comments: _____

Reviewed by:
 Meghan Blodgett-Carrillo



Hydrometer Report

<p>Project: Q.C. - 21F0419 South State Street PRDI Date Received: 2-Jul-21 Project #: 21S023-26 Sampled By: Client Client: Analytical Resources, Inc. Date Tested: 6-Jul-21 Source: 21F0419-26 A Tested By: M. Carrillo Sample#: B21-1006</p>	<p>Unified Soil Classification System, ASTM-2487 SP-SM, Poorly graded Sand with Silt and Gravel Sample Color brown</p>																																																																																																									
ASTM D7928, HYDROMETER ANALYSIS	ASTM D6913																																																																																																									
<p>Assumed Sp Gr: 2.65 Sample Weight: 100.16 grams Hydroscopic Moist: 0.59% Adj. Sample Wgt: 99.57 grams</p> <div style="text-align: center;">  ACCREDITED <small>Certificate #: 1366.01</small> </div> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Hydrometer Reading Minutes</th> <th style="text-align: left;">Corrected Reading</th> <th style="text-align: left;">Percent Passing</th> <th style="text-align: left;">Soils Particle Diameter</th> </tr> </thead> <tbody> <tr><td>1</td><td>10</td><td>5.8%</td><td>0.0523 mm</td></tr> <tr><td>2</td><td>9</td><td>5.2%</td><td>0.0371 mm</td></tr> <tr><td>5</td><td>9</td><td>5.2%</td><td>0.0235 mm</td></tr> <tr><td>15</td><td>8</td><td>4.6%</td><td>0.0137 mm</td></tr> <tr><td>30</td><td>6.5</td><td>3.8%</td><td>0.0097 mm</td></tr> <tr><td>60</td><td>5</td><td>2.9%</td><td>0.0069 mm</td></tr> <tr><td>240</td><td>4.5</td><td>2.6%</td><td>0.0035 mm</td></tr> <tr><td>1440</td><td>1</td><td>0.6%</td><td>0.0014 mm</td></tr> </tbody> </table> <p>% Gravel: 30.5% Liquid Limit: n/a % Sand: 63.8% Plastic Limit: n/a % Silt: 3.0% Plasticity Index: n/a % Clay: 2.7%</p>	Hydrometer Reading Minutes	Corrected Reading	Percent Passing	Soils Particle Diameter	1	10	5.8%	0.0523 mm	2	9	5.2%	0.0371 mm	5	9	5.2%	0.0235 mm	15	8	4.6%	0.0137 mm	30	6.5	3.8%	0.0097 mm	60	5	2.9%	0.0069 mm	240	4.5	2.6%	0.0035 mm	1440	1	0.6%	0.0014 mm	<p style="text-align: center;">Sieve Analysis</p> <p style="text-align: center;">Grain Size Distribution</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Sieve Size</th> <th style="text-align: left;">Percent Passing</th> <th style="text-align: left;">Soils Particle Diameter</th> </tr> </thead> <tbody> <tr><td>3.0"</td><td>100%</td><td>75.000 mm</td></tr> <tr><td>2.0"</td><td>100%</td><td>50.000 mm</td></tr> <tr><td>1.5"</td><td>100%</td><td>37.500 mm</td></tr> <tr><td>1.25"</td><td>98%</td><td>31.500 mm</td></tr> <tr><td>1.0"</td><td>97%</td><td>25.000 mm</td></tr> <tr><td>3/4"</td><td>93%</td><td>19.000 mm</td></tr> <tr><td>5/8"</td><td>89%</td><td>16.000 mm</td></tr> <tr><td>1/2"</td><td>85%</td><td>12.500 mm</td></tr> <tr><td>3/8"</td><td>79%</td><td>9.500 mm</td></tr> <tr><td>1/4"</td><td>73%</td><td>6.300 mm</td></tr> <tr><td>#4</td><td>70%</td><td>4.750 mm</td></tr> <tr><td>#10</td><td>58%</td><td>2.000 mm</td></tr> <tr><td>#20</td><td>48%</td><td>0.850 mm</td></tr> <tr><td>#40</td><td>31%</td><td>0.425 mm</td></tr> <tr><td>#100</td><td>9%</td><td>0.150 mm</td></tr> <tr><td>#200</td><td>5.8%</td><td>0.075 mm</td></tr> <tr><td>Silts</td><td>5.8%</td><td>0.074 mm</td></tr> <tr><td></td><td>5.2%</td><td>0.050 mm</td></tr> <tr><td></td><td>5.0%</td><td>0.020 mm</td></tr> <tr><td>Clays</td><td>2.7%</td><td>0.005 mm</td></tr> <tr><td></td><td>1.1%</td><td>0.002 mm</td></tr> <tr><td>Colloids</td><td>0.4%</td><td>0.001 mm</td></tr> </tbody> </table>	Sieve Size	Percent Passing	Soils Particle Diameter	3.0"	100%	75.000 mm	2.0"	100%	50.000 mm	1.5"	100%	37.500 mm	1.25"	98%	31.500 mm	1.0"	97%	25.000 mm	3/4"	93%	19.000 mm	5/8"	89%	16.000 mm	1/2"	85%	12.500 mm	3/8"	79%	9.500 mm	1/4"	73%	6.300 mm	#4	70%	4.750 mm	#10	58%	2.000 mm	#20	48%	0.850 mm	#40	31%	0.425 mm	#100	9%	0.150 mm	#200	5.8%	0.075 mm	Silts	5.8%	0.074 mm		5.2%	0.050 mm		5.0%	0.020 mm	Clays	2.7%	0.005 mm		1.1%	0.002 mm	Colloids	0.4%	0.001 mm
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Comments: _____

Reviewed by: 

 Meghan Blodgett-Carrillo

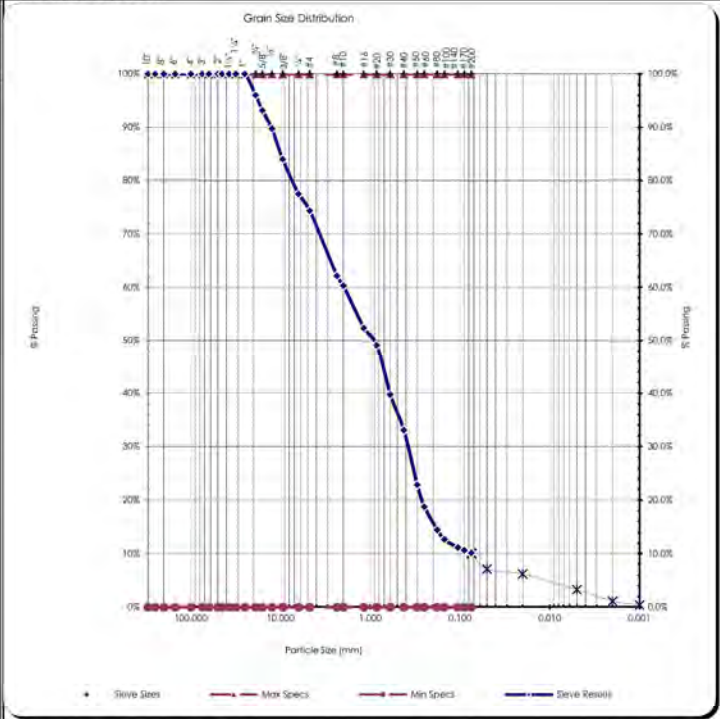


Sieve Report

Project: Q.C. - 21F0419 South State Street PRDI Project #: 21S023-26 Client: Analytical Resources, Inc. Source: 21F0419-28 A Sample#: B21-1007	Date Received: 2-Jul-21 Sampled By: Client Date Tested: 6-Jul-21 Tested By: M. Carrillo	Unified Soil Classification System, ASTM-2487 SW-SC, Well-graded Sand with Silty Clay and Gravel Sample Color: brown	ACCREDITED Certificate #: 1366.01
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ASTM D2216, ASTM D2419, ASTM D4318, ASTM D5281			
Specifications No Specs Sample Meets Specs ? N/A	D ₍₅₎ = 0.010 mm D ₍₁₀₎ = 0.074 mm D ₍₁₅₎ = 0.188 mm D ₍₃₀₎ = 0.387 mm D ₍₅₀₎ = 0.932 mm D ₍₆₀₎ = 1.964 mm D ₍₉₀₎ = 12.746 mm Dust Ratio = 27/88	% Gravel = 25.6% % Sand = 64.2% % Silt & Clay = 10.2% Liquid Limit = n/a Plasticity Index = n/a Sand Equivalent = n/a Fracture %, 1 Face = n/a Fracture %, 2+ Faces = n/a	Coeff. of Curvature, C _c = 1.03 Coeff. of Uniformity, C _u = 26.58 Fineness Modulus = 3.56 Plastic Limit = n/a Moisture %, as sampled = n/a Req'd Sand Equivalent = Req'd Fracture %, 1 Face = Req'd Fracture %, 2+ Faces =

ASTM C136, ASTM D6913, ASTM C117					
		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
Sieve Size	Metric				
US					
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00	100%	100%	100.0%	0.0%
1.50"	37.50	100%	100%	100.0%	0.0%
1.25"	31.50	100%	100%	100.0%	0.0%
1.00"	25.00	100%	100%	100.0%	0.0%
3/4"	19.00	96%	96%	100.0%	0.0%
5/8"	16.00	93%	93%	100.0%	0.0%
1/2"	12.50	90%	90%	100.0%	0.0%
3/8"	9.50	84%	84%	100.0%	0.0%
1/4"	6.30	78%	78%	100.0%	0.0%
#4	4.75	74%	74%	100.0%	0.0%
#8	2.36	62%	62%	100.0%	0.0%
#10	2.00	60%	60%	100.0%	0.0%
#16	1.18	52%	52%	100.0%	0.0%
#20	0.850	49%	49%	100.0%	0.0%
#30	0.600	40%	40%	100.0%	0.0%
#40	0.425	33%	33%	100.0%	0.0%
#50	0.300	23%	23%	100.0%	0.0%
#60	0.250	19%	19%	100.0%	0.0%
#80	0.180	15%	15%	100.0%	0.0%
#100	0.150	13%	13%	100.0%	0.0%
#140	0.106	11%	11%	100.0%	0.0%
#170	0.090	11%	11%	100.0%	0.0%
#200	0.075	10.2%	10.2%	100.0%	0.0%




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Comments: _____

Reviewed by: _____
 Meghan Blodgett-Carrillo



Hydrometer Report

<p>Project: Q.C. - 21F0419 South State Street PRDI Date Received: 2-Jul-21 Project #: 21S023-26 Sampled By: Client Client: Analytical Resources, Inc. Date Tested: 6-Jul-21 Source: 21F0419-28 A Tested By: M. Carrillo Sample#: B21-1007</p>	<p>Unified Soil Classification System, ASTM-2487 SW-SC, Well-graded Sand with Silty Clay and Gravel Sample Color brown</p>																																																																																																									
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<p>Assumed Sp Gr: 2.65 Sample Weight: 100.17 grams Hydroscopic Moist: 3.32% Adj. Sample Wgt: 96.95 grams</p> <div style="text-align: center;">  </div> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Hydrometer Reading Minutes</th> <th style="text-align: left;">Corrected Reading</th> <th style="text-align: left;">Percent Passing</th> <th style="text-align: left;">Soils Particle Diameter</th> </tr> </thead> <tbody> <tr><td>1</td><td>11</td><td>6.8%</td><td>0.0520 mm</td></tr> <tr><td>2</td><td>11</td><td>6.8%</td><td>0.0368 mm</td></tr> <tr><td>5</td><td>10.5</td><td>6.5%</td><td>0.0234 mm</td></tr> <tr><td>15</td><td>9</td><td>5.6%</td><td>0.0136 mm</td></tr> <tr><td>30</td><td>8</td><td>5.0%</td><td>0.0097 mm</td></tr> <tr><td>60</td><td>7</td><td>4.4%</td><td>0.0069 mm</td></tr> <tr><td>240</td><td>4</td><td>2.5%</td><td>0.0035 mm</td></tr> <tr><td>1440</td><td>1</td><td>0.6%</td><td>0.0014 mm</td></tr> </tbody> </table> <p>% Gravel: 25.6% Liquid Limit: n/a % Sand: 64.2% Plastic Limit: n/a % Silt: 6.8% Plasticity Index: n/a % Clay: 3.3%</p>	Hydrometer Reading Minutes	Corrected Reading	Percent Passing	Soils Particle Diameter	1	11	6.8%	0.0520 mm	2	11	6.8%	0.0368 mm	5	10.5	6.5%	0.0234 mm	15	9	5.6%	0.0136 mm	30	8	5.0%	0.0097 mm	60	7	4.4%	0.0069 mm	240	4	2.5%	0.0035 mm	1440	1	0.6%	0.0014 mm	<p style="text-align: center;">Sieve Analysis Grain Size Distribution</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Sieve Size</th> <th style="text-align: left;">Percent Passing</th> <th style="text-align: left;">Soils Particle Diameter</th> </tr> </thead> <tbody> <tr><td>3.0"</td><td>100%</td><td>75.000 mm</td></tr> <tr><td>2.0"</td><td>100%</td><td>50.000 mm</td></tr> <tr><td>1.5"</td><td>100%</td><td>37.500 mm</td></tr> <tr><td>1.25"</td><td>100%</td><td>31.500 mm</td></tr> <tr><td>1.0"</td><td>100%</td><td>25.000 mm</td></tr> <tr><td>3/4"</td><td>96%</td><td>19.000 mm</td></tr> <tr><td>5/8"</td><td>93%</td><td>16.000 mm</td></tr> <tr><td>1/2"</td><td>90%</td><td>12.500 mm</td></tr> <tr><td>3/8"</td><td>84%</td><td>9.500 mm</td></tr> <tr><td>1/4"</td><td>78%</td><td>6.300 mm</td></tr> <tr><td>#4</td><td>74%</td><td>4.750 mm</td></tr> <tr><td>#10</td><td>60%</td><td>2.000 mm</td></tr> <tr><td>#20</td><td>49%</td><td>0.850 mm</td></tr> <tr><td>#40</td><td>33%</td><td>0.425 mm</td></tr> <tr><td>#100</td><td>13%</td><td>0.150 mm</td></tr> <tr><td>#200</td><td>10.2%</td><td>0.075 mm</td></tr> <tr><td>Silts</td><td>10.0%</td><td>0.074 mm</td></tr> <tr><td></td><td>7.2%</td><td>0.050 mm</td></tr> <tr><td></td><td>6.2%</td><td>0.020 mm</td></tr> <tr><td>Clays</td><td>3.3%</td><td>0.005 mm</td></tr> <tr><td></td><td>1.1%</td><td>0.002 mm</td></tr> <tr><td>Colloids</td><td>0.4%</td><td>0.001 mm</td></tr> </tbody> </table>	Sieve Size	Percent Passing	Soils Particle Diameter	3.0"	100%	75.000 mm	2.0"	100%	50.000 mm	1.5"	100%	37.500 mm	1.25"	100%	31.500 mm	1.0"	100%	25.000 mm	3/4"	96%	19.000 mm	5/8"	93%	16.000 mm	1/2"	90%	12.500 mm	3/8"	84%	9.500 mm	1/4"	78%	6.300 mm	#4	74%	4.750 mm	#10	60%	2.000 mm	#20	49%	0.850 mm	#40	33%	0.425 mm	#100	13%	0.150 mm	#200	10.2%	0.075 mm	Silts	10.0%	0.074 mm		7.2%	0.050 mm		6.2%	0.020 mm	Clays	3.3%	0.005 mm		1.1%	0.002 mm	Colloids	0.4%	0.001 mm
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Comments: _____

Reviewed by: 

 Meghan Blodgett-Carrillo

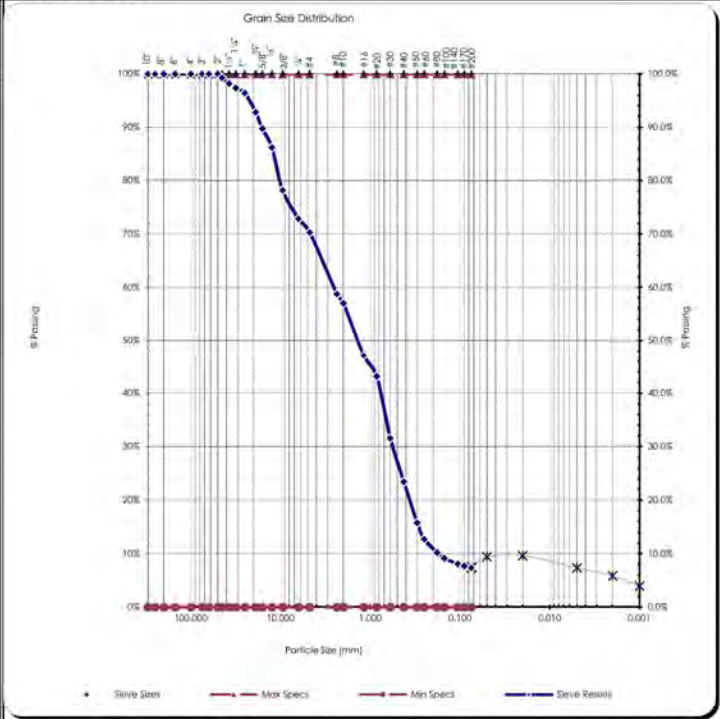


Sieve Report

Project: Q.C. - 21F0419 South State Street PRDI Project #: 21S023-26 Client: Analytical Resources, Inc. Source: 21F0419-30 A Sample#: B21-1008	Date Received: 2-Jul-21 Sampled By: Client Date Tested: 6-Jul-21 Tested By: M. Carrillo	Unified Soil Classification System, ASTM-2487 SP-SM, Poorly graded Sand with Silt and Gravel Sample Color: gray	ACCREDITED Certificate #: 1366.01
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ASTM D2216, ASTM D2419, ASTM D4318, ASTM D5281			
Specifications No Specs Sample Meets Specs ? N/A	D ₍₅₎ = 0.001 mm D ₍₁₀₎ = 0.173 mm D ₍₁₅₎ = 0.287 mm D ₍₃₀₎ = 0.566 mm D ₍₅₀₎ = 1.417 mm D ₍₆₀₎ = 2.616 mm D ₍₉₀₎ = 16.232 mm Dust Ratio = 27/86	% Gravel = 29.7% % Sand = 62.9% % Silt & Clay = 7.4% Liquid Limit = n/a Plasticity Index = n/a Sand Equivalent = n/a Fracture %, 1 Face = n/a Fracture %, 2+ Faces = n/a	Coeff. of Curvature, C _c = 0.71 Coeff. of Uniformity, C _u = 15.10 Fineness Modulus = 3.96 Plastic Limit = n/a Moisture %, as sampled = n/a Req'd Sand Equivalent = Req'd Fracture %, 1 Face = Req'd Fracture %, 2+ Faces =

ASTM C136, ASTM D6913, ASTM C117					
		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
Sieve Size	Metric				
US					
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00		99%	100.0%	0.0%
1.50"	37.50		98%	100.0%	0.0%
1.25"	31.50		97%	100.0%	0.0%
1.00"	25.00	96%	96%	100.0%	0.0%
3/4"	19.00	93%	93%	100.0%	0.0%
5/8"	16.00		90%	100.0%	0.0%
1/2"	12.50	86%	86%	100.0%	0.0%
3/8"	9.50	78%	78%	100.0%	0.0%
1/4"	6.30		73%	100.0%	0.0%
#4	4.75	70%	70%	100.0%	0.0%
#8	2.36		59%	100.0%	0.0%
#10	2.00	57%	57%	100.0%	0.0%
#16	1.18		47%	100.0%	0.0%
#20	0.850	43%	43%	100.0%	0.0%
#30	0.600		32%	100.0%	0.0%
#40	0.425	23%	23%	100.0%	0.0%
#50	0.300	16%	16%	100.0%	0.0%
#60	0.250	13%	13%	100.0%	0.0%
#80	0.180	10%	10%	100.0%	0.0%
#100	0.150	9%	9%	100.0%	0.0%
#140	0.106	8%	8%	100.0%	0.0%
#170	0.090	8%	8%	100.0%	0.0%
#200	0.075	7.4%	7.4%	100.0%	0.0%




Copyright: Sperry Engineering & Technical Services PS, 1996-98
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Comments: _____

Reviewed by: _____
 Meghan Blodgett-Carrillo



Hydrometer Report

<p>Project: Q.C. - 21F0419 South State Street PRDI Date Received: 2-Jul-21 Project #: 21S023-26 Sampled By: Client Client : Analytical Resources, Inc. Date Tested: 6-Jul-21 Source: 21F0419-30 A Tested By: M. Carrillo Sample#: B21-1008</p>	<p>Unified Soil Classification System, ASTM-2487 SP-SM, Poorly graded Sand with Silt and Gravel Sample Color gray</p>																																																																																																									
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Comments: _____

Reviewed by:  _____
 Meghan Blodgett-Carrillo



Sieve Report

Project: Q.C. - 21F0419 South State Street PRDI Project #: 21S023-26 Client: Analytical Resources, Inc. Source: 21F0419-34 A Sample#: B21-1009	Date Received: 2-Jul-21 Sampled By: Client Date Tested: 6-Jul-21 Tested By: M. Carrillo	Unified Soil Classification System, ASTM-2487 SP-SM, Poorly graded Sand with Silt and Gravel Sample Color: brown	ACCREDITED Certificate #: 1366.01
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ASTM D2216, ASTM D2419, ASTM D4318, ASTM D5281			
Specifications No Specs Sample Meets Specs ? N/A	$D_{15} = 0.022$ mm $D_{10} = 0.088$ mm $D_{15} = 0.174$ mm $D_{30} = 0.379$ mm $D_{50} = 1.248$ mm $D_{60} = 2.497$ mm $D_{90} = 16.156$ mm Dust Ratio = 27/97	% Gravel = 31.3% % Sand = 59.4% % Silt & Clay = 9.3% Liquid Limit = n/a Plasticity Index = n/a Sand Equivalent = n/a Fracture %, 1 Face = n/a Fracture %, 2+ Faces = n/a	Coeff. of Curvature, $C_c = 0.65$ Coeff. of Uniformity, $C_u = 28.26$ Fineness Modulus = 3.75 Plastic Limit = n/a Moisture %, as sampled = n/a Req'd Sand Equivalent = Req'd Fracture %, 1 Face = Req'd Fracture %, 2+ Faces =

ASTM C136, ASTM D6913, ASTM C117					
Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		99%	100.0%	0.0%
1.25"	31.50		98%	100.0%	0.0%
1.00"	25.00	98%	98%	100.0%	0.0%
3/4"	19.00	94%	94%	100.0%	0.0%
5/8"	16.00		90%	100.0%	0.0%
1/2"	12.50	85%	85%	100.0%	0.0%
3/8"	9.50	78%	78%	100.0%	0.0%
1/4"	6.30		72%	100.0%	0.0%
#4	4.75	69%	69%	100.0%	0.0%
#8	2.36		59%	100.0%	0.0%
#10	2.00	58%	58%	100.0%	0.0%
#16	1.18		49%	100.0%	0.0%
#20	0.850	46%	46%	100.0%	0.0%
#30	0.600		38%	100.0%	0.0%
#40	0.425	33%	33%	100.0%	0.0%
#50	0.300		24%	100.0%	0.0%
#60	0.250	20%	20%	100.0%	0.0%
#80	0.180		15%	100.0%	0.0%
#100	0.150	13%	13%	100.0%	0.0%
#140	0.106		11%	100.0%	0.0%
#170	0.090		10%	100.0%	0.0%
#200	0.075	9.3%	9.3%	100.0%	0.0%


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Comments: _____

Reviewed by: _____
 Meghan Blodgett-Carrillo



Hydrometer Report

<p>Project: Q.C. - 21F0419 South State Street PRDI Date Received: 2-Jul-21 Project #: 21S023-26 Sampled By: Client Client: Analytical Resources, Inc. Date Tested: 6-Jul-21 Source: 21F0419-34 A Tested By: M. Carrillo Sample#: B21-1009</p>	<p>Unified Soil Classification System, ASTM-2487 SP-SM, Poorly graded Sand with Silt and Gravel Sample Color brown</p>																																																																																																									
ASTM D7928, HYDROMETER ANALYSIS	ASTM D6913																																																																																																									
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Comments: _____

Reviewed by: 

 Meghan Blodgett-Carrillo

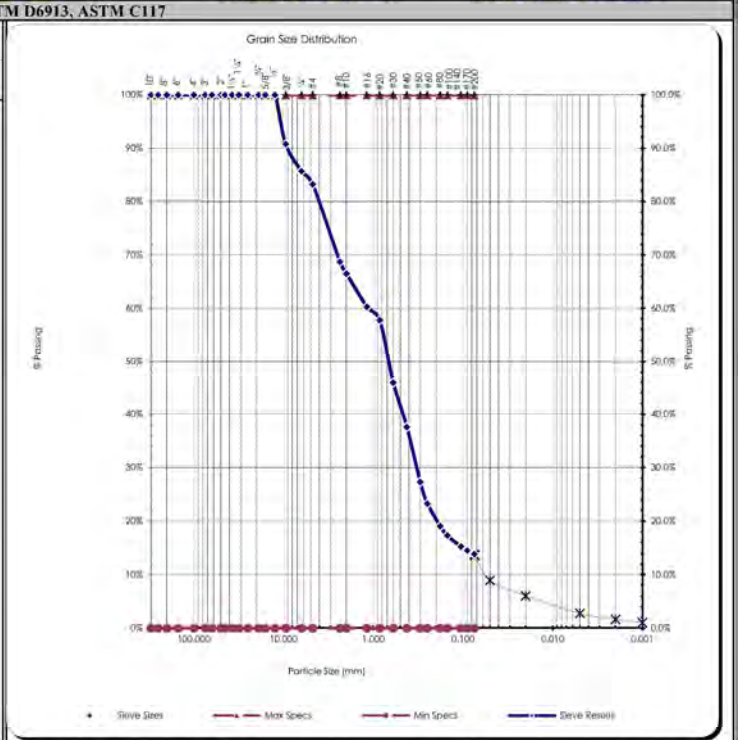


Sieve Report

Project: Q.C. - 21F0419 South State Street PRDI Project #: 21S023-26 Client: Analytical Resources, Inc. Source: 21F0419-38 A Sample#: B21-1010	Date Received: 2-Jul-21 Sampled By: Client Date Tested: 6-Jul-21 Tested By: M. Carrillo	Unified Soil Classification System, ASTM-2487 SM, Silty Sand with Gravel Sample Color: brown	 Certificate #: 1366.01
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Specifications No Specs Sample Meets Specs ? N/A	ASTM D2216, ASTM D2419, ASTM D4318, ASTM D5281 D ₍₅₎ = 0.013 mm D ₍₁₀₎ = 0.058 mm D ₍₁₅₎ = 0.100 mm D ₍₃₀₎ = 0.332 mm D ₍₅₀₎ = 0.686 mm D ₍₆₀₎ = 1.138 mm D ₍₉₀₎ = 8.985 mm Dust Ratio = 32/87	% Gravel = 16.7% % Sand = 69.4% % Silt & Clay = 13.8% Liquid Limit = n/a Plasticity Index = n/a Sand Equivalent = n/a Fracture %, 1 Face = n/a Fracture %, 2+ Faces = n/a	Coeff. of Curvature, C _c = 1.67 Coeff. of Uniformity, C _u = 19.59 Fineness Modulus = 3.06 Plastic Limit = n/a Moisture %, as sampled = 0.4% Req'd Sand Equivalent = Req'd Fracture %, 1 Face = Req'd Fracture %, 2+ Faces =
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Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00	100%	100%	100.0%	0.0%
3/4"	19.00	100%	100%	100.0%	0.0%
5/8"	16.00		100%	100.0%	0.0%
1/2"	12.50	100%	100%	100.0%	0.0%
3/8"	9.50	91%	91%	100.0%	0.0%
1/4"	6.30		86%	100.0%	0.0%
#4	4.75	83%	83%	100.0%	0.0%
#8	2.36		69%	100.0%	0.0%
#10	2.00	67%	67%	100.0%	0.0%
#16	1.18		60%	100.0%	0.0%
#20	0.850	58%	58%	100.0%	0.0%
#30	0.600		46%	100.0%	0.0%
#40	0.425	38%	38%	100.0%	0.0%
#50	0.300		27%	100.0%	0.0%
#60	0.250	23%	23%	100.0%	0.0%
#80	0.180		19%	100.0%	0.0%
#100	0.150	17%	17%	100.0%	0.0%
#140	0.106		15%	100.0%	0.0%
#170	0.090		15%	100.0%	0.0%
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Comments: _____

Reviewed by: 
 Meghan Blodgett-Carrillo



Hydrometer Report

<p>Project: Q.C. - 21F0419 South State Street PRDI Date Received: 2-Jul-21 Project #: 21S023-26 Sampled By: Client Client: Analytical Resources, Inc. Date Tested: 6-Jul-21 Source: 21F0419-38 A Tested By: M. Carrillo Sample#: B21-1010</p>	<p>Unified Soil Classification System, ASTM-2487 SM, Silty Sand with Gravel Sample Color brown</p>																																																																																																									
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Comments: _____

Reviewed by: 

 Meghan Blodgett-Carrillo

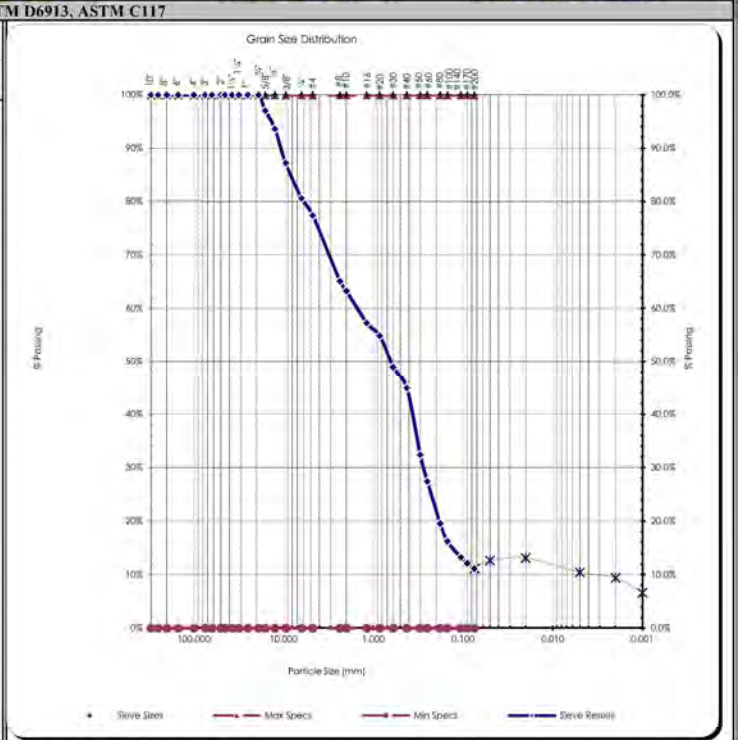


Sieve Report

Project: Q.C. - 21F0419 South State Street PRDI Project #: 21S023-26 Client: Analytical Resources, Inc. Source: 21F0419-42 A Sample#: B21-1011	Date Received: 2-Jul-21 Sampled By: Client Date Tested: 6-Jul-21 Tested By: M. Carrillo	Unified Soil Classification System, ASTM-2487 SP-SM, Poorly graded Sand with Silt and Gravel Sample Color: dark brown	ACCREDITED Certificate #: 1366.01
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Specifications No Specs Sample Meets Specs ? N/A	ASTM D2216, ASTM D2419, ASTM D4318, ASTM D5281 D ₍₅₎ = 0.001 mm D ₍₁₀₎ = 0.003 mm D ₍₁₅₎ = 0.131 mm D ₍₃₀₎ = 0.276 mm D ₍₅₀₎ = 0.642 mm D ₍₆₀₎ = 1.553 mm D ₍₁₀₀₎ = 10.796 mm Dust Ratio = 1/4	% Gravel = 22.6% % Sand = 66.3% % Silt & Clay = 11.2% Liquid Limit = n/a Plasticity Index = n/a Sand Equivalent = n/a Fracture %, 1 Face = n/a Fracture %, 2+ Faces = n/a	Coeff. of Curvature, C _c = 17.18 Coeff. of Uniformity, C _u = 544.96 Fineness Modulus = 3.15 Plastic Limit = n/a Moisture %, as sampled = n/a Req'd Sand Equivalent = Req'd Fracture %, 1 Face = Req'd Fracture %, 2+ Faces =
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Sieve Size		Actual Cumulative Percent Passing	Interpolated Cumulative Percent Passing	Specs Max	Specs Min
US	Metric				
12.00"	300.00		100%	100.0%	0.0%
10.00"	250.00		100%	100.0%	0.0%
8.00"	200.00		100%	100.0%	0.0%
6.00"	150.00		100%	100.0%	0.0%
4.00"	100.00		100%	100.0%	0.0%
3.00"	75.00		100%	100.0%	0.0%
2.50"	63.00		100%	100.0%	0.0%
2.00"	50.00	100%	100%	100.0%	0.0%
1.75"	45.00		100%	100.0%	0.0%
1.50"	37.50		100%	100.0%	0.0%
1.25"	31.50		100%	100.0%	0.0%
1.00"	25.00	100%	100%	100.0%	0.0%
3/4"	19.00	100%	100%	100.0%	0.0%
5/8"	16.00		97%	100.0%	0.0%
1/2"	12.50	94%	94%	100.0%	0.0%
3/8"	9.50	87%	87%	100.0%	0.0%
1/4"	6.30		81%	100.0%	0.0%
#4	4.75	77%	77%	100.0%	0.0%
#8	2.36		65%	100.0%	0.0%
#10	2.00	63%	63%	100.0%	0.0%
#16	1.18		57%	100.0%	0.0%
#20	0.850	55%	55%	100.0%	0.0%
#30	0.600		49%	100.0%	0.0%
#40	0.425	45%	45%	100.0%	0.0%
#50	0.300		32%	100.0%	0.0%
#60	0.250	27%	27%	100.0%	0.0%
#80	0.180		20%	100.0%	0.0%
#100	0.150	16%	16%	100.0%	0.0%
#140	0.106		13%	100.0%	0.0%
#170	0.090		12%	100.0%	0.0%
#200	0.075	11.2%	11.2%	100.0%	0.0%




Copyright: Sperry Engineering & Technical Services PS, 1996-98
 All results apply only to actual locations and materials tested. As a mutual protection to clients, the public and ourselves, all reports are submitted as the confidential property of clients, and authorization for publication of statements, conclusions or extracts from or regarding our reports is reserved pending our written approval.

Comments: _____

Reviewed by:
 Meghan Blodgett-Carrillo



Hydrometer Report

<p>Project: Q.C. - 21F0419 South State Street PRDI Date Received: 2-Jul-21 Project #: 21S023-26 Sampled By: Client Client : Analytical Resources, Inc. Date Tested: 6-Jul-21 Source: 21F0419-42 A Tested By: M. Carrillo Sample#: B21-1011</p>	<p>Unified Soil Classification System, ASTM-2487 SP-SM, Poorly graded Sand with Silt and Gravel Sample Color dark brown</p>																																																																																																									
ASTM D7928, HYDROMETER ANALYSIS	ASTM D6913																																																																																																									
<p>Assumed Sp Gr : 2.65 Sample Weight: 100.29 grams Hydroscopic Moist.: 5.28% Adj. Sample Wgt : 95.26 grams</p> <div style="text-align: center;">  </div> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Hydrometer Reading Minutes</th> <th style="text-align: left;">Corrected Reading</th> <th style="text-align: left;">Percent Passing</th> <th style="text-align: left;">Soils Particle Diameter</th> </tr> </thead> <tbody> <tr><td>1</td><td>20.5</td><td>13.6%</td><td>0.0492 mm</td></tr> <tr><td>2</td><td>20.5</td><td>13.6%</td><td>0.0348 mm</td></tr> <tr><td>5</td><td>20</td><td>13.3%</td><td>0.0220 mm</td></tr> <tr><td>15</td><td>19</td><td>12.6%</td><td>0.0128 mm</td></tr> <tr><td>30</td><td>18</td><td>12.0%</td><td>0.0091 mm</td></tr> <tr><td>60</td><td>16</td><td>10.6%</td><td>0.0065 mm</td></tr> <tr><td>240</td><td>15.5</td><td>10.3%</td><td>0.0033 mm</td></tr> <tr><td>1440</td><td>13.5</td><td>9.0%</td><td>0.0014 mm</td></tr> </tbody> </table> <p>% Gravel: 22.6% Liquid Limit: n/a % Sand: 66.3% Plastic Limit: n/a % Silt: 0.7% Plasticity Index: n/a % Clay: 10.5%</p>	Hydrometer Reading Minutes	Corrected Reading	Percent Passing	Soils Particle Diameter	1	20.5	13.6%	0.0492 mm	2	20.5	13.6%	0.0348 mm	5	20	13.3%	0.0220 mm	15	19	12.6%	0.0128 mm	30	18	12.0%	0.0091 mm	60	16	10.6%	0.0065 mm	240	15.5	10.3%	0.0033 mm	1440	13.5	9.0%	0.0014 mm	<p style="text-align: center;">Sieve Analysis</p> <p style="text-align: center;">Grain Size Distribution</p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Sieve Size</th> <th style="text-align: left;">Percent Passing</th> <th style="text-align: left;">Soils Particle Diameter</th> </tr> </thead> <tbody> <tr><td>3.0"</td><td>100%</td><td>75.000 mm</td></tr> <tr><td>2.0"</td><td>100%</td><td>50.000 mm</td></tr> <tr><td>1.5"</td><td>100%</td><td>37.500 mm</td></tr> <tr><td>1.25"</td><td>100%</td><td>31.500 mm</td></tr> <tr><td>1.0"</td><td>100%</td><td>25.000 mm</td></tr> <tr><td>3/4"</td><td>100%</td><td>19.000 mm</td></tr> <tr><td>5/8"</td><td>97%</td><td>16.000 mm</td></tr> <tr><td>1/2"</td><td>94%</td><td>12.500 mm</td></tr> <tr><td>3/8"</td><td>87%</td><td>9.500 mm</td></tr> <tr><td>1/4"</td><td>81%</td><td>6.300 mm</td></tr> <tr><td>#4</td><td>77%</td><td>4.750 mm</td></tr> <tr><td>#10</td><td>63%</td><td>2.000 mm</td></tr> <tr><td>#20</td><td>55%</td><td>0.850 mm</td></tr> <tr><td>#40</td><td>45%</td><td>0.425 mm</td></tr> <tr><td>#100</td><td>16%</td><td>0.150 mm</td></tr> <tr><td>#200</td><td>11.2%</td><td>0.075 mm</td></tr> <tr><td>Silts</td><td>11.3%</td><td>0.074 mm</td></tr> <tr><td></td><td>12.7%</td><td>0.050 mm</td></tr> <tr><td></td><td>13.1%</td><td>0.020 mm</td></tr> <tr><td>Clays</td><td>10.5%</td><td>0.005 mm</td></tr> <tr><td></td><td>9.4%</td><td>0.002 mm</td></tr> <tr><td>Colloids</td><td>6.6%</td><td>0.001 mm</td></tr> </tbody> </table>	Sieve Size	Percent Passing	Soils Particle Diameter	3.0"	100%	75.000 mm	2.0"	100%	50.000 mm	1.5"	100%	37.500 mm	1.25"	100%	31.500 mm	1.0"	100%	25.000 mm	3/4"	100%	19.000 mm	5/8"	97%	16.000 mm	1/2"	94%	12.500 mm	3/8"	87%	9.500 mm	1/4"	81%	6.300 mm	#4	77%	4.750 mm	#10	63%	2.000 mm	#20	55%	0.850 mm	#40	45%	0.425 mm	#100	16%	0.150 mm	#200	11.2%	0.075 mm	Silts	11.3%	0.074 mm		12.7%	0.050 mm		13.1%	0.020 mm	Clays	10.5%	0.005 mm		9.4%	0.002 mm	Colloids	6.6%	0.001 mm
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Comments: _____

Reviewed by: 

 Meghan Blodgett-Carrillo



GeoEngineers 17425 Union Hill Road Suite 250 Redmond WA, 98052	Project: South State Street PRDI Project Number: Project #186-890-03 Tsk 300 Project Manager: Brian Tracy	Reported: 22-Jul-2021 19:04
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**PRDI-1-PW-
21F0419-01 (Water)**

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5030C (Purge and Trap)	Sampled: 06/23/2021 09:40
Instrument: NT2 Analyst: PKC	Preparation Batch: BJF0786	Analyzed: 06/30/2021 01:15
Sample Preparation:	Sample Size: 10 mL	Extract ID: 21F0419-01 G
	Final Volume: 10 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Naphthalene	91-20-3	1	0.27	0.50	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>119</i>	<i>%</i>	
<i>Surrogate: Toluene-d8</i>				<i>80-120 %</i>	<i>94.9</i>	<i>%</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>				<i>80-120 %</i>	<i>84.4</i>	<i>%</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				<i>80-120 %</i>	<i>107</i>	<i>%</i>	



GeoEngineers 17425 Union Hill Road Suite 250 Redmond WA, 98052	Project: South State Street PRDI Project Number: Project #186-890-03 Tsk 300 Project Manager: Brian Tracy	Reported: 22-Jul-2021 19:04
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**PRDI-1-PW-
21F0419-01 (Water)**

Volatile Organic Compounds

Method: NWTPHg	Preparation Method: EPA 5030C (Purge and Trap)	Sampled: 06/23/2021 09:40
Instrument: NT2 Analyst: PKC	Preparation Batch: BJF0786	Analyzed: 06/30/2021 01:15
Sample Preparation:	Prepared: 06/29/2021	Extract ID: 21F0419-01 G
	Sample Size: 10 mL	
	Final Volume: 10 mL	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
Surrogate: Toluene-d8			80-120 %	94.9	%	
Surrogate: 4-Bromofluorobenzene			80-120 %	84.4	%	



GeoEngineers 17425 Union Hill Road Suite 250 Redmond WA, 98052	Project: South State Street PRDI Project Number: Project #186-890-03 Tsk 300 Project Manager: Brian Tracy	Reported: 22-Jul-2021 19:04
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**PRDI-1-PW-
21F0419-01 (Water)**

Petroleum Hydrocarbons

Method: NWTPH-Dx	Preparation Method: EPA 3510C SepF	Sample Size: 500 mL	Sampled: 06/23/2021 09:40
Instrument: FID4 Analyst: CTO	Preparation Batch: BJF0776	Final Volume: 1 mL	Analyzed: 07/14/2021 18:42
Sample Preparation:	Prepared: 06/29/2021		Extract ID: 21F0419-01 A 01

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Surrogate: <i>o</i> -Terphenyl			50-150 %	79.6	%	



GeoEngineers 17425 Union Hill Road Suite 250 Redmond WA, 98052	Project: South State Street PRDI Project Number: Project #186-890-03 Tsk 300 Project Manager: Brian Tracy	Reported: 22-Jul-2021 19:04
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**PRDI-1-PW-
21F0419-01 (Water)**

Wet Chemistry

Method: EPA 9014	Instrument: UV1800-2	Analyst: CKI	Sampled: 06/23/2021 09:40
Sample Preparation:	Preparation Method: SM 4500-CN ⁻ G-99	Preparation Batch: BJF0820	Analyzed: 07/01/2021 16:09
	Prepared: 06/30/2021	Sample Size: 50 mL	Extract ID: 21F0419-01 E
		Final Volume: 50 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total	57-12-5	1	0.0050	0.0050	0.0080	mg/L	



GeoEngineers 17425 Union Hill Road Suite 250 Redmond WA, 98052	Project: South State Street PRDI Project Number: Project #186-890-03 Tsk 300 Project Manager: Brian Tracy	Reported: 22-Jul-2021 19:04
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**PRDI-1-PW-
21F0419-01 (Water)**

Wet Chemistry

Method: SM 4500-CN ⁻ I-97	Preparation Method: SM 4500-CN ⁻ I-99	Sample Size: 50 mL	Sampled: 06/23/2021 09:40
Instrument: UV1800-2 Analyst: CKI	Preparation Batch: BJG0101	Final Volume: 50 mL	Analyzed: 07/06/2021 17:13
Sample Preparation:	Prepared: 07/06/2021	Extract ID: 21F0419-01 E	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Weak Acid Dissociable	57-12-5	1	0.005	0.005	ND	mg/L	U



GeoEngineers
17425 Union Hill Road Suite 250
Redmond WA, 98052

Project: South State Street PRDI
Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
22-Jul-2021 19:04

**PRDI-2-PW-
21F0419-02 (Water)**

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/23/2021 10:40
Instrument: NT2 Analyst: PKC Analyzed: 06/30/2021 13:54
Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-02 F
Preparation Batch: BJF0811 Sample Size: 0.1 mL
Prepared: 06/30/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	5.31	20.0	5580	ug/L	
Naphthalene	91-20-3	1	27.4	50.0	5100	ug/L	E
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>91.6</i>	<i>%</i>	
<i>Surrogate: Toluene-d8</i>				<i>80-120 %</i>	<i>96.1</i>	<i>%</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>				<i>80-120 %</i>	<i>96.9</i>	<i>%</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				<i>80-120 %</i>	<i>102</i>	<i>%</i>	



GeoEngineers
17425 Union Hill Road Suite 250
Redmond WA, 98052

Project: South State Street PRDI
Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
22-Jul-2021 19:04

**PRDI-2-PW-
21F0419-02 (Water)**

Volatile Organic Compounds

Method: NWTPHg Sampled: 06/23/2021 10:40
Instrument: NT2 Analyst: PKC Analyzed: 06/30/2021 13:54
Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-02 F
Preparation Batch: BJF0811 Sample Size: 0.1 mL
Prepared: 06/30/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	10000	47200	ug/L	
HC ID: GRO						
Surrogate: Toluene-d8			80-120 %	96.1	%	
Surrogate: 4-Bromofluorobenzene			80-120 %	96.9	%	



GeoEngineers 17425 Union Hill Road Suite 250 Redmond WA, 98052	Project: South State Street PRDI Project Number: Project #186-890-03 Tsk 300 Project Manager: Brian Tracy	Reported: 22-Jul-2021 19:04
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**PRDI-2-PW-
21F0419-02 (Water)**

Petroleum Hydrocarbons

Method: NWTPH-Dx	Instrument: FID4 Analyst: CTO	Sampled: 06/23/2021 10:40 Analyzed: 07/14/2021 19:03
Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJF0776 Prepared: 06/29/2021	Sample Size: 500 mL Final Volume: 1 mL Extract ID: 21F0419-02 A 01

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	3.32	mg/L	
HC ID: DRO						
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
<i>Surrogate: o-Terphenyl</i>			<i>50-150 %</i>	<i>91.5</i>	<i>%</i>	



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**PRDI-2-PW-
21F0419-02 (Water)**

Wet Chemistry

Method: EPA 9014	Instrument: UV1800-2	Analyst: CKI	Sampled: 06/23/2021 10:40
Sample Preparation:	Preparation Method: SM 4500-CN ⁻ G-99	Preparation Batch: BJF0820	Analyzed: 07/01/2021 16:11
	Prepared: 06/30/2021	Sample Size: 50 mL	Extract ID: 21F0419-02 E
		Final Volume: 50 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total	57-12-5	1	0.0050	0.0050	0.0080	mg/L	



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**PRDI-2-PW-
21F0419-02 (Water)**

Wet Chemistry

Method: SM 4500-CN⁻ I-97 Sampled: 06/23/2021 10:40
Instrument: UV1800-2 Analyst: CKI Analyzed: 07/06/2021 17:11

Sample Preparation: Preparation Method: SM 4500-CN⁻ I-99 Extract ID: 21F0419-02 E
Preparation Batch: BJG0101 Sample Size: 50 mL
Prepared: 07/06/2021 Final Volume: 50 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Weak Acid Dissociable	57-12-5	1	0.005	0.005	ND	mg/L	U



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**PRDI-2-PW-
21F0419-02RE1 (Water)**

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/23/2021 10:40
Instrument: NT3 Analyst: PKC Analyzed: 07/02/2021 17:19
Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-02RE1 G
Preparation Batch: BJG0021 Sample Size: 0.04 mL
Prepared: 07/02/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	13.3	50.0	5440	ug/L	
Naphthalene	91-20-3	1	68.4	125	5560	ug/L	
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-129 %	102	%
<i>Surrogate: Toluene-d8</i>					80-120 %	96.3	%
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	99.4	%
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	99.1	%



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**PRDI-3-PW-
21F0419-03 (Water)**

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/22/2021 13:15
Instrument: NT2 Analyst: PKC Analyzed: 06/30/2021 14:37

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-03 F
Preparation Batch: BJF0811 Sample Size: 10 mL
Prepared: 06/30/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.05	0.20	0.12	ug/L	J
Naphthalene	91-20-3	1	0.27	0.50	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-129 %	101	%
<i>Surrogate: Toluene-d8</i>					80-120 %	98.0	%
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	92.7	%
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	102	%



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**PRDI-3-PW-
21F0419-03 (Water)**

Volatile Organic Compounds

Method: NWTPHg	Preparation Method: EPA 5030C (Purge and Trap)	Sampled: 06/22/2021 13:15
Instrument: NT2 Analyst: PKC	Preparation Batch: BJF0811	Analyzed: 06/30/2021 14:37
Sample Preparation:	Prepared: 06/30/2021	Extract ID: 21F0419-03 F
	Sample Size: 10 mL	
	Final Volume: 10 mL	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
Surrogate: Toluene-d8			80-120 %	98.0	%	
Surrogate: 4-Bromofluorobenzene			80-120 %	92.7	%	



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**PRDI-3-PW-
21F0419-03 (Water)**

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 06/22/2021 13:15

Instrument: FID4 Analyst: CTO

Analyzed: 07/14/2021 20:04

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21F0419-03 A 01

Preparation Batch: BJF0776

Sample Size: 500 mL

Prepared: 06/29/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
<i>Surrogate: o-Terphenyl</i>			50-150 %	92.3	%	



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**PRDI-3-PW-
21F0419-03 (Water)**

Wet Chemistry

Method: EPA 9014	Instrument: UV1800-2	Analyst: CKI	Sampled: 06/22/2021 13:15	Analyzed: 07/01/2021 16:12
Sample Preparation:	Preparation Method: SM 4500-CN ⁻ G-99	Preparation Batch: BJF0820	Sample Size: 50 mL	Final Volume: 50 mL
	Prepared: 06/30/2021		Extract ID: 21F0419-03 E	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total	57-12-5	1	0.0050	0.0050	ND	mg/L	U



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**PRDI-3-PW-
21F0419-03 (Water)**

Wet Chemistry

Method: SM 4500-CN ⁻ I-97	Preparation Method: SM 4500-CN ⁻ I-99	Sample Size: 50 mL	Sampled: 06/22/2021 13:15
Instrument: UV1800-2 Analyst: CKI	Preparation Batch: BJG0101	Final Volume: 50 mL	Analyzed: 07/06/2021 17:14
Sample Preparation:	Prepared: 07/06/2021	Extract ID: 21F0419-03 E	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Weak Acid Dissociable	57-12-5	1	0.005	0.005	ND	mg/L	U



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**PRDI-4-PW-
21F0419-04 (Water)**

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5030C (Purge and Trap)	Sampled: 06/24/2021 10:00
Instrument: NT2 Analyst: PKC	Preparation Batch: BJF0811	Analyzed: 06/30/2021 14:58
Sample Preparation:	Prepared: 06/30/2021	Extract ID: 21F0419-04 G
	Sample Size: 10 mL	
	Final Volume: 10 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Naphthalene	91-20-3	1	0.27	0.50	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>102</i>	<i>%</i>	
<i>Surrogate: Toluene-d8</i>				<i>80-120 %</i>	<i>96.1</i>	<i>%</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>				<i>80-120 %</i>	<i>93.5</i>	<i>%</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				<i>80-120 %</i>	<i>104</i>	<i>%</i>	



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**PRDI-4-PW-
21F0419-04 (Water)**

Volatile Organic Compounds

Method: NWTPHg	Sampled: 06/24/2021 10:00
Instrument: NT2 Analyst: PKC	Analyzed: 06/30/2021 14:58
Sample Preparation:	Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-04 G
	Preparation Batch: BJF0811 Sample Size: 10 mL
	Prepared: 06/30/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
Surrogate: Toluene-d8			80-120 %	96.1	%	
Surrogate: 4-Bromofluorobenzene			80-120 %	93.5	%	



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**PRDI-4-PW-
21F0419-04 (Water)**

Petroleum Hydrocarbons

Method: NWTPH-Dx	Preparation Method: EPA 3510C SepF	Sample Size: 500 mL	Sampled: 06/24/2021 10:00
Instrument: FID4 Analyst: CTO	Preparation Batch: BJF0776	Final Volume: 1 mL	Analyzed: 07/14/2021 20:24
Sample Preparation:	Prepared: 06/29/2021		Extract ID: 21F0419-04 A 01

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	0.110	mg/L	
HC ID: DRO						
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
<i>Surrogate: o-Terphenyl</i>			50-150 %	93.8	%	



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**PRDI-4-PW-
21F0419-04 (Water)**

Wet Chemistry

Method: EPA 9014	Instrument: UV1800-2	Analyst: CKI	Sampled: 06/24/2021 10:00	Analyzed: 07/01/2021 16:13
Sample Preparation:	Preparation Method: SM 4500-CN ⁻ G-99	Preparation Batch: BJF0820	Sample Size: 50 mL	Final Volume: 50 mL
	Prepared: 06/30/2021		Extract ID: 21F0419-04 E	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total	57-12-5	1	0.0050	0.0050	0.100	mg/L	



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**PRDI-4-PW-
21F0419-04 (Water)**

Wet Chemistry

Method: SM 4500-CN⁻ I-97 Sampled: 06/24/2021 10:00
Instrument: UV1800-2 Analyst: CKI Analyzed: 07/06/2021 17:14

Sample Preparation: Preparation Method: SM 4500-CN⁻ I-99 Extract ID: 21F0419-04 E
Preparation Batch: BJG0101 Sample Size: 50 mL
Prepared: 07/06/2021 Final Volume: 50 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Weak Acid Dissociable	57-12-5	1	0.005	0.005	0.015	mg/L	



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**PRDI-5-PW-
21F0419-05 (Water)**

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5030C (Purge and Trap)	Sampled: 06/22/2021 12:00
Instrument: NT2 Analyst: PKC	Preparation Batch: BJF0811	Analyzed: 06/30/2021 15:20
Sample Preparation:	Sample Size: 10 mL	Extract ID: 21F0419-05 G
	Final Volume: 10 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.05	0.20	0.13	ug/L	J
Naphthalene	91-20-3	1	0.27	0.50	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>108</i>	<i>%</i>	
<i>Surrogate: Toluene-d8</i>				<i>80-120 %</i>	<i>94.8</i>	<i>%</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>				<i>80-120 %</i>	<i>87.7</i>	<i>%</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				<i>80-120 %</i>	<i>107</i>	<i>%</i>	



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**PRDI-5-PW-
21F0419-05 (Water)**

Volatile Organic Compounds

Method: NWTPHg	Preparation Method: EPA 5030C (Purge and Trap)	Sampled: 06/22/2021 12:00
Instrument: NT2 Analyst: PKC	Preparation Batch: BJF0811	Analyzed: 06/30/2021 15:20
Sample Preparation:	Prepared: 06/30/2021	Extract ID: 21F0419-05 G
	Sample Size: 10 mL	
	Final Volume: 10 mL	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
Surrogate: Toluene-d8			80-120 %	94.8	%	
Surrogate: 4-Bromofluorobenzene			80-120 %	87.7	%	



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**PRDI-5-PW-
21F0419-05 (Water)**

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 06/22/2021 12:00

Instrument: FID4 Analyst: CTO

Analyzed: 07/14/2021 20:45

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21F0419-05 A 01

Preparation Batch: BJF0776

Sample Size: 500 mL

Prepared: 06/29/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
<i>Surrogate: o-Terphenyl</i>			50-150 %	90.2	%	



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**PRDI-5-PW-
21F0419-05 (Water)**

Wet Chemistry

Method: EPA 9014	Instrument: UV1800-2	Analyst: CKI	Sampled: 06/22/2021 12:00	Analyzed: 07/01/2021 16:15
Sample Preparation:	Preparation Method: SM 4500-CN ⁻ G-99	Preparation Batch: BJF0820	Sample Size: 50 mL	Final Volume: 50 mL
	Prepared: 06/30/2021		Extract ID: 21F0419-05 E	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total	57-12-5	1	0.0050	0.0050	ND	mg/L	U



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**PRDI-5-PW-
21F0419-05 (Water)**

Wet Chemistry

Method: SM 4500-CN ⁻ I-97	Preparation Method: SM 4500-CN ⁻ I-99	Sample Size: 50 mL	Sampled: 06/22/2021 12:00
Instrument: UV1800-2 Analyst: CKI	Preparation Batch: BJG0101	Final Volume: 50 mL	Analyzed: 07/06/2021 17:16
Sample Preparation:	Prepared: 07/06/2021	Extract ID: 21F0419-05 E	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Weak Acid Dissociable	57-12-5	1	0.005	0.005	ND	mg/L	U



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**PRDI-6-PW-
21F0419-06 (Water)**

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5030C (Purge and Trap)	Sampled: 06/22/2021 10:30
Instrument: NT2 Analyst: PKC	Preparation Batch: BJF0811	Analyzed: 06/30/2021 15:41
Sample Preparation:	Sample Size: 10 mL	Extract ID: 21F0419-06 F
	Final Volume: 10 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Naphthalene	91-20-3	1	0.27	0.50	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	112	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	95.0	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	92.8	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	106	%	



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**PRDI-6-PW-
21F0419-06 (Water)**

Volatile Organic Compounds

Method: NWTPHg Sampled: 06/22/2021 10:30
Instrument: NT2 Analyst: PKC Analyzed: 06/30/2021 15:41
Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-06 F
Preparation Batch: BJF0811 Sample Size: 10 mL
Prepared: 06/30/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
Surrogate: Toluene-d8			80-120 %	95.0	%	
Surrogate: 4-Bromofluorobenzene			80-120 %	92.8	%	



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**PRDI-6-PW-
21F0419-06 (Water)**

Petroleum Hydrocarbons

Method: NWTPH-Dx	Instrument: FID4 Analyst: CTO	Sampled: 06/22/2021 10:30	Analyzed: 07/14/2021 21:05
Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJF0776 Prepared: 06/29/2021	Sample Size: 500 mL Final Volume: 1 mL	Extract ID: 21F0419-06 A 01

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
<i>Surrogate: o-Terphenyl</i>			50-150 %	86.8	%	



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**PRDI-6-PW-
21F0419-06 (Water)**

Wet Chemistry

Method: EPA 9014	Instrument: UV1800-2	Analyst: CKI	Sampled: 06/22/2021 10:30	Analyzed: 07/01/2021 16:15
Sample Preparation:	Preparation Method: SM 4500-CN ⁻ G-99	Preparation Batch: BJF0820	Sample Size: 50 mL	Final Volume: 50 mL
	Prepared: 06/30/2021		Extract ID: 21F0419-06 E	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total	57-12-5	1	0.0050	0.0050	0.0250	mg/L	



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**PRDI-6-PW-
21F0419-06 (Water)**

Wet Chemistry

Method: SM 4500-CN ⁻ I-97	Preparation Method: SM 4500-CN ⁻ I-99	Sample Size: 50 mL	Sampled: 06/22/2021 10:30
Instrument: UV1800-2 Analyst: CKI	Preparation Batch: BJG0101	Final Volume: 50 mL	Analyzed: 07/06/2021 17:17
Sample Preparation:	Prepared: 07/06/2021	Extract ID: 21F0419-06 E	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Weak Acid Dissociable	57-12-5	1	0.005	0.005	ND	mg/L	U



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**PRDI-7-PW-
21F0419-07 (Water)**

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/23/2021 12:50
Instrument: NT2 Analyst: PKC Analyzed: 06/30/2021 16:03

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-07 F
Preparation Batch: BJF0811 Sample Size: 10 mL
Prepared: 06/30/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Naphthalene	91-20-3	1	0.27	0.50	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>114</i>	<i>%</i>	
<i>Surrogate: Toluene-d8</i>				<i>80-120 %</i>	<i>93.6</i>	<i>%</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>				<i>80-120 %</i>	<i>93.4</i>	<i>%</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				<i>80-120 %</i>	<i>106</i>	<i>%</i>	



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**PRDI-7-PW-
21F0419-07 (Water)**

Volatile Organic Compounds

Method: NWTPHg	Preparation Method: EPA 5030C (Purge and Trap)	Sampled: 06/23/2021 12:50
Instrument: NT2 Analyst: PKC	Preparation Batch: BJF0811	Analyzed: 06/30/2021 16:03
Sample Preparation:	Prepared: 06/30/2021	Extract ID: 21F0419-07 F
	Sample Size: 10 mL	
	Final Volume: 10 mL	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
Surrogate: Toluene-d8			80-120 %	93.6	%	
Surrogate: 4-Bromofluorobenzene			80-120 %	93.4	%	



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**PRDI-7-PW-
21F0419-07 (Water)**

Petroleum Hydrocarbons

Method: NWTPH-Dx	Instrument: FID4 Analyst: CTO	Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJF0776 Prepared: 06/29/2021	Sample Size: 500 mL Final Volume: 1 mL	Reported: Sampled: 06/23/2021 12:50 Analyzed: 07/14/2021 21:25 Extract ID: 21F0419-07 A 01
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Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Surrogate: <i>o</i> -Terphenyl			50-150 %	92.3	%	



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**PRDI-7-PW-
21F0419-07 (Water)**

Wet Chemistry

Method: EPA 9014	Preparation Method: SM 4500-CN ⁻ G-99	Sampled: 06/23/2021 12:50
Instrument: UV1800-2 Analyst: CKI	Preparation Batch: BJF0820	Analyzed: 07/01/2021 16:16
Sample Preparation:	Prepared: 06/30/2021	Extract ID: 21F0419-07 E
	Sample Size: 50 mL	
	Final Volume: 50 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total	57-12-5	1	0.0050	0.0050	ND	mg/L	U



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**PRDI-7-PW-
21F0419-07 (Water)**

Wet Chemistry

Method: SM 4500-CN ⁻ I-97	Preparation Method: SM 4500-CN ⁻ I-99	Sample Size: 50 mL	Sampled: 06/23/2021 12:50
Instrument: UV1800-2 Analyst: CKI	Preparation Batch: BJG0101	Final Volume: 50 mL	Analyzed: 07/06/2021 17:17
Sample Preparation:	Prepared: 07/06/2021	Extract ID: 21F0419-07 E	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Weak Acid Dissociable	57-12-5	1	0.005	0.005	ND	mg/L	U



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**PRDI-8-PW-
21F0419-08 (Water)**

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/24/2021 09:20
Instrument: NT2 Analyst: PKC Analyzed: 06/30/2021 16:24

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-08 F
Preparation Batch: BJF0811 Sample Size: 10 mL
Prepared: 06/30/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Naphthalene	91-20-3	1	0.27	0.50	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>117</i>	<i>%</i>	
<i>Surrogate: Toluene-d8</i>				<i>80-120 %</i>	<i>94.1</i>	<i>%</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>				<i>80-120 %</i>	<i>92.7</i>	<i>%</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				<i>80-120 %</i>	<i>104</i>	<i>%</i>	



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**PRDI-8-PW-
21F0419-08 (Water)**

Volatile Organic Compounds

Method: NWTPHg Sampled: 06/24/2021 09:20
Instrument: NT2 Analyst: PKC Analyzed: 06/30/2021 16:24
Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-08 F
Preparation Batch: BJF0811 Sample Size: 10 mL
Prepared: 06/30/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
Surrogate: Toluene-d8			80-120 %	94.1	%	
Surrogate: 4-Bromofluorobenzene			80-120 %	92.7	%	



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**PRDI-8-PW-
21F0419-08 (Water)**

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 06/24/2021 09:20

Instrument: FID4 Analyst: CTO

Analyzed: 07/14/2021 21:46

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21F0419-08 A 01

Preparation Batch: BJF0776

Sample Size: 500 mL

Prepared: 06/29/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Surrogate: <i>o</i> -Terphenyl			50-150 %	91.3	%	



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**PRDI-8-PW-
21F0419-08 (Water)**

Wet Chemistry

Method: EPA 9014	Instrument: UV1800-2	Analyst: CKI	Sampled: 06/24/2021 09:20
Sample Preparation:	Preparation Method: SM 4500-CN ⁻ G-99	Preparation Batch: BJF0820	Analyzed: 07/01/2021 16:17
	Prepared: 06/30/2021	Sample Size: 50 mL	Extract ID: 21F0419-08 E
		Final Volume: 50 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total	57-12-5	1	0.0050	0.0050	ND	mg/L	U



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**PRDI-8-PW-
21F0419-08 (Water)**

Wet Chemistry

Method: SM 4500-CN ⁻ I-97	Preparation Method: SM 4500-CN ⁻ I-99	Sample Size: 50 mL	Sampled: 06/24/2021 09:20
Instrument: UV1800-2 Analyst: CKI	Preparation Batch: BJG0101	Final Volume: 50 mL	Analyzed: 07/06/2021 17:18
Sample Preparation:	Prepared: 07/06/2021	Extract ID: 21F0419-08 E	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Weak Acid Dissociable	57-12-5	1	0.005	0.005	ND	mg/L	U



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**PRDI-10-PW-
21F0419-09 (Water)**

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/24/2021 13:00
Instrument: NT2 Analyst: PKC Analyzed: 06/30/2021 16:45

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-09 G
Preparation Batch: BJF0811 Sample Size: 10 mL
Prepared: 06/30/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Naphthalene	91-20-3	1	0.27	0.50	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>115</i>	<i>%</i>	
<i>Surrogate: Toluene-d8</i>				<i>80-120 %</i>	<i>96.8</i>	<i>%</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>				<i>80-120 %</i>	<i>91.7</i>	<i>%</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				<i>80-120 %</i>	<i>107</i>	<i>%</i>	



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**PRDI-10-PW-
21F0419-09 (Water)**

Volatile Organic Compounds

Method: NWTPHg	Sampled: 06/24/2021 13:00
Instrument: NT2 Analyst: PKC	Analyzed: 06/30/2021 16:45
Sample Preparation:	Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-09 G
	Preparation Batch: BJF0811 Sample Size: 10 mL
	Prepared: 06/30/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
Surrogate: Toluene-d8			80-120 %	96.8	%	
Surrogate: 4-Bromofluorobenzene			80-120 %	91.7	%	



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**PRDI-10-PW-
21F0419-09 (Water)**

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 06/24/2021 13:00

Instrument: FID4 Analyst: CTO

Analyzed: 07/15/2021 10:23

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21F0419-09 A 01

Preparation Batch: BJF0776

Sample Size: 500 mL

Prepared: 06/29/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
<i>Surrogate: o-Terphenyl</i>			50-150 %	71.0	%	



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**PRDI-10-PW-
21F0419-09 (Water)**

Wet Chemistry

Method: EPA 9014 Sampled: 06/24/2021 13:00
Instrument: UV1800-2 Analyst: CKI Analyzed: 07/01/2021 16:17

Sample Preparation: Preparation Method: SM 4500-CN⁻ G-99 Extract ID: 21F0419-09 E
Preparation Batch: BJF0820 Sample Size: 50 mL
Prepared: 06/30/2021 Final Volume: 50 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total	57-12-5	1	0.0050	0.0050	ND	mg/L	U



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**PRDI-10-PW-
21F0419-09 (Water)**

Wet Chemistry

Method: SM 4500-CN ⁻ I-97	Preparation Method: SM 4500-CN ⁻ I-99	Sample Size: 50 mL	Sampled: 06/24/2021 13:00
Instrument: UV1800-2 Analyst: CKI	Preparation Batch: BJG0101	Final Volume: 50 mL	Analyzed: 07/06/2021 17:18
Sample Preparation:	Prepared: 07/06/2021	Extract ID: 21F0419-09 E	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Weak Acid Dissociable	57-12-5	1	0.005	0.005	ND	mg/L	U



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**PRDI-11-PW-
21F0419-10 (Water)**

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/25/2021 11:10
Instrument: NT2 Analyst: PKC Analyzed: 06/30/2021 17:07

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-10 G
Preparation Batch: BJF0811 Sample Size: 10 mL
Prepared: 06/30/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Naphthalene	91-20-3	1	0.27	0.50	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>121</i>	<i>%</i>	
<i>Surrogate: Toluene-d8</i>				<i>80-120 %</i>	<i>97.3</i>	<i>%</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>				<i>80-120 %</i>	<i>92.0</i>	<i>%</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				<i>80-120 %</i>	<i>106</i>	<i>%</i>	



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**PRDI-11-PW-
21F0419-10 (Water)**

Volatile Organic Compounds

Method: NWTPHg	Preparation Method: EPA 5030C (Purge and Trap)	Sampled: 06/25/2021 11:10
Instrument: NT2 Analyst: PKC	Preparation Batch: BJF0811	Analyzed: 06/30/2021 17:07
Sample Preparation:	Prepared: 06/30/2021	Extract ID: 21F0419-10 G
	Sample Size: 10 mL	
	Final Volume: 10 mL	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
Surrogate: Toluene-d8			80-120 %	97.3	%	
Surrogate: 4-Bromofluorobenzene			80-120 %	92.0	%	



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**PRDI-11-PW-
21F0419-10 (Water)**

Petroleum Hydrocarbons

Method: NWTPH-Dx	Instrument: FID4 Analyst: CTO	Sampled: 06/25/2021 11:10 Analyzed: 07/15/2021 10:44
Sample Preparation:	Preparation Method: EPA 3510C SepF Preparation Batch: BJF0776 Prepared: 06/29/2021	Sample Size: 500 mL Final Volume: 1 mL Extract ID: 21F0419-10 A 01

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
Surrogate: <i>o</i> -Terphenyl			50-150 %	90.1	%	



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**PRDI-11-PW-
21F0419-10 (Water)**

Wet Chemistry

Method: EPA 9014 Sampled: 06/25/2021 11:10
Instrument: UV1800-2 Analyst: CKI Analyzed: 07/01/2021 16:18

Sample Preparation: Preparation Method: SM 4500-CN⁻ G-99 Extract ID: 21F0419-10 E
Preparation Batch: BJF0820 Sample Size: 50 mL
Prepared: 06/30/2021 Final Volume: 50 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total	57-12-5	1	0.0050	0.0050	0.0280	mg/L	



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**PRDI-11-PW-
21F0419-10 (Water)**

Wet Chemistry

Method: SM 4500-CN ⁻ I-97	Preparation Method: SM 4500-CN ⁻ I-99	Sample Size: 50 mL	Sampled: 06/25/2021 11:10
Instrument: UV1800-2 Analyst: CKI	Preparation Batch: BJG0101	Final Volume: 50 mL	Analyzed: 07/06/2021 17:19
Sample Preparation:	Prepared: 07/06/2021	Extract ID: 21F0419-10 E	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Weak Acid Dissociable	57-12-5	1	0.005	0.005	ND	mg/L	U



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**PRDI-12-PW-
21F0419-11 (Water)**

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/25/2021 10:10
Instrument: NT3 Analyst: PKC Analyzed: 07/06/2021 15:51

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-11 H
Preparation Batch: BJG0120 Sample Size: 2 mL
Prepared: 07/06/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.27	1.00	ND	ug/L	U
Naphthalene	91-20-3	1	1.37	2.50	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>108</i>	<i>%</i>	
<i>Surrogate: Toluene-d8</i>				<i>80-120 %</i>	<i>99.4</i>	<i>%</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>				<i>80-120 %</i>	<i>95.8</i>	<i>%</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				<i>80-120 %</i>	<i>106</i>	<i>%</i>	



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**PRDI-12-PW-
21F0419-11 (Water)**

Volatile Organic Compounds

Method: NWTPHg Sampled: 06/25/2021 10:10
Instrument: NT3 Analyst: PKC Analyzed: 07/06/2021 15:51
Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-11 H
Preparation Batch: BJG0120 Sample Size: 2 mL
Prepared: 07/06/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	500	ND	ug/L	U
Surrogate: Toluene-d8			80-120 %	99.4	%	
Surrogate: 4-Bromofluorobenzene			80-120 %	95.8	%	



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**PRDI-12-PW-
21F0419-11 (Water)**

Petroleum Hydrocarbons

Method: NWTPH-Dx

Sampled: 06/25/2021 10:10

Instrument: FID4 Analyst: CTO

Analyzed: 07/15/2021 11:44

Sample Preparation:

Preparation Method: EPA 3510C SepF

Extract ID: 21F0419-11 A 01

Preparation Batch: BJF0776

Sample Size: 500 mL

Prepared: 06/29/2021

Final Volume: 1 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	0.100	ND	mg/L	U
Motor Oil Range Organics (C24-C38)	RRO	1	0.200	ND	mg/L	U
<i>Surrogate: o-Terphenyl</i>			50-150 %	92.9	%	



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**PRDI-12-PW-
21F0419-11 (Water)**

Wet Chemistry

Method: EPA 9014	Instrument: UV1800-2	Analyst: CKI	Sampled: 06/25/2021 10:10	Analyzed: 07/01/2021 16:19
Sample Preparation:	Preparation Method: SM 4500-CN ⁻ G-99	Preparation Batch: BJF0820	Sample Size: 50 mL	Final Volume: 50 mL
	Prepared: 06/30/2021		Extract ID: 21F0419-11 E	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total	57-12-5	1	0.0050	0.0050	0.0620	mg/L	



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**PRDI-12-PW-
21F0419-11 (Water)**

Wet Chemistry

Method: SM 4500-CN⁻ I-97 Sampled: 06/25/2021 10:10
Instrument: UV1800-2 Analyst: CKI Analyzed: 07/06/2021 17:20

Sample Preparation: Preparation Method: SM 4500-CN⁻ I-99 Extract ID: 21F0419-11 E
Preparation Batch: BJG0101 Sample Size: 50 mL
Prepared: 07/06/2021 Final Volume: 50 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Weak Acid Dissociable	57-12-5	1	0.005	0.005	0.011	mg/L	



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**Dup-1-PW-
21F0419-12 (Water)**

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5030C (Purge and Trap)	Sampled: 06/23/2021 11:20
Instrument: NT3 Analyst: PKC	Preparation Batch: BJG0021	Analyzed: 07/02/2021 17:44
Sample Preparation:	Sample Size: 0.04 mL	Extract ID: 21F0419-12 F
	Final Volume: 10 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	13.3	50.0	5550	ug/L	
Naphthalene	91-20-3	1	68.4	125	6250	ug/L	
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-129 %	104	%	
<i>Surrogate: Toluene-d8</i>				80-120 %	100	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	104	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	105	%	



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**Dup-1-PW-
21F0419-12 (Water)**

Volatile Organic Compounds

Method: NWTPHg	Sampled: 06/23/2021 11:20
Instrument: NT3 Analyst: PKC	Analyzed: 07/02/2021 17:44
Sample Preparation:	Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-12 F
	Preparation Batch: BJG0021 Sample Size: 0.04 mL
	Prepared: 07/02/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	25000	41100	ug/L	
HC ID: GRO						
Surrogate: Toluene-d8			80-120 %	100	%	
Surrogate: 4-Bromofluorobenzene			80-120 %	104	%	



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**Dup-1-PW-
21F0419-12 (Water)**

Petroleum Hydrocarbons

Method: NWTPH-Dx	Preparation Method: EPA 3510C SepF		Sampled: 06/23/2021 11:20
Instrument: FID4 Analyst: CTO	Preparation Batch: BJF0776	Sample Size: 500 mL	Analyzed: 07/15/2021 12:05
Sample Preparation:	Prepared: 06/29/2021	Final Volume: 1 mL	Extract ID: 21F0419-12 A 01

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24) HC ID: DRO	DRO	1	0.100	3.31	mg/L	
Motor Oil Range Organics (C24-C38) HC ID: RRO	RRO	1	0.200	0.200	mg/L	
<i>Surrogate: o-Terphenyl</i>			50-150 %	92.6	%	



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**Dup-1-PW-
21F0419-12 (Water)**

Wet Chemistry

Method: EPA 9014	Instrument: UV1800-2	Analyst: CKI	Sampled: 06/23/2021 11:20	Analyzed: 07/01/2021 16:19
Sample Preparation:	Preparation Method: SM 4500-CN ⁻ G-99	Preparation Batch: BJF0820	Sample Size: 50 mL	Final Volume: 50 mL
	Prepared: 06/30/2021		Extract ID: 21F0419-12 E	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total	57-12-5	1	0.0050	0.0050	0.0070	mg/L	



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**Dup-1-PW-
21F0419-12 (Water)**

Wet Chemistry

Method: SM 4500-CN ⁻ I-97	Preparation Method: SM 4500-CN ⁻ I-99	Sample Size: 50 mL	Sampled: 06/23/2021 11:20
Instrument: UV1800-2 Analyst: CKI	Preparation Batch: BJG0101	Final Volume: 50 mL	Analyzed: 07/06/2021 17:20
Sample Preparation:	Prepared: 07/06/2021	Extract ID: 21F0419-12 E	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Weak Acid Dissociable	57-12-5	1	0.005	0.005	ND	mg/L	U



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PRDI-1-SC-0-15
21F0419-13 (Solid)

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5035 (Sodium Bisulfate)	Sampled: 06/23/2021 10:00
Instrument: NT5 Analyst: PB	Preparation Batch: BJF0792	Analyzed: 06/29/2021 17:20
Sample Preparation:	Sample Size: 4.76 g (wet)	Extract ID: 21F0419-13 D
	Final Volume: 5 mL	Dry Weight: 3.35 g
		% Solids: 70.38

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.25	1.49	4.30	ug/kg	
Naphthalene	91-20-3	1	3.68	7.46	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-149 %	108 %	
<i>Surrogate: Toluene-d8</i>					77-120 %	98.5 %	
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	99.8 %	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	101 %	



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PRDI-1-SC-0-15
21F0419-13 (Solid)

Volatile Organic Compounds

Method: NWTPHg	Sampled: 06/23/2021 10:00
Instrument: NT3 Analyst: PKC	Analyzed: 07/03/2021 13:31
Sample Preparation:	Preparation Method: EPA 5035 (Methanol Extraction)
	Preparation Batch: BJG0090
	Sample Size: 9.058 g (wet)
	Final Volume: 5 mL
	Extract ID: 21F0419-13 F
	Dry Weight: 6.38 g
	% Solids: 70.38

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	6030	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	100	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	89.4	%	



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PRDI-1-SC-0-15
21F0419-13 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx			Sampled: 06/23/2021 10:00
Instrument: FID4 Analyst: CTO			Analyzed: 07/15/2021 18:11
Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Sample Size: 10.02 g (wet)	Extract ID: 21F0419-13 A 01
	Preparation Batch: BJG0096	Final Volume: 1 mL	Dry Weight: 7.05 g
	Prepared: 07/06/2021		% Solids: 70.38

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24) HC ID: DRO	DRO	5	35.5	48.8	mg/kg	D
Motor Oil Range Organics (C24-C38) HC ID: MOTOR OIL	RRO	5	70.9	195	mg/kg	D
<i>Surrogate: o-Terphenyl</i>			50-150 %	91.1	%	



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PRDI-1-SC-0-15
21F0419-13 (Solid)

Wet Chemistry

Method: EPA 9014	Instrument: UV1800-2 Analyst: CKI		Sampled: 06/23/2021 10:00
Sample Preparation:	Preparation Method: EPA 9010C m	Sample Size: 2.698 g (wet)	Extract ID: 21F0419-13 B
	Preparation Batch: BJG0011	Final Volume: 52.698 mL	Dry Weight: 1.88 g
	Prepared: 07/01/2021		% Solids: 69.51

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.139	0.139	ND	mg/kg	U



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PRDI-1-SC-0-15
21F0419-13 (Solid)

Wet Chemistry

Method: EPA 9060A m Sampled: 06/23/2021 10:00
Instrument: TOC Cube Analyst: BF Analyzed: 07/14/2021 22:22

Sample Preparation: Preparation Method: PSEP 1986 (modified) Extract ID: 21F0419-13 B
Preparation Batch: BJG0116 Dry Weight: 0.19 g
Prepared: 07/06/2021 Final Volume: 0.273 mL % Solids: 69.51

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	4.95	%	



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PRDI-1-SC-0-15
21F0419-13 (Solid)

Wet Chemistry

Method: SM 2540 G-97 Sampled: 06/23/2021 10:00
Instrument: BAL2 Analyst: DOE Analyzed: 06/29/2021 13:57

Sample Preparation: Preparation Method: No Prep Wet Chem Extract ID: 21F0419-13
Preparation Batch: BJF0789 Dry Weight: 3.48 g
Prepared: 06/29/2021 Final Volume: 5 g % Solids: 69.51

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	69.51	%	



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PRDI-1-SC-15-60
21F0419-14 (Solid)

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/23/2021 10:20
Instrument: NT5 Analyst: PB Analyzed: 06/30/2021 17:46
Sample Preparation: Preparation Method: EPA 5035 (Sodium Bisulfate) Extract ID: 21F0419-14 E
Preparation Batch: BJF0832 Sample Size: 12 g (wet)
Prepared: 06/30/2021 Final Volume: 5 mL Dry Weight: 9.95 g
% Solids: 82.93

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.08	0.50	ND	ug/kg	U
Naphthalene	91-20-3	1	1.24	2.51	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-149 %	122	%
<i>Surrogate: Toluene-d8</i>					77-120 %	103	%
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	98.8	%
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	102	%



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PRDI-1-SC-15-60
21F0419-14 (Solid)

Volatile Organic Compounds

Method: NWTPHg Sampled: 06/23/2021 10:20
Instrument: NT3 Analyst: PKC Analyzed: 07/03/2021 13:56
Sample Preparation: Preparation Method: EPA 5035 (Methanol Extraction) Extract ID: 21F0419-14 G
Preparation Batch: BJG0090 Sample Size: 16.786 g (wet)
Prepared: 07/03/2021 Final Volume: 5 mL Dry Weight: 13.92 g
% Solids: 82.93

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	2830	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	98.0	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	88.8	%	



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PRDI-1-SC-15-60
21F0419-14 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx			Sampled: 06/23/2021 10:20
Instrument: FID4 Analyst: CTO			Analyzed: 07/15/2021 19:12
Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Sample Size: 10.07 g (wet)	Extract ID: 21F0419-14 B 01
	Preparation Batch: BJG0096	Final Volume: 1 mL	Dry Weight: 8.35 g
	Prepared: 07/06/2021		% Solids: 82.93

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)		DRO 1	5.99	53.1	mg/kg	
HC ID: DIESEL						
Motor Oil Range Organics (C24-C38)		RRO 1	12.0	79.5	mg/kg	
HC ID: MOTOR OIL						
Surrogate: <i>o</i> -Terphenyl			50-150 %	94.3	%	



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PRDI-1-SC-15-60
21F0419-14 (Solid)

Wet Chemistry

Method: EPA 9014		Sampled: 06/23/2021 10:20
Instrument: UV1800-2 Analyst: CKI		Analyzed: 07/02/2021 12:57
Sample Preparation:	Preparation Method: EPA 9010C m	Extract ID: 21F0419-14 C
	Preparation Batch: BJG0011	Dry Weight: 1.94 g
	Prepared: 07/01/2021	% Solids: 74.46
	Sample Size: 2.602 g (wet)	
	Final Volume: 52.602 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.134	0.134	ND	mg/kg	U



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PRDI-1-SC-15-60
21F0419-14 (Solid)

Wet Chemistry

Method: EPA 9060A m		Sampled: 06/23/2021 10:20
Instrument: TOC Cube Analyst: BF		Analyzed: 07/14/2021 22:54
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Extract ID: 21F0419-14 C
	Preparation Batch: BJG0116	Dry Weight: 0.42 g
	Prepared: 07/06/2021	% Solids: 74.46
	Sample Size: 0.5698 g (wet)	
	Final Volume: 0.5698 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	0.92	%	



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PRDI-1-SC-15-60
21F0419-14 (Solid)

Wet Chemistry

Method: SM 2540 G-97			Sampled: 06/23/2021 10:20
Instrument: BAL2 Analyst: DOE			Analyzed: 06/29/2021 13:57
Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 21F0419-14
	Preparation Batch: BJF0789	Final Volume: 5 g	Dry Weight: 3.72 g
	Prepared: 06/29/2021		% Solids: 74.46

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	74.46	%	



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PRDI-2-SC-0-15
21F0419-15 (Solid)

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/23/2021 11:00
Instrument: NT5 Analyst: PB Analyzed: 06/29/2021 18:21
Sample Preparation: Preparation Method: EPA 5035 (Sodium Bisulfate) Extract ID: 21F0419-15 D
Preparation Batch: BJF0792 Sample Size: 4.82 g (wet)
Prepared: 06/29/2021 Final Volume: 5 mL Dry Weight: 3.19 g
% Solids: 66.09

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.26	1.57	0.92	ug/kg	J
Naphthalene	91-20-3	1	3.87	7.85	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-149 %	111	%
<i>Surrogate: Toluene-d8</i>					77-120 %	98.7	%
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	101	%
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	101	%



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PRDI-2-SC-0-15
21F0419-15 (Solid)

Volatile Organic Compounds

Method: NWTPHg	Sampled: 06/23/2021 11:00
Instrument: NT3 Analyst: PKC	Analyzed: 07/03/2021 14:21
Sample Preparation:	Preparation Method: EPA 5035 (Methanol Extraction)
	Preparation Batch: BJG0090
	Sample Size: 7.224 g (wet)
	Final Volume: 5 mL
	Extract ID: 21F0419-15 F
	Dry Weight: 4.77 g
	% Solids: 66.09

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	7800	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	102	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	93.2	%	



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PRDI-2-SC-0-15
21F0419-15 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx		Sampled: 06/23/2021 11:00
Instrument: FID4 Analyst: CTO		Analyzed: 07/15/2021 19:33
Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Extract ID: 21F0419-15 A 01
	Preparation Batch: BJG0096	Dry Weight: 6.64 g
	Prepared: 07/06/2021	% Solids: 66.09
	Sample Size: 10.04 g (wet)	
	Final Volume: 1 mL	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24) HC ID: DRO	DRO	5	37.7	74.1	mg/kg	D
Motor Oil Range Organics (C24-C38) HC ID: MOTOR OIL	RRO	5	75.4	235	mg/kg	D
Surrogate: <i>o</i> -Terphenyl			50-150 %	95.1	%	



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PRDI-2-SC-0-15
21F0419-15 (Solid)

Wet Chemistry

Method: EPA 9014			Sampled: 06/23/2021 11:00
Instrument: UV1800-2 Analyst: CKI			Analyzed: 07/02/2021 12:57
Sample Preparation:	Preparation Method: EPA 9010C m	Sample Size: 2.534 g (wet)	Extract ID: 21F0419-15 B
	Preparation Batch: BJG0011	Final Volume: 52.534 mL	Dry Weight: 1.65 g
	Prepared: 07/01/2021		% Solids: 65.14

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.158	0.158	ND	mg/kg	U



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PRDI-2-SC-0-15
21F0419-15 (Solid)

Wet Chemistry

Method: EPA 9060A m		Sampled: 06/23/2021 11:00
Instrument: TOC Cube Analyst: BF		Analyzed: 07/14/2021 23:25
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Extract ID: 21F0419-15 B
	Preparation Batch: BJG0116	Dry Weight: 0.25 g
	Prepared: 07/06/2021	% Solids: 65.14
	Sample Size: 0.377 g (wet)	
	Final Volume: 0.377 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	3.42	%	



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PRDI-2-SC-0-15
21F0419-15 (Solid)

Wet Chemistry

Method: SM 2540 G-97			Sampled: 06/23/2021 11:00
Instrument: BAL2 Analyst: DOE			Analyzed: 06/29/2021 13:57
Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 21F0419-15
	Preparation Batch: BJF0789	Final Volume: 5 g	Dry Weight: 3.26 g
	Prepared: 06/29/2021		% Solids: 65.14

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	65.14	%	



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PRDI-2-SC-15-60
21F0419-16 (Solid)

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/23/2021 11:10
Instrument: NT5 Analyst: PB Analyzed: 06/29/2021 18:52
Sample Preparation: Preparation Method: EPA 5035 (Sodium Bisulfate) Extract ID: 21F0419-16 E
Preparation Batch: BJF0792 Sample Size: 7.39 g (wet)
Prepared: 06/29/2021 Final Volume: 5 mL Dry Weight: 4.84 g
% Solids: 65.49

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.17	1.03	1.31	ug/kg	
Naphthalene	91-20-3	1	2.54	5.17	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-149 %	109	%
<i>Surrogate: Toluene-d8</i>					77-120 %	98.2	%
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	97.0	%
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	101	%



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PRDI-2-SC-15-60
21F0419-16 (Solid)

Volatile Organic Compounds

Method: NWTPHg Sampled: 06/23/2021 11:10
Instrument: NT3 Analyst: PKC Analyzed: 07/03/2021 14:47
Sample Preparation: Preparation Method: EPA 5035 (Methanol Extraction) Extract ID: 21F0419-16 G
Preparation Batch: BJG0090 Sample Size: 6.359 g (wet)
Prepared: 07/03/2021 Final Volume: 5 mL Dry Weight: 4.16 g
% Solids: 65.49

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	8640	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	99.8	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	90.2	%	



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PRDI-2-SC-15-60
21F0419-16 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Instrument: FID4 Analyst: CTO	Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Preparation Batch: BJG0096	Prepared: 07/06/2021	Sample Size: 10.07 g (wet)	Final Volume: 1 mL	Reporting Limit	Result	Units	Notes
								37.9	91.4	mg/kg	D
								75.8	243	mg/kg	D
								50-150 %	94.7	%	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24) HC ID: DRO	DRO	5	37.9	91.4	mg/kg	D
Motor Oil Range Organics (C24-C38) HC ID: MOTOR OIL	RRO	5	75.8	243	mg/kg	D
Surrogate: <i>o</i> -Terphenyl			50-150 %	94.7	%	



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PRDI-2-SC-15-60
21F0419-16 (Solid)

Wet Chemistry

Method: EPA 9014			Sampled: 06/23/2021 11:10
Instrument: UV1800-2 Analyst: CKI			Analyzed: 07/02/2021 12:58
Sample Preparation:	Preparation Method: EPA 9010C m	Sample Size: 2.573 g (wet)	Extract ID: 21F0419-16 C
	Preparation Batch: BJG0011	Final Volume: 52.573 mL	Dry Weight: 1.56 g
	Prepared: 07/01/2021		% Solids: 60.45

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.167	0.167	ND	mg/kg	U



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PRDI-2-SC-15-60
21F0419-16 (Solid)

Wet Chemistry

Method: EPA 9060A m	Sampled: 06/23/2021 11:10	
Instrument: TOC Cube Analyst: BF	Analyzed: 07/14/2021 23:56	
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Extract ID: 21F0419-16 C
	Preparation Batch: BJG0116	Dry Weight: 0.19 g
	Prepared: 07/06/2021	% Solids: 60.45
	Sample Size: 0.3124 g (wet)	
	Final Volume: 0.3124 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	2.96	%	



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PRDI-2-SC-15-60
21F0419-16 (Solid)

Wet Chemistry

Method: SM 2540 G-97 Sampled: 06/23/2021 11:10
Instrument: BAL2 Analyst: DOE Analyzed: 06/29/2021 13:57

Sample Preparation: Preparation Method: No Prep Wet Chem Extract ID: 21F0419-16
Preparation Batch: BJF0789 Dry Weight: 3.02 g
Prepared: 06/29/2021 Final Volume: 5 g % Solids: 60.45

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	60.45	%	



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PRDI-3-SC-0-15
21F0419-17 (Solid)

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5035 (Sodium Bisulfate)	Sampled: 06/22/2021 13:10
Instrument: NT5 Analyst: PB	Preparation Batch: BJF0792	Analyzed: 06/29/2021 19:22
Sample Preparation:	Sample Size: 12.09 g (wet)	Extract ID: 21F0419-17 D
Prepared: 06/29/2021	Final Volume: 5 mL	Dry Weight: 11.16 g % Solids: 92.31

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.07	0.45	0.82	ug/kg	
Naphthalene	91-20-3	1	1.10	2.24	ND	ug/kg	U
Surrogate: 1,2-Dichloroethane-d4				80-149 %	117	%	
Surrogate: Toluene-d8				77-120 %	99.1	%	
Surrogate: 4-Bromofluorobenzene				80-120 %	104	%	
Surrogate: 1,2-Dichlorobenzene-d4				80-120 %	105	%	



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PRDI-3-SC-0-15
21F0419-17 (Solid)

Volatile Organic Compounds

Method: NWTPHg		Sampled: 06/22/2021 13:10
Instrument: NT3 Analyst: PKC		Analyzed: 07/03/2021 15:12
Sample Preparation:	Preparation Method: EPA 5035 (Methanol Extraction)	Extract ID: 21F0419-17 H
	Preparation Batch: BJG0090	Dry Weight: 14.66 g
	Sample Size: 15.88 g (wet)	% Solids: 92.31
	Prepared: 07/03/2021	Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	2120	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	102	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	85.7	%	



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PRDI-3-SC-0-15
21F0419-17 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Instrument: FID4 Analyst: CTO	Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Preparation Batch: BJG0096	Prepared: 07/06/2021	Sample Size: 10.04 g (wet)	Final Volume: 1 mL	Reporting Limit	Result	Units	Notes
								5.39	7.83	mg/kg	
								10.8	34.1	mg/kg	
								50-150 %	96.7	%	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24) HC ID: DRO		DRO 1	5.39	7.83	mg/kg	
Motor Oil Range Organics (C24-C38) HC ID: MOTOR OIL		RRO 1	10.8	34.1	mg/kg	
Surrogate: o-Terphenyl			50-150 %	96.7	%	



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PRDI-3-SC-0-15
21F0419-17 (Solid)

Wet Chemistry

Method: EPA 9014			Sampled: 06/22/2021 13:10
Instrument: UV1800-2 Analyst: CKI			Analyzed: 07/02/2021 12:59
Sample Preparation:	Preparation Method: EPA 9010C m	Sample Size: 2.612 g (wet)	Extract ID: 21F0419-17 B
	Preparation Batch: BJG0011	Final Volume: 52.612 mL	Dry Weight: 2.36 g
	Prepared: 07/01/2021		% Solids: 90.33

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.110	0.110	ND	mg/kg	U



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PRDI-3-SC-0-15
21F0419-17 (Solid)

Wet Chemistry

Method: EPA 9060A m			Sampled: 06/22/2021 13:10
Instrument: TOC Cube Analyst: BF			Analyzed: 07/15/2021 00:28
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Sample Size: 0.2504 g (wet)	Extract ID: 21F0419-17 B
	Preparation Batch: BJG0116	Final Volume: 0.2504 mL	Dry Weight: 0.23 g
	Prepared: 07/06/2021		% Solids: 90.33

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	0.61	%	



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PRDI-3-SC-0-15
21F0419-17 (Solid)

Wet Chemistry

Method: SM 2540 G-97			Sampled: 06/22/2021 13:10
Instrument: BAL2 Analyst: DOE			Analyzed: 06/29/2021 13:57
Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 21F0419-17
	Preparation Batch: BJF0789	Final Volume: 5 g	Dry Weight: 4.52 g
	Prepared: 06/29/2021		% Solids: 90.33

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	90.33	%	



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PRDI-3-SC-15-60
21F0419-18 (Solid)

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/22/2021 13:30
Instrument: NT5 Analyst: PB Analyzed: 06/29/2021 19:51
Sample Preparation: Preparation Method: EPA 5035 (Sodium Bisulfate) Extract ID: 21F0419-18 E
Preparation Batch: BJF0792 Sample Size: 11.5 g (wet)
Prepared: 06/29/2021 Final Volume: 5 mL Dry Weight: 9.48 g
% Solids: 82.45

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.09	0.53	0.82	ug/kg	
Naphthalene	91-20-3	1	1.30	2.64	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-149 %	115	%
<i>Surrogate: Toluene-d8</i>					77-120 %	99.5	%
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	105	%
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	102	%



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PRDI-3-SC-15-60
21F0419-18 (Solid)

Volatile Organic Compounds

Method: NWTPHg	Preparation Method: EPA 5035 (Methanol Extraction)	Sampled: 06/22/2021 13:30
Instrument: NT3 Analyst: PKC	Preparation Batch: BJG0090	Analyzed: 07/03/2021 15:37
Sample Preparation:	Sample Size: 17.669 g (wet)	Extract ID: 21F0419-18 G
	Final Volume: 5 mL	Dry Weight: 14.57 g
		% Solids: 82.45

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	2780	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	101	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	94.6	%	



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PRDI-3-SC-15-60
21F0419-18 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Instrument: FID4 Analyst: CTO	Sampled: 06/22/2021 13:30 Analyzed: 07/15/2021 20:34
Sample Preparation:	Preparation Method: EPA 3546 (Microwave) Preparation Batch: BJG0096 Prepared: 07/06/2021	Sample Size: 10.09 g (wet) Final Volume: 1 mL Extract ID: 21F0419-18 B 01 Dry Weight: 8.32 g % Solids: 82.45

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	6.01	ND	mg/kg	U
Motor Oil Range Organics (C24-C38)	RRO	1	12.0	26.1	mg/kg	
HC ID: MOTOR OIL						
Surrogate: <i>o</i> -Terphenyl			50-150 %	91.6	%	



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PRDI-3-SC-15-60
21F0419-18 (Solid)

Wet Chemistry

Method: EPA 9014			Sampled: 06/22/2021 13:30
Instrument: UV1800-2 Analyst: CKI			Analyzed: 07/02/2021 13:00
Sample Preparation:	Preparation Method: EPA 9010C m		Extract ID: 21F0419-18 C
	Preparation Batch: BJG0011	Sample Size: 2.511 g (wet)	Dry Weight: 2.05 g
	Prepared: 07/01/2021	Final Volume: 52.511 mL	% Solids: 81.72

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.127	0.127	ND	mg/kg	U



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PRDI-3-SC-15-60
21F0419-18 (Solid)

Wet Chemistry

Method: SM 2540 G-97 Sampled: 06/22/2021 13:30
Instrument: BAL2 Analyst: DOE Analyzed: 06/29/2021 13:57

Sample Preparation: Preparation Method: No Prep Wet Chem Extract ID: 21F0419-18
Preparation Batch: BJF0789 Dry Weight: 4.09 g
Prepared: 06/29/2021 Final Volume: 5 g % Solids: 81.72

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	81.72	%	



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PRDI-3-SC-15-60
21F0419-18RE1 (Solid)

Wet Chemistry

Method: EPA 9060A m	Sampled: 06/22/2021 13:30	
Instrument: TOC Cube Analyst: BF	Analyzed: 07/21/2021 14:31	
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Extract ID: 21F0419-18RE1 C
	Preparation Batch: BJG0116	Dry Weight: 0.11 g
	Prepared: 07/06/2021	% Solids: 81.72
	Sample Size: 0.1395 g (wet)	
	Final Volume: 0.1395 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	0.18	%	



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PRDI-4-SC-0-15
21F0419-19 (Solid)

Volatile Organic Compounds

Method: EPA 8260D	Sampled: 06/24/2021 10:10
Instrument: NT5 Analyst: PB	Analyzed: 06/29/2021 20:20
Sample Preparation:	Preparation Method: EPA 5035 (Sodium Bisulfate)
	Preparation Batch: BJF0792
	Sample Size: 6.44 g (wet)
	Final Volume: 5 mL
	Extract ID: 21F0419-19 D
	Dry Weight: 4.39 g
	% Solids: 68.10

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.19	1.14	0.42	ug/kg	J
Naphthalene	91-20-3	1	2.81	5.70	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-149 %	113	%
<i>Surrogate: Toluene-d8</i>					77-120 %	99.3	%
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	103	%
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	101	%



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PRDI-4-SC-0-15
21F0419-19 (Solid)

Volatile Organic Compounds

Method: NWTPHg	Sampled: 06/24/2021 10:10
Instrument: NT3 Analyst: PKC	Analyzed: 07/03/2021 16:02
Sample Preparation:	Preparation Method: EPA 5035 (Methanol Extraction)
	Preparation Batch: BJG0090
	Sample Size: 5.061 g (wet)
	Final Volume: 5 mL
	Extract ID: 21F0419-19 F
	Dry Weight: 3.45 g
	% Solids: 68.10

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	9600	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	96.9	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	85.1	%	



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PRDI-4-SC-0-15
21F0419-19 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx			Sampled: 06/24/2021 10:10
Instrument: FID4 Analyst: CTO			Analyzed: 07/15/2021 20:54
Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Sample Size: 10.05 g (wet)	Extract ID: 21F0419-19 A 01
	Preparation Batch: BJG0096	Final Volume: 1 mL	Dry Weight: 6.84 g
	Prepared: 07/06/2021		% Solids: 68.10

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24) HC ID: DRO	DRO	5	36.5	99.1	mg/kg	D
Motor Oil Range Organics (C24-C38) HC ID: MOTOR OIL	RRO	5	73.1	210	mg/kg	D
<i>Surrogate: o-Terphenyl</i>			50-150 %	94.7	%	



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PRDI-4-SC-0-15
21F0419-19 (Solid)

Wet Chemistry

Method: EPA 9014			Sampled: 06/24/2021 10:10
Instrument: UV1800-2 Analyst: CKI			Analyzed: 07/02/2021 13:01
Sample Preparation:	Preparation Method: EPA 9010C m	Sample Size: 2.538 g (wet)	Extract ID: 21F0419-19 B
	Preparation Batch: BJG0011	Final Volume: 52.538 mL	Dry Weight: 1.60 g
	Prepared: 07/01/2021		% Solids: 63.05

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.163	0.163	ND	mg/kg	U



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PRDI-4-SC-0-15
21F0419-19 (Solid)

Wet Chemistry

Method: SM 2540 G-97			Sampled: 06/24/2021 10:10
Instrument: BAL2 Analyst: DOE			Analyzed: 06/29/2021 13:57
Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 21F0419-19
	Preparation Batch: BJF0789	Final Volume: 5 g	Dry Weight: 3.15 g
	Prepared: 06/29/2021		% Solids: 63.05

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	63.05	%	



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PRDI-4-SC-0-15
21F0419-19RE1 (Solid)

Wet Chemistry

Method: EPA 9060A m	Instrument: TOC Cube Analyst: BF	Sampled: 06/24/2021 10:10 Analyzed: 07/21/2021 15:03
Sample Preparation:	Preparation Method: PSEP 1986 (modified) Preparation Batch: BJG0116 Prepared: 07/06/2021	Sample Size: 0.2816 g (wet) Final Volume: 0.2816 mL Extract ID: 21F0419-19RE1 B Dry Weight: 0.18 g % Solids: 63.05

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	4.15	%	



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PRDI-4-SC-15-60
21F0419-20 (Solid)

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/24/2021 10:20
Instrument: NT5 Analyst: PB Analyzed: 06/29/2021 20:48
Sample Preparation: Preparation Method: EPA 5035 (Sodium Bisulfate) Extract ID: 21F0419-20 E
Preparation Batch: BJF0792 Sample Size: 10.77 g (wet)
Prepared: 06/29/2021 Final Volume: 5 mL Dry Weight: 6.79 g
% Solids: 63.07

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.12	0.74	0.53	ug/kg	J
Naphthalene	91-20-3	1	1.81	3.68	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-149 %	108	%
<i>Surrogate: Toluene-d8</i>					77-120 %	97.7	%
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	94.3	%
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	100	%



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PRDI-4-SC-15-60
21F0419-20 (Solid)

Volatile Organic Compounds

Method: NWTPHg Sampled: 06/24/2021 10:20
Instrument: NT3 Analyst: PKC Analyzed: 07/03/2021 16:27
Sample Preparation: Preparation Method: EPA 5035 (Methanol Extraction) Extract ID: 21F0419-20 H
Preparation Batch: BJG0090 Sample Size: 9.057 g (wet)
Prepared: 07/03/2021 Final Volume: 5 mL Dry Weight: 5.71 g
% Solids: 63.07

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	7300	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	97.6	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	92.3	%	



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PRDI-4-SC-15-60
21F0419-20 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Instrument: FID4 Analyst: CTO	Sampled: 06/24/2021 10:20 Analyzed: 07/15/2021 21:15
Sample Preparation:	Preparation Method: EPA 3546 (Microwave) Preparation Batch: BJG0096 Prepared: 07/06/2021	Sample Size: 10.02 g (wet) Final Volume: 1 mL Extract ID: 21F0419-20 B 01 Dry Weight: 6.32 g % Solids: 63.07

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24) HC ID: DRO	DRO	5	39.6	225	mg/kg	D
Motor Oil Range Organics (C24-C38) HC ID: MOTOR OIL	RRO	5	79.1	361	mg/kg	D
Surrogate: <i>o</i> -Terphenyl			50-150 %	85.3	%	



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PRDI-4-SC-15-60
21F0419-20 (Solid)

Wet Chemistry

Method: EPA 9014			Sampled: 06/24/2021 10:20
Instrument: UV1800-2 Analyst: CKI			Analyzed: 07/02/2021 13:01
Sample Preparation:	Preparation Method: EPA 9010C m	Sample Size: 2.616 g (wet)	Extract ID: 21F0419-20 C
	Preparation Batch: BJG0011	Final Volume: 52.616 mL	Dry Weight: 1.77 g
	Prepared: 07/01/2021		% Solids: 67.60

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.147	0.147	0.179	mg/kg	



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PRDI-4-SC-15-60
21F0419-20 (Solid)

Wet Chemistry

Method: EPA 9060A m			Sampled: 06/24/2021 10:20
Instrument: TOC Cube Analyst: BF			Analyzed: 07/15/2021 02:02
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Sample Size: 0.3353 g (wet)	Extract ID: 21F0419-20 C
	Preparation Batch: BJG0116	Final Volume: 0.3353 mL	Dry Weight: 0.23 g
	Prepared: 07/06/2021		% Solids: 67.60

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	5.69	%	



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PRDI-4-SC-15-60
21F0419-20 (Solid)

Wet Chemistry

Method: SM 2540 G-97 Sampled: 06/24/2021 10:20
Instrument: BAL2 Analyst: DOE Analyzed: 06/29/2021 13:57

Sample Preparation: Preparation Method: No Prep Wet Chem Extract ID: 21F0419-20
Preparation Batch: BJF0789 Dry Weight: 3.38 g
Prepared: 06/29/2021 Final Volume: 5 g % Solids: 67.60

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	67.60	%	



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PRDI-5-SC-0-15
21F0419-21 (Solid)

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/22/2021 11:50
Instrument: NT5 Analyst: PB Analyzed: 06/29/2021 21:15
Sample Preparation: Preparation Method: EPA 5035 (Sodium Bisulfate) Extract ID: 21F0419-21 D
Preparation Batch: BJF0792 Sample Size: 9.74 g (wet)
Prepared: 06/29/2021 Final Volume: 5 mL Dry Weight: 9.02 g
% Solids: 92.60

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.09	0.55	0.81	ug/kg	
Naphthalene	91-20-3	1	1.37	2.77	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-149 %	111	%
<i>Surrogate: Toluene-d8</i>					77-120 %	98.7	%
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	104	%
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	103	%



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PRDI-5-SC-0-15
21F0419-21 (Solid)

Volatile Organic Compounds

Method: NWTPHg Sampled: 06/22/2021 11:50
Instrument: NT3 Analyst: PKC Analyzed: 07/03/2021 16:52
Sample Preparation: Preparation Method: EPA 5035 (Methanol Extraction) Extract ID: 21F0419-21 G
Preparation Batch: BJG0090 Sample Size: 14.18 g (wet)
Prepared: 07/03/2021 Final Volume: 5 mL Dry Weight: 13.13 g
% Solids: 92.60

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	2300	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	97.8	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	89.2	%	



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PRDI-5-SC-0-15
21F0419-21 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Sampled: 06/22/2021 11:50
Instrument: FID4 Analyst: CTO	Analyzed: 07/15/2021 21:35
Sample Preparation:	Preparation Method: EPA 3546 (Microwave)
	Preparation Batch: BJG0096
	Sample Size: 10.05 g (wet)
	Final Volume: 1 mL
	Extract ID: 21F0419-21 A 01
	Dry Weight: 9.31 g
	% Solids: 92.60

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	1	5.37	ND	mg/kg	U
Motor Oil Range Organics (C24-C38)	RRO	1	10.7	42.5	mg/kg	
HC ID: MOTOR OIL						
Surrogate: <i>o</i> -Terphenyl			50-150 %	87.0	%	



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PRDI-5-SC-0-15
21F0419-21 (Solid)

Wet Chemistry

Method: EPA 9014			Sampled: 06/22/2021 11:50
Instrument: UV1800-2 Analyst: CKI			Analyzed: 07/02/2021 13:02
Sample Preparation:	Preparation Method: EPA 9010C m	Sample Size: 2.563 g (wet)	Extract ID: 21F0419-21 B
	Preparation Batch: BJG0011	Final Volume: 52.563 mL	Dry Weight: 2.38 g
	Prepared: 07/01/2021		% Solids: 92.78

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.109	0.109	ND	mg/kg	U



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PRDI-5-SC-0-15
21F0419-21 (Solid)

Wet Chemistry

Method: EPA 9060A m		Sampled: 06/22/2021 11:50
Instrument: TOC Cube Analyst: BF		Analyzed: 07/15/2021 02:34
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Extract ID: 21F0419-21 B
	Preparation Batch: BJG0116	Dry Weight: 0.32 g
	Prepared: 07/06/2021	% Solids: 92.78
	Sample Size: 0.34 g (wet)	
	Final Volume: 0.34 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	0.26	%	



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PRDI-5-SC-0-15
21F0419-21 (Solid)

Wet Chemistry

Method: SM 2540 G-97			Sampled: 06/22/2021 11:50
Instrument: BAL2 Analyst: DOE			Analyzed: 06/29/2021 13:57
Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 21F0419-21
	Preparation Batch: BJF0789	Final Volume: 5 g	Dry Weight: 4.64 g
	Prepared: 06/29/2021		% Solids: 92.78

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	92.78	%	



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PRDI-5-SC-15-60
21F0419-22 (Solid)

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5035 (Sodium Bisulfate)	Sampled: 06/22/2021 12:40
Instrument: NT5 Analyst: PB	Preparation Batch: BJF0792	Analyzed: 06/29/2021 21:41
Sample Preparation:	Sample Size: 10.04 g (wet)	Extract ID: 21F0419-22 E
	Final Volume: 5 mL	Dry Weight: 8.37 g
		% Solids: 83.35

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.10	0.60	2.78	ug/kg	
Naphthalene	91-20-3	1	1.47	2.99	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-149 %	115 %	
<i>Surrogate: Toluene-d8</i>					77-120 %	99.2 %	
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	104 %	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	103 %	



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PRDI-5-SC-15-60
21F0419-22 (Solid)

Volatile Organic Compounds

Method: NWTPHg Sampled: 06/22/2021 12:40
Instrument: NT3 Analyst: PKC Analyzed: 07/03/2021 17:17
Sample Preparation: Preparation Method: EPA 5035 (Methanol Extraction) Extract ID: 21F0419-22 G
Preparation Batch: BJG0090 Sample Size: 9.69 g (wet)
Prepared: 07/03/2021 Final Volume: 5 mL Dry Weight: 8.08 g
% Solids: 83.35

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	4090	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	104	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	93.0	%	



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PRDI-5-SC-15-60
21F0419-22 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx
Instrument: FID4 Analyst: CTO
Sample Preparation: Preparation Method: EPA 3546 (Microwave)
Preparation Batch: BJG0096 Sample Size: 10.04 g (wet)
Prepared: 07/06/2021 Final Volume: 1 mL
Extract ID: 21F0419-22 B 01
Dry Weight: 8.37 g
% Solids: 83.35

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24) HC ID: DRO	DRO	5	29.9	64.5	mg/kg	D
Motor Oil Range Organics (C24-C38) HC ID: MOTOR OIL	RRO	5	59.7	119	mg/kg	D
Surrogate: <i>o</i> -Terphenyl			50-150 %	88.4	%	



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PRDI-5-SC-15-60
21F0419-22 (Solid)

Wet Chemistry

Method: EPA 9014			Sampled: 06/22/2021 12:40
Instrument: UV1800-2 Analyst: CKI			Analyzed: 07/02/2021 13:03
Sample Preparation:	Preparation Method: EPA 9010C m	Sample Size: 2.67 g (wet)	Extract ID: 21F0419-22 C
	Preparation Batch: BJG0011	Final Volume: 52.67 mL	Dry Weight: 2.19 g
	Prepared: 07/01/2021		% Solids: 82.02

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.119	0.119	0.192	mg/kg	



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PRDI-5-SC-15-60
21F0419-22 (Solid)

Wet Chemistry

Method: EPA 9060A m	Sampled: 06/22/2021 12:40
Instrument: TOC Cube Analyst: BF	Analyzed: 07/15/2021 03:05
Sample Preparation:	Preparation Method: PSEP 1986 (modified)
	Preparation Batch: BJG0116
	Prepared: 07/06/2021
	Sample Size: 0.3537 g (wet)
	Final Volume: 0.3537 mL
	Extract ID: 21F0419-22 C
	Dry Weight: 0.29 g
	% Solids: 82.02

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	0.56	%	



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PRDI-5-SC-15-60
21F0419-22 (Solid)

Wet Chemistry

Method: SM 2540 G-97			Sampled: 06/22/2021 12:40
Instrument: BAL2 Analyst: DOE			Analyzed: 06/29/2021 13:57
Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 21F0419-22
	Preparation Batch: BJF0789	Final Volume: 5 g	Dry Weight: 4.10 g
	Prepared: 06/29/2021		% Solids: 82.02

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	82.02	%	



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PRDI-6-SC-0-15
21F0419-23 (Solid)

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5035 (Sodium Bisulfate)	Sampled: 06/22/2021 10:45
Instrument: NT5 Analyst: PB	Preparation Batch: BJF0792	Analyzed: 06/29/2021 22:07
Sample Preparation:	Sample Size: 9.2 g (wet)	Extract ID: 21F0419-23 D
	Final Volume: 5 mL	Dry Weight: 6.38 g
		% Solids: 69.30

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.13	0.78	0.27	ug/kg	J
Naphthalene	91-20-3	1	1.93	3.92	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-149 %	110	%	
<i>Surrogate: Toluene-d8</i>				77-120 %	99.3	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	99.1	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	101	%	



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PRDI-6-SC-0-15
21F0419-23 (Solid)

Volatile Organic Compounds

Method: NWTPHg	Preparation Method: EPA 5035 (Methanol Extraction)	Sampled: 06/22/2021 10:45
Instrument: NT3 Analyst: PKC	Preparation Batch: BJJ0090	Analyzed: 07/03/2021 17:42
Sample Preparation:	Sample Size: 11.342 g (wet)	Extract ID: 21F0419-23 G
	Final Volume: 5 mL	Dry Weight: 7.86 g
		% Solids: 69.30

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	5400	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	99.4	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	90.3	%	



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PRDI-6-SC-0-15
21F0419-23 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Sampled: 06/22/2021 10:45	
Instrument: FID4 Analyst: CTO	Analyzed: 07/15/2021 22:56	
Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Extract ID: 21F0419-23 A 01
	Preparation Batch: BJJ0096	Dry Weight: 7.01 g
	Prepared: 07/06/2021	% Solids: 69.30
	Sample Size: 10.12 g (wet)	
	Final Volume: 1 mL	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)		DRO	7.13	43.3	mg/kg	
HC ID: DIESEL						
Motor Oil Range Organics (C24-C38)		RRO	14.3	113	mg/kg	
HC ID: MOTOR OIL						
Surrogate: <i>o</i> -Terphenyl			50-150 %	87.6	%	



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PRDI-6-SC-0-15
21F0419-23 (Solid)

Wet Chemistry

Method: EPA 9014		Sampled: 06/22/2021 10:45
Instrument: UV1800-2 Analyst: CKI		Analyzed: 07/02/2021 13:03
Sample Preparation:	Preparation Method: EPA 9010C m	Extract ID: 21F0419-23 B
	Preparation Batch: BJG0011	Dry Weight: 1.88 g
	Prepared: 07/01/2021	Final Volume: 52.627 mL
		% Solids: 71.63

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.138	0.138	ND	mg/kg	U



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PRDI-6-SC-0-15
21F0419-23 (Solid)

Wet Chemistry

Method: EPA 9060A m	Sampled: 06/22/2021 10:45	
Instrument: TOC Cube Analyst: BF	Analyzed: 07/15/2021 04:39	
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Extract ID: 21F0419-23 B
	Preparation Batch: BJG0116	Dry Weight: 0.24 g
	Prepared: 07/06/2021	% Solids: 71.63
	Sample Size: 0.3384 g (wet)	
	Final Volume: 0.3384 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	3.73	%	



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PRDI-6-SC-0-15
21F0419-23 (Solid)

Wet Chemistry

Method: SM 2540 G-97			Sampled: 06/22/2021 10:45
Instrument: BAL2 Analyst: DOE			Analyzed: 06/29/2021 13:57
Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 21F0419-23
	Preparation Batch: BJF0789	Final Volume: 5 g	Dry Weight: 3.58 g
	Prepared: 06/29/2021		% Solids: 71.63

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	71.63	%	



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PRDI-6-SC-15-60
21F0419-24 (Solid)

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5035 (Sodium Bisulfate)	Sampled: 06/22/2021 10:50
Instrument: NT5 Analyst: PB	Preparation Batch: BJF0792	Analyzed: 06/29/2021 22:33
Sample Preparation:	Sample Size: 12.5 g (wet)	Extract ID: 21F0419-24 E
	Final Volume: 5 mL	Dry Weight: 9.68 g
		% Solids: 77.47

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.09	0.52	ND	ug/kg	U
Naphthalene	91-20-3	1	1.27	2.58	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-149 %	111	%	
<i>Surrogate: Toluene-d8</i>				77-120 %	100	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	100	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	102	%	



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PRDI-6-SC-15-60
21F0419-24 (Solid)

Volatile Organic Compounds

Method: NWTPHg Sampled: 06/22/2021 10:50
Instrument: NT3 Analyst: PKC Analyzed: 07/03/2021 18:07
Sample Preparation: Preparation Method: EPA 5035 (Methanol Extraction) Extract ID: 21F0419-24 G
Preparation Batch: BJG0090 Sample Size: 9.91 g (wet)
Prepared: 07/03/2021 Final Volume: 5 mL Dry Weight: 7.68 g
% Solids: 77.47

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	4710	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	100	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	93.4	%	



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PRDI-6-SC-15-60
21F0419-24 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx Sampled: 06/22/2021 10:50
Instrument: FID4 Analyst: CTO Analyzed: 07/15/2021 23:16
Sample Preparation: Preparation Method: EPA 3546 (Microwave) Extract ID: 21F0419-24 B 01
Preparation Batch: BJG0096 Dry Weight: 7.75 g
Prepared: 07/06/2021 Final Volume: 1 mL % Solids: 77.47

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24) HC ID: DIESEL		DRO 1	6.45	28.1	mg/kg	
Motor Oil Range Organics (C24-C38) HC ID: MOTOR OIL		RRO 1	12.9	99.9	mg/kg	
Surrogate: <i>o</i> -Terphenyl			50-150 %	89.6	%	



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PRDI-6-SC-15-60
21F0419-24 (Solid)

Wet Chemistry

Method: EPA 9014			Sampled: 06/22/2021 10:50
Instrument: UV1800-2 Analyst: CKI			Analyzed: 07/02/2021 13:04
Sample Preparation:	Preparation Method: EPA 9010C m	Sample Size: 2.684 g (wet)	Extract ID: 21F0419-24 C
	Preparation Batch: BJG0011	Final Volume: 52.684 mL	Dry Weight: 2.09 g
	Prepared: 07/01/2021		% Solids: 78.05

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.125	0.125	ND	mg/kg	U



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Project: South State Street PRDI
Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
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PRDI-6-SC-15-60
21F0419-24 (Solid)

Wet Chemistry

Method: SM 2540 G-97 Sampled: 06/22/2021 10:50
Instrument: BAL2 Analyst: DOE Analyzed: 06/29/2021 13:57

Sample Preparation: Preparation Method: No Prep Wet Chem Extract ID: 21F0419-24
Preparation Batch: BJF0789 Dry Weight: 3.90 g
Prepared: 06/29/2021 Final Volume: 5 g % Solids: 78.05

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	78.05	%	



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PRDI-6-SC-15-60
21F0419-24RE1 (Solid)

Wet Chemistry

Method: EPA 9060A m			Sampled: 06/22/2021 10:50
Instrument: TOC Cube Analyst: BF			Analyzed: 07/21/2021 15:34
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Sample Size: 0.2517 g (wet)	Extract ID: 21F0419-24RE1 C
	Preparation Batch: BJG0116	Final Volume: 0.2517 mL	Dry Weight: 0.20 g
	Prepared: 07/06/2021		% Solids: 78.05

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	1.38	%	



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PRDI-7-SC-0-15
21F0419-25 (Solid)

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5035 (Sodium Bisulfate)	Sampled: 06/23/2021 13:00
Instrument: NT5 Analyst: PB	Preparation Batch: BJF0792	Analyzed: 06/29/2021 22:59
Sample Preparation:	Sample Size: 8.01 g (wet)	Extract ID: 21F0419-25 D
	Final Volume: 5 mL	Dry Weight: 6.83 g
		% Solids: 85.26

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.12	0.73	0.47	ug/kg	J
Naphthalene	91-20-3	1	1.80	3.66	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-149 %	113	%	
<i>Surrogate: Toluene-d8</i>				77-120 %	99.0	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	102	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	100	%	



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Project Manager: Brian Tracy

Reported:
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PRDI-7-SC-0-15
21F0419-25 (Solid)

Volatile Organic Compounds

Method: NWTPHg		Sampled: 06/23/2021 13:00
Instrument: NT3 Analyst: PKC		Analyzed: 07/03/2021 18:33
Sample Preparation:	Preparation Method: EPA 5035 (Methanol Extraction)	Extract ID: 21F0419-25 G
	Preparation Batch: BJJ0090	Sample Size: 12.306 g (wet)
	Prepared: 07/03/2021	Final Volume: 5 mL
		Dry Weight: 10.49 g
		% Solids: 85.26

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	3250	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	101	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	91.0	%	



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PRDI-7-SC-0-15
21F0419-25 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Sampled: 06/23/2021 13:00	
Instrument: FID4 Analyst: CTO	Analyzed: 07/15/2021 23:37	
Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Extract ID: 21F0419-25 A 01
	Preparation Batch: BJG0096	Dry Weight: 8.58 g
	Prepared: 07/06/2021	% Solids: 85.26
	Sample Size: 10.06 g (wet)	
	Final Volume: 1 mL	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)		DRO	5.83	14.4	mg/kg	
HC ID: DRO						
Motor Oil Range Organics (C24-C38)		RRO	11.7	69.1	mg/kg	
HC ID: MOTOR OIL						
Surrogate: o-Terphenyl			50-150 %	91.6	%	



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PRDI-7-SC-0-15
21F0419-25 (Solid)

Wet Chemistry

Method: EPA 9014			Sampled: 06/23/2021 13:00
Instrument: UV1800-2 Analyst: CKI			Analyzed: 07/02/2021 13:04
Sample Preparation:	Preparation Method: EPA 9010C m	Sample Size: 2.57 g (wet)	Extract ID: 21F0419-25 B
	Preparation Batch: BJG0011	Final Volume: 52.57 mL	Dry Weight: 2.24 g
	Prepared: 07/01/2021		% Solids: 87.24

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.116	0.116	ND	mg/kg	U



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PRDI-7-SC-0-15
21F0419-25 (Solid)

Wet Chemistry

Method: EPA 9060A m	Sampled: 06/23/2021 13:00	
Instrument: TOC Cube Analyst: BF	Analyzed: 07/15/2021 05:42	
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Extract ID: 21F0419-25 B
	Preparation Batch: BJG0116	Dry Weight: 0.30 g
	Prepared: 07/06/2021	% Solids: 87.24
	Sample Size: 0.3394 g (wet)	
	Final Volume: 0.3394 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	0.51	%	



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PRDI-7-SC-0-15
21F0419-25 (Solid)

Wet Chemistry

Method: SM 2540 G-97			Sampled: 06/23/2021 13:00
Instrument: BAL2 Analyst: DOE			Analyzed: 06/29/2021 13:57
Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 21F0419-25
	Preparation Batch: BJF0789	Final Volume: 5 g	Dry Weight: 4.36 g
	Prepared: 06/29/2021		% Solids: 87.24

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	87.24	%	



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PRDI-7-SC-15-60
21F0419-26 (Solid)

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5035 (Sodium Bisulfate)	Sampled: 06/23/2021 13:20
Instrument: NT5 Analyst: PB	Preparation Batch: BJF0792	Analyzed: 06/29/2021 23:25
Sample Preparation:	Sample Size: 6.37 g (wet)	Extract ID: 21F0419-26 E
Prepared: 06/29/2021	Final Volume: 5 mL	Dry Weight: 5.19 g % Solids: 81.54

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.16	0.96	1.53	ug/kg	
Naphthalene	91-20-3	1	2.37	4.81	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-149 %	114 %	
<i>Surrogate: Toluene-d8</i>					77-120 %	100 %	
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	102 %	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	102 %	



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PRDI-7-SC-15-60
21F0419-26 (Solid)

Volatile Organic Compounds

Method: NWTPHg Sampled: 06/23/2021 13:20
Instrument: NT3 Analyst: PKC Analyzed: 07/03/2021 18:58
Sample Preparation: Preparation Method: EPA 5035 (Methanol Extraction) Extract ID: 21F0419-26 H
Preparation Batch: BJG0090 Sample Size: 7.853 g (wet)
Prepared: 07/03/2021 Final Volume: 5 mL Dry Weight: 6.40 g
% Solids: 81.54

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	5040	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	102	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	83.4	%	



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PRDI-7-SC-15-60
21F0419-26 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Instrument: FID4 Analyst: CTO	Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Preparation Batch: BJG0137	Prepared: 07/07/2021	Sample Size: 10.04 g (wet)	Final Volume: 1 mL	Extract ID: 21F0419-26 B 01	Dry Weight: 8.19 g	% Solids: 81.54
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Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24) HC ID: DRO		DRO 1	6.11	15.7	mg/kg	
Motor Oil Range Organics (C24-C38) HC ID: MOTOR OIL		RRO 1	12.2	96.3	mg/kg	
Surrogate: <i>o</i> -Terphenyl			50-150 %	85.2	%	



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PRDI-7-SC-15-60
21F0419-26 (Solid)

Wet Chemistry

Method: EPA 9014			Sampled: 06/23/2021 13:20
Instrument: UV1800-2 Analyst: CKI			Analyzed: 07/02/2021 13:05
Sample Preparation:	Preparation Method: EPA 9010C m	Sample Size: 2.532 g (wet)	Extract ID: 21F0419-26 C
	Preparation Batch: BJG0011	Final Volume: 52.532 mL	Dry Weight: 1.99 g
	Prepared: 07/01/2021		% Solids: 78.59

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.131	0.131	ND	mg/kg	U



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PRDI-7-SC-15-60
21F0419-26 (Solid)

Wet Chemistry

Method: EPA 9060A m		Sampled: 06/23/2021 13:20
Instrument: TOC Cube Analyst: BF		Analyzed: 07/15/2021 06:14
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Extract ID: 21F0419-26 C
	Preparation Batch: BJG0116	Dry Weight: 0.25 g
	Prepared: 07/06/2021	% Solids: 78.59
	Sample Size: 0.3169 g (wet)	
	Final Volume: 0.3169 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	0.73	%	



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PRDI-7-SC-15-60
21F0419-26 (Solid)

Wet Chemistry

Method: SM 2540 G-97 Sampled: 06/23/2021 13:20
Instrument: BAL2 Analyst: DOE Analyzed: 06/29/2021 13:57

Sample Preparation: Preparation Method: No Prep Wet Chem Extract ID: 21F0419-26
Preparation Batch: BJF0789 Dry Weight: 3.93 g
Prepared: 06/29/2021 Final Volume: 5 g % Solids: 78.59

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	78.59	%	



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PRDI-8-SC-0-15
21F0419-27 (Solid)

Volatile Organic Compounds

Method: EPA 8260D	Sampled: 06/24/2021 09:30
Instrument: NT5 Analyst: PB	Analyzed: 06/29/2021 23:50
Sample Preparation:	Preparation Method: EPA 5035 (Sodium Bisulfate)
	Preparation Batch: BJF0792
	Sample Size: 4.95 g (wet)
	Final Volume: 5 mL
	Extract ID: 21F0419-27 D
	Dry Weight: 3.36 g
	% Solids: 67.84

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.25	1.49	0.59	ug/kg	J
Naphthalene	91-20-3	1	3.67	7.44	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-149 %	115	%
<i>Surrogate: Toluene-d8</i>					77-120 %	101	%
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	101	%
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	101	%



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PRDI-8-SC-0-15
21F0419-27 (Solid)

Volatile Organic Compounds

Method: NWTPHg	Sampled: 06/24/2021 09:30
Instrument: NT3 Analyst: PKC	Analyzed: 07/06/2021 16:17
Sample Preparation:	Preparation Method: EPA 5035 (Methanol Extraction)
	Preparation Batch: BJG0122
	Sample Size: 4.051 g (wet)
	Final Volume: 5 mL
	Extract ID: 21F0419-27 G
	Dry Weight: 2.75 g
	% Solids: 67.84

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	11500	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	104	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	91.0	%	



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PRDI-8-SC-0-15
21F0419-27 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Sampled: 06/24/2021 09:30	
Instrument: FID4 Analyst: CTO	Analyzed: 07/16/2021 01:39	
Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Extract ID: 21F0419-27 A 01
	Preparation Batch: BJG0137	Dry Weight: 6.87 g
	Prepared: 07/07/2021	% Solids: 67.84
	Sample Size: 10.12 g (wet)	
	Final Volume: 1 mL	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	5	36.4	40.7	mg/kg	D
HC ID: DRO						
Motor Oil Range Organics (C24-C38)	RRO	5	72.8	142	mg/kg	D
HC ID: MOTOR OIL						
Surrogate: <i>o</i> -Terphenyl			50-150 %	84.4	%	



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PRDI-8-SC-0-15
21F0419-27 (Solid)

Wet Chemistry

Method: EPA 9014			Sampled: 06/24/2021 09:30
Instrument: UV1800-2 Analyst: CKI			Analyzed: 07/02/2021 13:07
Sample Preparation:	Preparation Method: EPA 9010C m	Sample Size: 2.656 g (wet)	Extract ID: 21F0419-27 B
	Preparation Batch: BJG0011	Final Volume: 52.656 mL	Dry Weight: 1.94 g
	Prepared: 07/01/2021		% Solids: 73.04

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.134	0.134	ND	mg/kg	U



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Project Manager: Brian Tracy

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PRDI-8-SC-0-15
21F0419-27 (Solid)

Wet Chemistry

Method: EPA 9060A m		Sampled: 06/24/2021 09:30
Instrument: TOC Cube Analyst: BF		Analyzed: 07/15/2021 06:45
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Extract ID: 21F0419-27 B
	Preparation Batch: BJG0116	Dry Weight: 0.25 g
	Prepared: 07/06/2021	% Solids: 73.04
	Sample Size: 0.3459 g (wet)	
	Final Volume: 0.3459 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	2.25	%	



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PRDI-8-SC-0-15
21F0419-27 (Solid)

Wet Chemistry

Method: SM 2540 G-97			Sampled: 06/24/2021 09:30
Instrument: BAL2 Analyst: DOE			Analyzed: 06/29/2021 13:57
Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 21F0419-27
	Preparation Batch: BJF0789	Final Volume: 5 g	Dry Weight: 3.65 g
	Prepared: 06/29/2021		% Solids: 73.04

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	73.04	%	



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PRDI-8-SC-15-60
21F0419-28 (Solid)

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/24/2021 09:40
Instrument: NT5 Analyst: PB Analyzed: 06/30/2021 00:16
Sample Preparation: Preparation Method: EPA 5035 (Sodium Bisulfate) Extract ID: 21F0419-28 E
Preparation Batch: BJF0792 Sample Size: 6.51 g (wet)
Prepared: 06/29/2021 Final Volume: 5 mL Dry Weight: 5.11 g
% Solids: 78.48

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.16	0.98	3.67	ug/kg	
Naphthalene	91-20-3	1	2.41	4.89	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					<i>80-149 %</i>	<i>114</i>	<i>%</i>
<i>Surrogate: Toluene-d8</i>					<i>77-120 %</i>	<i>100</i>	<i>%</i>
<i>Surrogate: 4-Bromofluorobenzene</i>					<i>80-120 %</i>	<i>101</i>	<i>%</i>
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					<i>80-120 %</i>	<i>103</i>	<i>%</i>



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PRDI-8-SC-15-60
21F0419-28 (Solid)

Volatile Organic Compounds

Method: NWTPHg Sampled: 06/24/2021 09:40
Instrument: NT3 Analyst: PKC Analyzed: 07/06/2021 16:42
Sample Preparation: Preparation Method: EPA 5035 (Methanol Extraction) Extract ID: 21F0419-28 H
Preparation Batch: BJG0122 Sample Size: 11.854 g (wet)
Prepared: 07/06/2021 Final Volume: 5 mL Dry Weight: 9.30 g
% Solids: 78.48

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	4060	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	101	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	85.2	%	



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PRDI-8-SC-15-60
21F0419-28 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Sampled: 06/24/2021 09:40	
Instrument: FID4 Analyst: CTO	Analyzed: 07/16/2021 01:59	
Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Extract ID: 21F0419-28 B 01
	Preparation Batch: BJG0137	Dry Weight: 7.93 g
	Prepared: 07/07/2021	% Solids: 78.48
	Sample Size: 10.1 g (wet)	
	Final Volume: 1 mL	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)		DRO 1	6.31	16.0	mg/kg	
HC ID: DIESEL						
Motor Oil Range Organics (C24-C38)		RRO 1	12.6	54.0	mg/kg	
HC ID: MOTOR OIL						
Surrogate: <i>o</i> -Terphenyl			50-150 %	94.6	%	



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PRDI-8-SC-15-60
21F0419-28 (Solid)

Wet Chemistry

Method: EPA 9014	Instrument: UV1800-2 Analyst: CKI		Sampled: 06/24/2021 09:40
Sample Preparation:	Preparation Method: EPA 9010C m	Sample Size: 2.644 g (wet)	Extract ID: 21F0419-28 C
	Preparation Batch: BJG0011	Final Volume: 52.644 mL	Dry Weight: 1.97 g
	Prepared: 07/01/2021		% Solids: 74.59

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.132	0.132	ND	mg/kg	U



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Project: South State Street PRDI
Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
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PRDI-8-SC-15-60
21F0419-28 (Solid)

Wet Chemistry

Method: EPA 9060A m		Sampled: 06/24/2021 09:40
Instrument: TOC Cube Analyst: BF		Analyzed: 07/15/2021 07:16
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Extract ID: 21F0419-28 C
	Preparation Batch: BJG0116	Dry Weight: 0.28 g
	Prepared: 07/06/2021	% Solids: 74.59
	Sample Size: 0.3801 g (wet)	
	Final Volume: 0.3801 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	1.24	%	



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Project Manager: Brian Tracy

Reported:
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PRDI-8-SC-15-60
21F0419-28 (Solid)

Wet Chemistry

Method: SM 2540 G-97 Sampled: 06/24/2021 09:40
Instrument: BAL2 Analyst: DOE Analyzed: 06/29/2021 13:57

Sample Preparation: Preparation Method: No Prep Wet Chem Extract ID: 21F0419-28
Preparation Batch: BJF0789 Dry Weight: 3.73 g
Prepared: 06/29/2021 Final Volume: 5 g % Solids: 74.59

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	74.59	%	



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PRDI-9-SC-0-15
21F0419-29 (Solid)

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5035 (Sodium Bisulfate)	Sampled: 06/24/2021 12:00
Instrument: NT5 Analyst: PB	Preparation Batch: BJF0832	Analyzed: 06/30/2021 18:11
Sample Preparation:	Sample Size: 2.5 g (wet)	Extract ID: 21F0419-29 E
	Final Volume: 5 mL	Dry Weight: 1.72 g
		% Solids: 68.70

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.48	2.91	ND	ug/kg	U
Naphthalene	91-20-3	1	7.17	14.6	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-149 %	122	%	
<i>Surrogate: Toluene-d8</i>				77-120 %	102	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	99.1	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	100	%	



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PRDI-9-SC-0-15
21F0419-29 (Solid)

Volatile Organic Compounds

Method: NWTPHg Sampled: 06/24/2021 12:00
Instrument: NT3 Analyst: PKC Analyzed: 07/06/2021 17:07
Sample Preparation: Preparation Method: EPA 5035 (Methanol Extraction) Extract ID: 21F0419-29 F
Preparation Batch: BJG0122 Sample Size: 9.592 g (wet) Dry Weight: 6.59 g
Prepared: 07/06/2021 Final Volume: 5 mL % Solids: 68.70

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	6070	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	103	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	89.1	%	



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PRDI-9-SC-0-15
21F0419-29 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Instrument: FID4 Analyst: CTO	Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Preparation Batch: BJG0137	Prepared: 07/07/2021	Sample Size: 10.05 g (wet)	Final Volume: 1 mL	Reporting Limit	Result	Units	Notes
								36.2	37.2	mg/kg	D
								72.4	130	mg/kg	D
								50-150 %	93.3	%	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24) HC ID: DRO	DRO	5	36.2	37.2	mg/kg	D
Motor Oil Range Organics (C24-C38) HC ID: MOTOR OIL	RRO	5	72.4	130	mg/kg	D
Surrogate: <i>o</i> -Terphenyl			50-150 %	93.3	%	



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PRDI-9-SC-0-15
21F0419-29 (Solid)

Wet Chemistry

Method: EPA 9014		Sampled: 06/24/2021 12:00
Instrument: UV1800-2 Analyst: CKI		Analyzed: 07/02/2021 13:08
Sample Preparation:	Preparation Method: EPA 9010C m	Extract ID: 21F0419-29 B
	Preparation Batch: BJG0011	Dry Weight: 1.83 g
	Prepared: 07/01/2021	% Solids: 71.02
	Sample Size: 2.576 g (wet)	
	Final Volume: 52.576 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.142	0.142	ND	mg/kg	U



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PRDI-9-SC-0-15
21F0419-29 (Solid)

Wet Chemistry

Method: EPA 9060A m	Sampled: 06/24/2021 12:00
Instrument: TOC Cube Analyst: BF	Analyzed: 07/15/2021 07:48
Sample Preparation:	Preparation Method: PSEP 1986 (modified)
	Preparation Batch: BJG0116
	Prepared: 07/06/2021
	Sample Size: 0.3104 g (wet)
	Final Volume: 0.3104 mL
	Extract ID: 21F0419-29 B
	Dry Weight: 0.22 g
	% Solids: 71.02

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	2.92	%	



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PRDI-9-SC-0-15
21F0419-29 (Solid)

Wet Chemistry

Method: SM 2540 G-97			Sampled: 06/24/2021 12:00
Instrument: BAL2 Analyst: DOE			Analyzed: 06/29/2021 13:57
Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 21F0419-29
	Preparation Batch: BJF0789	Final Volume: 5 g	Dry Weight: 3.55 g
	Prepared: 06/29/2021		% Solids: 71.02

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	71.02	%	



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PRDI-9-SC-15-60
21F0419-30 (Solid)

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5035 (Sodium Bisulfate)	Sampled: 06/24/2021 12:10
Instrument: NT5 Analyst: PB	Preparation Batch: BJF0832	Analyzed: 06/30/2021 13:56
Sample Preparation:	Sample Size: 7.89 g (wet)	Extract ID: 21F0419-30 E
	Final Volume: 5 mL	Dry Weight: 6.58 g
		% Solids: 83.41

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.13	0.76	0.90	ug/kg	
Naphthalene	91-20-3	1	1.87	3.80	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-149 %	116	%	
<i>Surrogate: Toluene-d8</i>				77-120 %	101	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	97.0	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	101	%	



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PRDI-9-SC-15-60
21F0419-30 (Solid)

Volatile Organic Compounds

Method: NWTPHg	Sampled: 06/24/2021 12:10
Instrument: NT3 Analyst: PKC	Analyzed: 07/06/2021 17:32
Sample Preparation:	Preparation Method: EPA 5035 (Methanol Extraction)
	Preparation Batch: BJG0122
	Sample Size: 9.402 g (wet)
	Final Volume: 5 mL
	Extract ID: 21F0419-30 G
	Dry Weight: 7.84 g
	% Solids: 83.41

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	4180	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	99.0	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	90.6	%	



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PRDI-9-SC-15-60
21F0419-30 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Instrument: FID4 Analyst: CTO	Sampled: 06/24/2021 12:10 Analyzed: 07/16/2021 02:40
Sample Preparation:	Preparation Method: EPA 3546 (Microwave) Preparation Batch: BJG0137 Prepared: 07/07/2021	Sample Size: 10.03 g (wet) Final Volume: 1 mL Extract ID: 21F0419-30 B 01 Dry Weight: 8.37 g % Solids: 83.41

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24) HC ID: DIESEL		DRO 1	5.98	20.3	mg/kg	
Motor Oil Range Organics (C24-C38) HC ID: MOTOR OIL		RRO 1	12.0	81.7	mg/kg	
Surrogate: <i>o</i> -Terphenyl			50-150 %	90.1	%	



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PRDI-9-SC-15-60
21F0419-30 (Solid)

Wet Chemistry

Method: EPA 9014		Sampled: 06/24/2021 12:10
Instrument: UV1800-2 Analyst: CKI		Analyzed: 07/02/2021 13:09
Sample Preparation:	Preparation Method: EPA 9010C m	Extract ID: 21F0419-30 C
	Preparation Batch: BJG0011	Dry Weight: 2.13 g
	Prepared: 07/01/2021	Final Volume: 52.565 mL
		% Solids: 83.09

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.122	0.122	ND	mg/kg	U



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PRDI-9-SC-15-60
21F0419-30 (Solid)

Wet Chemistry

Method: EPA 9060A m		Sampled: 06/24/2021 12:10
Instrument: TOC Cube Analyst: BF		Analyzed: 07/15/2021 12:00
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Extract ID: 21F0419-30 C
	Preparation Batch: BJJ0118	Dry Weight: 0.49 g
	Prepared: 07/06/2021	% Solids: 83.09
	Sample Size: 0.5906 g (wet)	
	Final Volume: 0.5906 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	0.91	%	



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PRDI-9-SC-15-60
21F0419-30 (Solid)

Wet Chemistry

Method: SM 2540 G-97			Sampled: 06/24/2021 12:10
Instrument: BAL2 Analyst: DOE			Analyzed: 06/30/2021 11:02
Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 21F0419-30
	Preparation Batch: BJF0823	Final Volume: 5 g	Dry Weight: 4.15 g
	Prepared: 06/30/2021		% Solids: 83.09

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	83.09	%	



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Reported:
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PRDI-9-SS-0-12
21F0419-31 (Solid)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM		Sampled: 06/24/2021 12:00
Instrument: NT11 Analyst: VTS		Analyzed: 07/15/2021 15:21
Sample Preparation:	Preparation Method: EPA 3546 (Microwave) Low Level Preparation Batch: BJG0176 Prepared: 07/08/2021	Extract ID: 21F0419-31 A 01 Dry Weight: 10.43 g % Solids: 74.53
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJG0139 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-31 A 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJG0138 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-31 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzo(a)anthracene	56-55-3	1	0.07	0.48	114	ug/kg	E
Chrysene	218-01-9	1	0.07	0.48	125	ug/kg	E
Benzo(b)fluoranthene	205-99-2	1	0.06	0.48	113	ug/kg	E
Benzo(k)fluoranthene	207-08-9	1	0.10	0.48	92.9	ug/kg	E
Benzo(a)pyrene	50-32-8	1	0.08	0.48	162	ug/kg	E
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.08	0.48	121	ug/kg	E
Dibenzo(a,h)anthracene	53-70-3	1	0.10	0.48	55.5	ug/kg	E
<i>Surrogate: 2-Methylnaphthalene-d10</i>					32-120 %	70.3 %	
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					21-133 %	138 %	*
<i>Surrogate: Fluoranthene-d10</i>					36-134 %	110 %	



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Reported:
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PRDI-9-SS-0-12
21F0419-31RE1 (Solid)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM Sampled: 06/24/2021 12:00
Instrument: NT11 Analyst: VTS Analyzed: 07/16/2021 09:11

Sample Preparation: Preparation Method: EPA 3546 (Microwave) Low Level Extract ID: 21F0419-31RE1 A 01
Preparation Batch: BJG0176 Sample Size: 14 g (wet)
Prepared: 07/08/2021 Final Volume: 0.5 mL Dry Weight: 10.43 g
% Solids: 74.53

Sample Cleanup: Cleanup Method: Silica Gel Extract ID: 21F0419-31RE1 A 01
Cleanup Batch: CJG0139 Initial Volume: 0.5 mL
Cleaned: 15-Jul-2021 Final Volume: 0.5 mL

Sample Cleanup: Cleanup Method: Sulfur Extract ID: 21F0419-31RE1 A 01
Cleanup Batch: CJG0138 Initial Volume: 0.5 mL
Cleaned: 15-Jul-2021 Final Volume: 0.5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzo(a)anthracene	56-55-3	10	0.69	4.79	259	ug/kg	D
Chrysene	218-01-9	10	0.67	4.79	289	ug/kg	D
Benzo(b)fluoranthene	205-99-2	10	0.63	4.79	201	ug/kg	D
Benzo(k)fluoranthene	207-08-9	10	0.97	4.79	142	ug/kg	D
Benzo(a)pyrene	50-32-8	10	0.83	4.79	286	ug/kg	D
Indeno(1,2,3-cd)pyrene	193-39-5	10	0.84	4.79	156	ug/kg	D
Dibenzo(a,h)anthracene	53-70-3	10	1.01	4.79	49.8	ug/kg	D
<i>Surrogate: 2-Methylnaphthalene-d10</i>					32-120 %	70.3	%
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					21-133 %	116	% Q
<i>Surrogate: Fluoranthene-d10</i>					36-134 %	114	%



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PRDI-9-SC-0-45
21F0419-32 (Solid)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM		Sampled: 06/24/2021 12:00
Instrument: NT11 Analyst: VTS		Analyzed: 07/15/2021 16:52
Sample Preparation:	Preparation Method: EPA 3546 (Microwave) Low Level Preparation Batch: BJG0176 Prepared: 07/08/2021	Extract ID: 21F0419-32 A 01 Dry Weight: 10.05 g % Solids: 82.03
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJG0139 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-32 A 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJG0138 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-32 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzo(a)anthracene	56-55-3	1	0.07	0.50	131	ug/kg	E
Chrysene	218-01-9	1	0.07	0.50	131	ug/kg	E
Benzo(b)fluoranthene	205-99-2	1	0.07	0.50	155	ug/kg	E
Benzo(k)fluoranthene	207-08-9	1	0.10	0.50	105	ug/kg	E
Benzo(a)pyrene	50-32-8	1	0.09	0.50	180	ug/kg	E
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.09	0.50	152	ug/kg	E
Dibenzo(a,h)anthracene	53-70-3	1	0.10	0.50	75.1	ug/kg	E
<i>Surrogate: 2-Methylnaphthalene-d10</i>					32-120 %	68.2 %	
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					21-133 %	141 %	*
<i>Surrogate: Fluoranthene-d10</i>					36-134 %	78.9 %	



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PRDI-9-SC-0-45
21F0419-32RE1 (Solid)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM Sampled: 06/24/2021 12:00
Instrument: NT11 Analyst: VTS Analyzed: 07/16/2021 09:41

Sample Preparation: Preparation Method: EPA 3546 (Microwave) Low Level Extract ID: 21F0419-32RE1 A 01
Preparation Batch: BJG0176 Sample Size: 12.25 g (wet)
Prepared: 07/08/2021 Final Volume: 0.5 mL Dry Weight: 10.05 g
% Solids: 82.03

Sample Cleanup: Cleanup Method: Silica Gel Extract ID: 21F0419-32RE1 A 01
Cleanup Batch: CJG0139 Initial Volume: 0.5 mL
Cleaned: 15-Jul-2021 Final Volume: 0.5 mL

Sample Cleanup: Cleanup Method: Sulfur Extract ID: 21F0419-32RE1 A 01
Cleanup Batch: CJG0138 Initial Volume: 0.5 mL
Cleaned: 15-Jul-2021 Final Volume: 0.5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzo(a)anthracene	56-55-3	10	0.72	4.98	362	ug/kg	D
Chrysene	218-01-9	10	0.70	4.98	333	ug/kg	D
Benzo(b)fluoranthene	205-99-2	10	0.66	4.98	304	ug/kg	D
Benzo(k)fluoranthene	207-08-9	10	1.01	4.98	212	ug/kg	D
Benzo(a)pyrene	50-32-8	10	0.87	4.98	375	ug/kg	D
Indeno(1,2,3-cd)pyrene	193-39-5	10	0.88	4.98	275	ug/kg	D
Dibenzo(a,h)anthracene	53-70-3	10	1.04	4.98	83.2	ug/kg	D
<i>Surrogate: 2-Methylnaphthalene-d10</i>					32-120 %	72.5 %	
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					21-133 %	124 %	Q
<i>Surrogate: Fluoranthene-d10</i>					36-134 %	112 %	



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PRDI-10-SC-0-15
21F0419-33 (Solid)

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5035 (Sodium Bisulfate)	Sampled: 06/24/2021 13:10
Instrument: NT5 Analyst: PB	Preparation Batch: BJF0832	Analyzed: 06/30/2021 14:21
Sample Preparation:	Sample Size: 6.96 g (wet)	Extract ID: 21F0419-33 D
	Final Volume: 5 mL	Dry Weight: 6.37 g
		% Solids: 91.48

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.13	0.79	0.53	ug/kg	J
Naphthalene	91-20-3	1	1.93	3.93	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-149 %	118	%	
<i>Surrogate: Toluene-d8</i>				77-120 %	101	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	101	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	103	%	



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PRDI-10-SC-0-15
21F0419-33 (Solid)

Volatile Organic Compounds

Method: NWTPHg Sampled: 06/24/2021 13:10
Instrument: NT3 Analyst: PKC Analyzed: 07/06/2021 17:57
Sample Preparation: Preparation Method: EPA 5035 (Methanol Extraction) Extract ID: 21F0419-33 F
Preparation Batch: BJG0122 Sample Size: 6.942 g (wet)
Prepared: 07/06/2021 Final Volume: 5 mL Dry Weight: 6.35 g
% Solids: 91.48

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	4400	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	102	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	93.5	%	



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PRDI-10-SC-0-15
21F0419-33 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Sampled: 06/24/2021 13:10	
Instrument: FID4 Analyst: CTO	Analyzed: 07/16/2021 03:00	
Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Extract ID: 21F0419-33 A 01
	Preparation Batch: BJG0137	Dry Weight: 9.22 g
	Prepared: 07/07/2021	% Solids: 91.48
	Sample Size: 10.08 g (wet)	
	Final Volume: 1 mL	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)		DRO	5.42	13.1	mg/kg	
HC ID: DIESEL						
Motor Oil Range Organics (C24-C38)		RRO	10.8	41.7	mg/kg	
HC ID: MOTOR OIL						
Surrogate: <i>o</i> -Terphenyl			50-150 %	94.8	%	



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PRDI-10-SC-0-15
21F0419-33 (Solid)

Wet Chemistry

Method: EPA 9014		Sampled: 06/24/2021 13:10
Instrument: UV1800-2 Analyst: CKI		Analyzed: 07/02/2021 13:10
Sample Preparation:	Preparation Method: EPA 9010C m	Extract ID: 21F0419-33 B
	Preparation Batch: BJG0011	Dry Weight: 2.30 g
	Prepared: 07/01/2021	Final Volume: 52.553 mL
		% Solids: 90.27

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.113	0.113	ND	mg/kg	U



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PRDI-10-SC-0-15
21F0419-33 (Solid)

Wet Chemistry

Method: EPA 9060A m	Instrument: TOC Cube Analyst: BF	Sampled: 06/24/2021 13:10	Analyzed: 07/15/2021 14:07
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Sample Size: 0.352 g (wet)	Extract ID: 21F0419-33 B
	Preparation Batch: BJG0118	Final Volume: 0.352 mL	Dry Weight: 0.32 g
	Prepared: 07/06/2021		% Solids: 90.27

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	0.37	%	



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PRDI-10-SC-0-15
21F0419-33 (Solid)

Wet Chemistry

Method: SM 2540 G-97			Sampled: 06/24/2021 13:10
Instrument: BAL2 Analyst: DOE			Analyzed: 06/30/2021 11:02
Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 21F0419-33
	Preparation Batch: BJF0823	Final Volume: 5 g	Dry Weight: 4.51 g
	Prepared: 06/30/2021		% Solids: 90.27

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	90.27	%	



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PRDI-10-SC-15-60
21F0419-34 (Solid)

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/24/2021 13:20
Instrument: NT5 Analyst: PB Analyzed: 06/30/2021 14:46
Sample Preparation: Preparation Method: EPA 5035 (Sodium Bisulfate) Extract ID: 21F0419-34 E
Preparation Batch: BJF0832 Sample Size: 12.41 g (wet)
Prepared: 06/30/2021 Final Volume: 5 mL Dry Weight: 9.31 g
% Solids: 74.98

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.09	0.54	ND	ug/kg	U
Naphthalene	91-20-3	1	1.32	2.69	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-149 %	124	%
<i>Surrogate: Toluene-d8</i>					77-120 %	103	%
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	103	%
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	103	%



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PRDI-10-SC-15-60
21F0419-34 (Solid)

Volatile Organic Compounds

Method: NWTPHg		Sampled: 06/24/2021 13:20
Instrument: NT3 Analyst: PKC		Analyzed: 07/06/2021 18:22
Sample Preparation:	Preparation Method: EPA 5035 (Methanol Extraction)	Extract ID: 21F0419-34 G
	Preparation Batch: BJG0122	Dry Weight: 10.34 g
	Sample Size: 13.784 g (wet)	% Solids: 74.98
	Prepared: 07/06/2021	Final Volume: 5 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	4090	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	101	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	88.1	%	



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PRDI-10-SC-15-60
21F0419-34 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Instrument: FID4 Analyst: CTO	Sampled: 06/24/2021 13:20 Analyzed: 07/16/2021 03:20
Sample Preparation:	Preparation Method: EPA 3546 (Microwave) Preparation Batch: BJG0137 Prepared: 07/07/2021	Sample Size: 10.08 g (wet) Final Volume: 1 mL Extract ID: 21F0419-34 B 01 Dry Weight: 7.56 g % Solids: 74.98

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24) HC ID: DIESEL		DRO 1	6.62	41.2	mg/kg	
Motor Oil Range Organics (C24-C38) HC ID: MOTOR OIL		RRO 1	13.2	71.1	mg/kg	
Surrogate: <i>o</i> -Terphenyl			50-150 %	82.0	%	



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PRDI-10-SC-15-60
21F0419-34 (Solid)

Wet Chemistry

Method: EPA 9014		Sampled: 06/24/2021 13:20
Instrument: UV1800-2 Analyst: CKI		Analyzed: 07/02/2021 13:11
Sample Preparation:	Preparation Method: EPA 9010C m	Extract ID: 21F0419-34 C
	Preparation Batch: BJG0011	Dry Weight: 1.91 g
	Prepared: 07/01/2021	% Solids: 74.97
	Sample Size: 2.547 g (wet)	
	Final Volume: 52.547 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.136	0.136	ND	mg/kg	U



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PRDI-10-SC-15-60
21F0419-34 (Solid)

Wet Chemistry

Method: EPA 9060A m	Sampled: 06/24/2021 13:20	
Instrument: TOC Cube Analyst: BF	Analyzed: 07/15/2021 17:17	
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Extract ID: 21F0419-34 C
	Preparation Batch: BJG0118	Dry Weight: 0.44 g
	Prepared: 07/06/2021	% Solids: 74.97
	Sample Size: 0.5901 g (wet)	
	Final Volume: 0.5901 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	1.42	%	



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PRDI-10-SC-15-60
21F0419-34 (Solid)

Wet Chemistry

Method: SM 2540 G-97 Sampled: 06/24/2021 13:20
Instrument: BAL2 Analyst: DOE Analyzed: 06/30/2021 11:02

Sample Preparation: Preparation Method: No Prep Wet Chem Extract ID: 21F0419-34
Preparation Batch: BJF0823 Dry Weight: 3.75 g
Prepared: 06/30/2021 Final Volume: 5 g % Solids: 74.97

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	74.97	%	



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PRDI-10-SS-0-12
21F0419-35 (Solid)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM	Sampled: 06/24/2021 13:30
Instrument: NT11 Analyst: VTS	Analyzed: 07/15/2021 17:22
Sample Preparation: Preparation Method: EPA 3546 (Microwave) Low Level	Extract ID: 21F0419-35 A 01
Preparation Batch: BJG0176	Sample Size: 11 g (wet)
Prepared: 07/08/2021	Final Volume: 0.5 mL
	Dry Weight: 10.08 g
	% Solids: 91.60
Sample Cleanup: Cleanup Method: Silica Gel	Extract ID: 21F0419-35 A 01
Cleanup Batch: CJG0139	Initial Volume: 0.5 mL
Cleaned: 15-Jul-2021	Final Volume: 0.5 mL
Sample Cleanup: Cleanup Method: Sulfur	Extract ID: 21F0419-35 A 01
Cleanup Batch: CJG0138	Initial Volume: 0.5 mL
Cleaned: 15-Jul-2021	Final Volume: 0.5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzo(a)anthracene	56-55-3	1	0.07	0.50	13.0	ug/kg	
Chrysene	218-01-9	1	0.07	0.50	12.9	ug/kg	
Benzo(b)fluoranthene	205-99-2	1	0.07	0.50	10.0	ug/kg	
Benzo(k)fluoranthene	207-08-9	1	0.10	0.50	6.01	ug/kg	
Benzo(a)pyrene	50-32-8	1	0.09	0.50	14.9	ug/kg	
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.09	0.50	9.84	ug/kg	
Dibenzo(a,h)anthracene	53-70-3	1	0.10	0.50	2.87	ug/kg	
Surrogate: 2-Methylnaphthalene-d10				32-120 %	62.4	%	
Surrogate: Dibenzo[a,h]anthracene-d14				21-133 %	123	%	
Surrogate: Fluoranthene-d10				36-134 %	99.2	%	



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PRDI-10-SS-0-12
21F0419-35RE1 (Solid)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM		Sampled: 06/24/2021 13:30
Instrument: NT11 Analyst: VTS		Analyzed: 07/16/2021 10:18
Sample Preparation:	Preparation Method: EPA 3546 (Microwave) Low Level Preparation Batch: BJG0176 Prepared: 07/08/2021	Extract ID: 21F0419-35RE1 A 01 Dry Weight: 10.08 g % Solids: 91.60
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJG0139 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-35RE1 A 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJG0138 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-35RE1 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzo(a)anthracene	56-55-3	2	0.14	0.99	13.1	ug/kg	D
Chrysene	218-01-9	2	0.14	0.99	13.0	ug/kg	D
Benzo(b)fluoranthene	205-99-2	2	0.13	0.99	9.45	ug/kg	D
Benzo(k)fluoranthene	207-08-9	2	0.20	0.99	6.37	ug/kg	D
Benzo(a)pyrene	50-32-8	2	0.17	0.99	14.7	ug/kg	D
Indeno(1,2,3-cd)pyrene	193-39-5	2	0.17	0.99	8.52	ug/kg	D
Dibenzo(a,h)anthracene	53-70-3	2	0.21	0.99	2.42	ug/kg	D
<i>Surrogate: 2-Methylnaphthalene-d10</i>					32-120 %	62.5 %	
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					21-133 %	108 %	Q
<i>Surrogate: Fluoranthene-d10</i>					36-134 %	102 %	



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PRDI-10-SC-0-45
21F0419-36 (Solid)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM		Sampled: 06/24/2021 13:40
Instrument: NT11 Analyst: VTS		Analyzed: 07/15/2021 17:53
Sample Preparation:	Preparation Method: EPA 3546 (Microwave) Low Level Preparation Batch: BJG0176 Prepared: 07/08/2021	Extract ID: 21F0419-36 A 01 Dry Weight: 10.38 g % Solids: 79.76
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJG0139 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-36 A 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJG0138 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-36 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzo(a)anthracene	56-55-3	1	0.07	0.48	72.8	ug/kg	E
Chrysene	218-01-9	1	0.07	0.48	82.7	ug/kg	E
Benzo(b)fluoranthene	205-99-2	1	0.06	0.48	64.6	ug/kg	E
Benzo(k)fluoranthene	207-08-9	1	0.10	0.48	35.8	ug/kg	
Benzo(a)pyrene	50-32-8	1	0.08	0.48	82.9	ug/kg	E
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.08	0.48	60.0	ug/kg	E
Dibenzo(a,h)anthracene	53-70-3	1	0.10	0.48	23.1	ug/kg	
<i>Surrogate: 2-Methylnaphthalene-d10</i>					32-120 %	65.1 %	
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					21-133 %	115 %	
<i>Surrogate: Fluoranthene-d10</i>					36-134 %	97.6 %	



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PRDI-10-SC-0-45
21F0419-36RE1 (Solid)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM Sampled: 06/24/2021 13:40
Instrument: NT11 Analyst: VTS Analyzed: 07/16/2021 10:48

Sample Preparation: Preparation Method: EPA 3546 (Microwave) Low Level Extract ID: 21F0419-36RE1 A 01
Preparation Batch: BJG0176 Sample Size: 13.01 g (wet)
Prepared: 07/08/2021 Final Volume: 0.5 mL Dry Weight: 10.38 g
% Solids: 79.76

Sample Cleanup: Cleanup Method: Silica Gel Extract ID: 21F0419-36RE1 A 01
Cleanup Batch: CJG0139 Initial Volume: 0.5 mL
Cleaned: 15-Jul-2021 Final Volume: 0.5 mL

Sample Cleanup: Cleanup Method: Sulfur Extract ID: 21F0419-36RE1 A 01
Cleanup Batch: CJG0138 Initial Volume: 0.5 mL
Cleaned: 15-Jul-2021 Final Volume: 0.5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzo(a)anthracene	56-55-3	5	0.35	2.41	102	ug/kg	D
Chrysene	218-01-9	5	0.34	2.41	120	ug/kg	D
Benzo(b)fluoranthene	205-99-2	5	0.32	2.41	78.4	ug/kg	D
Benzo(k)fluoranthene	207-08-9	5	0.49	2.41	44.6	ug/kg	D
Benzo(a)pyrene	50-32-8	5	0.42	2.41	109	ug/kg	D
Indeno(1,2,3-cd)pyrene	193-39-5	5	0.42	2.41	67.6	ug/kg	D
Dibenzo(a,h)anthracene	53-70-3	5	0.51	2.41	22.2	ug/kg	D
<i>Surrogate: 2-Methylnaphthalene-d10</i>					<i>32-120 %</i>	<i>64.1 %</i>	
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					<i>21-133 %</i>	<i>107 %</i>	Q
<i>Surrogate: Fluoranthene-d10</i>					<i>36-134 %</i>	<i>106 %</i>	



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PRDI-11-SC-0-15
21F0419-37 (Solid)

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5035 (Sodium Bisulfate)	Sampled: 06/25/2021 11:20
Instrument: NT5 Analyst: PB	Preparation Batch: BJF0832	Analyzed: 06/30/2021 15:12
Sample Preparation:	Sample Size: 5.46 g (wet)	Extract ID: 21F0419-37 D
	Final Volume: 5 mL	Dry Weight: 2.75 g
		% Solids: 50.32

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.30	1.82	7.09	ug/kg	
Naphthalene	91-20-3	1	4.48	9.10	ND	ug/kg	U
Surrogate: 1,2-Dichloroethane-d4				80-149 %	23.4	%	*
Surrogate: Toluene-d8				77-120 %	81.8	%	
Surrogate: 4-Bromofluorobenzene				80-120 %	60.6	%	*
Surrogate: 1,2-Dichlorobenzene-d4				80-120 %	90.3	%	



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PRDI-11-SC-0-15
21F0419-37 (Solid)

Volatile Organic Compounds

Method: NWTPHg	Sampled: 06/25/2021 11:20
Instrument: NT3 Analyst: PKC	Analyzed: 07/06/2021 18:48
Sample Preparation:	Preparation Method: EPA 5035 (Methanol Extraction)
	Preparation Batch: BJG0122
	Sample Size: 6.278 g (wet)
	Final Volume: 5 mL
	Extract ID: 21F0419-37 F
	Dry Weight: 3.16 g
	% Solids: 50.32

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	12900	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	102	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	92.0	%	



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PRDI-11-SC-0-15
21F0419-37 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Sampled: 06/25/2021 11:20	
Instrument: FID4 Analyst: CTO	Analyzed: 07/16/2021 04:21	
Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Extract ID: 21F0419-37 A 01
	Preparation Batch: BJG0137	Dry Weight: 5.05 g
	Prepared: 07/07/2021	% Solids: 50.32
	Sample Size: 10.04 g (wet)	
	Final Volume: 1 mL	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)		DRO 1	9.90	87.6	mg/kg	
HC ID: DRO						
Motor Oil Range Organics (C24-C38)		RRO 1	19.8	189	mg/kg	
HC ID: MOTOR OIL						
Surrogate: <i>o</i> -Terphenyl			50-150 %	89.3	%	



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PRDI-11-SC-0-15
21F0419-37 (Solid)

Wet Chemistry

Method: EPA 9014		Sampled: 06/25/2021 11:20
Instrument: UV1800-1 Analyst: CKI		Analyzed: 07/06/2021 12:10
Sample Preparation:	Preparation Method: EPA 9010C m	Extract ID: 21F0419-37 B
	Preparation Batch: BJG0059	Dry Weight: 1.34 g
	Prepared: 07/06/2021	Final Volume: 52.583 mL
		% Solids: 51.83

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.194	0.194	ND	mg/kg	U



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PRDI-11-SC-0-15
21F0419-37 (Solid)

Wet Chemistry

Method: EPA 9060A m		Sampled: 06/25/2021 11:20
Instrument: TOC Cube Analyst: BF		Analyzed: 07/15/2021 17:48
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Extract ID: 21F0419-37 B
	Preparation Batch: BJG0118	Dry Weight: 0.08 g
	Prepared: 07/06/2021	% Solids: 51.83
	Sample Size: 0.1459 g (wet)	
	Final Volume: 0.1459 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	12.1	%	



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PRDI-11-SC-0-15
21F0419-37 (Solid)

Wet Chemistry

Method: SM 2540 G-97 Sampled: 06/25/2021 11:20
Instrument: BAL2 Analyst: DOE Analyzed: 06/30/2021 11:02

Sample Preparation: Preparation Method: No Prep Wet Chem Extract ID: 21F0419-37
Preparation Batch: BJF0823 Dry Weight: 2.59 g
Prepared: 06/30/2021 Final Volume: 5 g % Solids: 51.83

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	51.83	%	



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Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

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PRDI-11-SC-0-15
21F0419-37RE1 (Solid)

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/25/2021 11:20
Instrument: NT5 Analyst: PB Analyzed: 07/06/2021 16:13
Sample Preparation: Preparation Method: No Prep - Volatiles Extract ID: 21F0419-37RE1 D
Preparation Batch: BJG0132 Dry Weight: 2.80 g
Prepared: 07/06/2021 Final Volume: 5 g % Solids: 50.32
TS jar

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.29	1.79	ND	ug/kg	U
Naphthalene	91-20-3	1	4.40	8.94	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-149 %	105	%	
<i>Surrogate: Toluene-d8</i>				77-120 %	101	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	84.6	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	99.3	%	



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PRDI-11-SC-15-60
21F0419-38 (Solid)

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5035 (Sodium Bisulfate)	Sampled: 06/25/2021 11:30
Instrument: NT5 Analyst: PB	Preparation Batch: BJF0832	Analyzed: 06/30/2021 15:39
Sample Preparation:	Sample Size: 6.14 g (wet)	Extract ID: 21F0419-38 E
	Final Volume: 5 mL	Dry Weight: 1.79 g
		% Solids: 29.23

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.46	2.79	3.16	ug/kg	
Naphthalene	91-20-3	1	6.86	13.9	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				80-149 %	94.9	%	
<i>Surrogate: Toluene-d8</i>				77-120 %	98.6	%	
<i>Surrogate: 4-Bromofluorobenzene</i>				80-120 %	86.4	%	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				80-120 %	99.5	%	



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PRDI-11-SC-15-60
21F0419-38 (Solid)

Volatile Organic Compounds

Method: NWTPHg	Preparation Method: EPA 5035 (Methanol Extraction)	Sampled: 06/25/2021 11:30
Instrument: NT3 Analyst: PKC	Preparation Batch: BJG0122	Analyzed: 07/06/2021 19:13
Sample Preparation:	Sample Size: 4.618 g (wet)	Extract ID: 21F0419-38 G
	Final Volume: 5 mL	Dry Weight: 1.35 g
		% Solids: 29.23

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	30600	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	102	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	87.3	%	



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PRDI-11-SC-15-60
21F0419-38 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Sampled: 06/25/2021 11:30	
Instrument: FID4 Analyst: CTO	Analyzed: 07/16/2021 04:42	
Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Extract ID: 21F0419-38 B 01
	Preparation Batch: BJG0137	Dry Weight: 2.93 g
	Prepared: 07/07/2021	% Solids: 29.23
	Sample Size: 10.04 g (wet)	
	Final Volume: 1 mL	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)		DRO 1	17.0	213	mg/kg	
HC ID: DRO						
Motor Oil Range Organics (C24-C38)		RRO 1	34.1	433	mg/kg	
HC ID: MOTOR OIL						
Surrogate: o-Terphenyl			50-150 %	90.9	%	



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PRDI-11-SC-15-60
21F0419-38 (Solid)

Wet Chemistry

Method: EPA 9014	Instrument: UV1800-1 Analyst: CKI		Sampled: 06/25/2021 11:30
Sample Preparation:	Preparation Method: EPA 9010C m	Sample Size: 2.552 g (wet)	Extract ID: 21F0419-38 C
	Preparation Batch: BJG0059	Final Volume: 52.552 mL	Dry Weight: 0.58 g
	Prepared: 07/06/2021		% Solids: 22.86

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.446	0.446	ND	mg/kg	U



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PRDI-11-SC-15-60
21F0419-38 (Solid)

Wet Chemistry

Method: EPA 9060A m		Sampled: 06/25/2021 11:30
Instrument: TOC Cube Analyst: BF		Analyzed: 07/15/2021 18:20
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Extract ID: 21F0419-38 C
	Preparation Batch: BJG0118	Dry Weight: 0.03 g
	Prepared: 07/06/2021	% Solids: 22.86
	Sample Size: 0.1435 g (wet)	
	Final Volume: 0.1435 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	29.1	%	



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PRDI-11-SC-15-60
21F0419-38 (Solid)

Wet Chemistry

Method: SM 2540 G-97			Sampled: 06/25/2021 11:30
Instrument: BAL2 Analyst: DOE			Analyzed: 06/30/2021 11:02
Sample Preparation:	Preparation Method: No Prep Wet Chem	Sample Size: 5 g (wet)	Extract ID: 21F0419-38
	Preparation Batch: BJF0823	Final Volume: 5 g	Dry Weight: 1.14 g
	Prepared: 06/30/2021		% Solids: 22.86

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	22.86	%	



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PRDI-11-SS-0-12
21F0419-39 (Solid)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM	Sampled: 06/25/2021 11:40
Instrument: NT11 Analyst: VTS	Analyzed: 07/15/2021 18:23
Sample Preparation: Preparation Method: EPA 3546 (Microwave) Low Level	Extract ID: 21F0419-39 A 01
Preparation Batch: BJG0176	Sample Size: 21.02 g (wet)
Prepared: 07/08/2021	Final Volume: 0.5 mL
	Dry Weight: 10.01 g
	% Solids: 47.61
Sample Cleanup: Cleanup Method: Silica Gel	Extract ID: 21F0419-39 A 01
Cleanup Batch: CJG0139	Initial Volume: 0.5 mL
Cleaned: 15-Jul-2021	Final Volume: 0.5 mL
Sample Cleanup: Cleanup Method: Sulfur	Extract ID: 21F0419-39 A 01
Cleanup Batch: CJG0138	Initial Volume: 0.5 mL
Cleaned: 15-Jul-2021	Final Volume: 0.5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzo(a)anthracene	56-55-3	1	0.07	0.50	89.4	ug/kg	E
Chrysene	218-01-9	1	0.07	0.50	89.1	ug/kg	E
Benzo(b)fluoranthene	205-99-2	1	0.07	0.50	88.7	ug/kg	E
Benzo(k)fluoranthene	207-08-9	1	0.10	0.50	61.0	ug/kg	E
Benzo(a)pyrene	50-32-8	1	0.09	0.50	131	ug/kg	E
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.09	0.50	94.3	ug/kg	E
Dibenzo(a,h)anthracene	53-70-3	1	0.10	0.50	34.0	ug/kg	
<i>Surrogate: 2-Methylnaphthalene-d10</i>					32-120 %	65.5	%
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					21-133 %	133	%
<i>Surrogate: Fluoranthene-d10</i>					36-134 %	93.6	%



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PRDI-11-SS-0-12
21F0419-39RE1 (Solid)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM		Sampled: 06/25/2021 11:40
Instrument: NT11 Analyst: VTS		Analyzed: 07/16/2021 11:18
Sample Preparation:	Preparation Method: EPA 3546 (Microwave) Low Level Preparation Batch: BJG0176 Prepared: 07/08/2021	Extract ID: 21F0419-39RE1 A 01 Dry Weight: 10.01 g % Solids: 47.61
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJG0139 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-39RE1 A 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJG0138 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-39RE1 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzo(a)anthracene	56-55-3	5	0.36	2.50	129	ug/kg	D
Chrysene	218-01-9	5	0.35	2.50	124	ug/kg	D
Benzo(b)fluoranthene	205-99-2	5	0.33	2.50	101	ug/kg	D
Benzo(k)fluoranthene	207-08-9	5	0.50	2.50	70.6	ug/kg	D
Benzo(a)pyrene	50-32-8	5	0.43	2.50	163	ug/kg	D
Indeno(1,2,3-cd)pyrene	193-39-5	5	0.44	2.50	102	ug/kg	D
Dibenzo(a,h)anthracene	53-70-3	5	0.52	2.50	29.5	ug/kg	D
<i>Surrogate: 2-Methylnaphthalene-d10</i>					32-120 %	65.3 %	
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					21-133 %	110 %	Q
<i>Surrogate: Fluoranthene-d10</i>					36-134 %	101 %	



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Project Manager: Brian Tracy

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PRDI-11-SC-0-45
21F0419-40 (Solid)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM		Sampled: 06/25/2021 11:50
Instrument: NT11 Analyst: VTS		Analyzed: 07/15/2021 18:53
Sample Preparation:	Preparation Method: EPA 3546 (Microwave) Low Level Preparation Batch: BJG0176 Prepared: 07/08/2021	Extract ID: 21F0419-40 A 01 Dry Weight: 10.02 g % Solids: 30.25
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJG0139 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-40 A 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJG0138 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-40 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzo(a)anthracene	56-55-3	1	0.07	0.50	102	ug/kg	E
Chrysene	218-01-9	1	0.07	0.50	103	ug/kg	E
Benzo(b)fluoranthene	205-99-2	1	0.07	0.50	113	ug/kg	E
Benzo(k)fluoranthene	207-08-9	1	0.10	0.50	70.0	ug/kg	E
Benzo(a)pyrene	50-32-8	1	0.09	0.50	151	ug/kg	E
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.09	0.50	123	ug/kg	E
Dibenzo(a,h)anthracene	53-70-3	1	0.10	0.50	47.1	ug/kg	
<i>Surrogate: 2-Methylnaphthalene-d10</i>					32-120 %	62.8	%
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					21-133 %	120	%
<i>Surrogate: Fluoranthene-d10</i>					36-134 %	81.9	%



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Reported:
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PRDI-11-SC-0-45
21F0419-40RE1 (Solid)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM Sampled: 06/25/2021 11:50
Instrument: NT11 Analyst: VTS Analyzed: 07/16/2021 11:48

Sample Preparation: Preparation Method: EPA 3546 (Microwave) Low Level Extract ID: 21F0419-40RE1 A 01
Preparation Batch: BJG0176 Sample Size: 33.11 g (wet)
Prepared: 07/08/2021 Final Volume: 0.5 mL Dry Weight: 10.02 g
% Solids: 30.25

Sample Cleanup: Cleanup Method: Silica Gel Extract ID: 21F0419-40RE1 A 01
Cleanup Batch: CJG0139 Initial Volume: 0.5 mL
Cleaned: 15-Jul-2021 Final Volume: 0.5 mL

Sample Cleanup: Cleanup Method: Sulfur Extract ID: 21F0419-40RE1 A 01
Cleanup Batch: CJG0138 Initial Volume: 0.5 mL
Cleaned: 15-Jul-2021 Final Volume: 0.5 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzo(a)anthracene	56-55-3	10	0.72	4.99	187	ug/kg	D
Chrysene	218-01-9	10	0.70	4.99	181	ug/kg	D
Benzo(b)fluoranthene	205-99-2	10	0.66	4.99	155	ug/kg	D
Benzo(k)fluoranthene	207-08-9	10	1.01	4.99	104	ug/kg	D
Benzo(a)pyrene	50-32-8	10	0.87	4.99	241	ug/kg	D
Indeno(1,2,3-cd)pyrene	193-39-5	10	0.88	4.99	168	ug/kg	D
Dibenzo(a,h)anthracene	53-70-3	10	1.05	4.99	45.1	ug/kg	D
<i>Surrogate: 2-Methylnaphthalene-d10</i>					32-120 %	66.1 %	
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					21-133 %	103 %	Q
<i>Surrogate: Fluoranthene-d10</i>					36-134 %	98.4 %	



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PRDI-12-SC-0-15
21F0419-41 (Solid)

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/25/2021 10:20
Instrument: NT5 Analyst: PB Analyzed: 06/30/2021 16:04
Sample Preparation: Preparation Method: EPA 5035 (Sodium Bisulfate) Extract ID: 21F0419-41 D
Preparation Batch: BJF0832 Sample Size: 7.12 g (wet)
Prepared: 06/30/2021 Final Volume: 5 mL Dry Weight: 5.68 g
% Solids: 79.81

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.15	0.88	0.40	ug/kg	J
Naphthalene	91-20-3	1	2.17	4.40	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-149 %	115	%
<i>Surrogate: Toluene-d8</i>					77-120 %	101	%
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	99.4	%
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	103	%



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PRDI-12-SC-0-15
21F0419-41 (Solid)

Volatile Organic Compounds

Method: NWTPHg	Sampled: 06/25/2021 10:20
Instrument: NT3 Analyst: PKC	Analyzed: 07/06/2021 19:38
Sample Preparation:	Preparation Method: EPA 5035 (Methanol Extraction)
	Preparation Batch: BJG0122
	Sample Size: 8.916 g (wet)
	Final Volume: 5 mL
	Extract ID: 21F0419-41 F
	Dry Weight: 7.12 g
	% Solids: 79.81

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	4780	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	102	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	94.5	%	



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PRDI-12-SC-0-15
21F0419-41 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Instrument: FID4 Analyst: CTO	Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Preparation Batch: BJG0137	Prepared: 07/07/2021	Sample Size: 10.06 g (wet)	Final Volume: 1 mL	Reporting Limit	Result	Units	Notes
								6.23	11.4	mg/kg	
								12.5	43.7	mg/kg	
								50-150 %	86.0	%	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24) HC ID: DIESEL	DRO	1	6.23	11.4	mg/kg	
Motor Oil Range Organics (C24-C38) HC ID: MOTOR OIL	RRO	1	12.5	43.7	mg/kg	
Surrogate: o-Terphenyl			50-150 %	86.0	%	



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PRDI-12-SC-0-15
21F0419-41 (Solid)

Wet Chemistry

Method: EPA 9014			Sampled: 06/25/2021 10:20
Instrument: UV1800-1 Analyst: CKI			Analyzed: 07/06/2021 12:13
Sample Preparation:	Preparation Method: EPA 9010C m	Sample Size: 2.532 g (wet)	Extract ID: 21F0419-41 B
	Preparation Batch: BJG0059	Final Volume: 52.532 mL	Dry Weight: 1.82 g
	Prepared: 07/06/2021		% Solids: 71.71

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.143	0.143	ND	mg/kg	U



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PRDI-12-SC-0-15
21F0419-41 (Solid)

Wet Chemistry

Method: EPA 9060A m			Sampled: 06/25/2021 10:20
Instrument: TOC Cube Analyst: BF			Analyzed: 07/15/2021 18:51
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Sample Size: 0.5329 g (wet)	Extract ID: 21F0419-41 B
	Preparation Batch: BJG0118	Final Volume: 0.5329 mL	Dry Weight: 0.38 g
	Prepared: 07/06/2021		% Solids: 71.71

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	0.91	%	



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PRDI-12-SC-0-15
21F0419-41 (Solid)

Wet Chemistry

Method: SM 2540 G-97 Sampled: 06/25/2021 10:20
Instrument: BAL2 Analyst: DOE Analyzed: 06/30/2021 11:02

Sample Preparation: Preparation Method: No Prep Wet Chem Extract ID: 21F0419-41
Preparation Batch: BJF0823 Dry Weight: 3.59 g
Prepared: 06/30/2021 Final Volume: 5 g % Solids: 71.71

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	71.71	%	



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PRDI-12-SC-15-60
21F0419-42 (Solid)

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/25/2021 10:30
Instrument: NT5 Analyst: PB Analyzed: 06/30/2021 16:30
Sample Preparation: Preparation Method: EPA 5035 (Sodium Bisulfate) Extract ID: 21F0419-42 E
Preparation Batch: BJF0832 Sample Size: 2.91 g (wet)
Prepared: 06/30/2021 Final Volume: 5 mL Dry Weight: 1.60 g
% Solids: 55.02

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.52	3.12	ND	ug/kg	U
Naphthalene	91-20-3	1	7.69	15.6	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-149 %	117	%
<i>Surrogate: Toluene-d8</i>					77-120 %	102	%
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	93.5	%
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	99.2	%



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PRDI-12-SC-15-60
21F0419-42 (Solid)

Volatile Organic Compounds

Method: NWTPHg	Preparation Method: EPA 5035 (Methanol Extraction)	Sampled: 06/25/2021 10:30
Instrument: NT3 Analyst: PKC	Preparation Batch: BJG0122	Analyzed: 07/06/2021 20:03
Sample Preparation:	Sample Size: 7.36 g (wet)	Extract ID: 21F0419-42 G
	Final Volume: 5 mL	Dry Weight: 4.05 g
		% Solids: 55.02

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	10300	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	99.8	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	89.1	%	



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PRDI-12-SC-15-60
21F0419-42 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx Sampled: 06/25/2021 10:30
Instrument: FID4 Analyst: CTO Analyzed: 07/16/2021 05:22
Sample Preparation: Preparation Method: EPA 3546 (Microwave) Extract ID: 21F0419-42 B 01
Preparation Batch: BJG0137 Sample Size: 10.04 g (wet) Dry Weight: 5.52 g
Prepared: 07/07/2021 Final Volume: 1 mL % Solids: 55.02

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24) HC ID: DRO		DRO 1	9.05	69.3	mg/kg	
Motor Oil Range Organics (C24-C38) HC ID: MOTOR OIL		RRO 1	18.1	160	mg/kg	
<i>Surrogate: o-Terphenyl</i>			50-150 %	75.7	%	



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PRDI-12-SC-15-60
21F0419-42 (Solid)

Wet Chemistry

Method: EPA 9014		Sampled: 06/25/2021 10:30
Instrument: UV1800-1 Analyst: CKI		Analyzed: 07/06/2021 12:14
Sample Preparation:	Preparation Method: EPA 9010C m	Extract ID: 21F0419-42 C
	Preparation Batch: BJG0059	Dry Weight: 1.35 g
	Prepared: 07/06/2021	% Solids: 53.42
	Sample Size: 2.535 g (wet)	
	Final Volume: 52.535 mL	

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.192	0.192	ND	mg/kg	U



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PRDI-12-SC-15-60
21F0419-42 (Solid)

Wet Chemistry

Method: EPA 9060A m	Sampled: 06/25/2021 10:30
Instrument: TOC Cube Analyst: BF	Analyzed: 07/15/2021 19:22
Sample Preparation:	Preparation Method: PSEP 1986 (modified)
	Preparation Batch: BJG0118
	Prepared: 07/06/2021
	Sample Size: 0.2919 g (wet)
	Final Volume: 0.2919 mL
	Extract ID: 21F0419-42 C
	Dry Weight: 0.16 g
	% Solids: 53.42

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	8.53	%	



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PRDI-12-SC-15-60
21F0419-42 (Solid)

Wet Chemistry

Method: SM 2540 G-97 Sampled: 06/25/2021 10:30
Instrument: BAL2 Analyst: DOE Analyzed: 06/30/2021 11:02

Sample Preparation: Preparation Method: No Prep Wet Chem Extract ID: 21F0419-42
Preparation Batch: BJF0823 Dry Weight: 2.67 g
Prepared: 06/30/2021 Final Volume: 5 g % Solids: 53.42

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	53.42	%	



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PRDI-12-SS-0-12
21F0419-43 (Solid)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM		Sampled: 06/25/2021 10:40
Instrument: NT11 Analyst: VTS		Analyzed: 07/15/2021 19:23
Sample Preparation:	Preparation Method: EPA 3546 (Microwave) Low Level Preparation Batch: BJG0176 Prepared: 07/08/2021	Extract ID: 21F0419-43 A 01 Dry Weight: 10.04 g % Solids: 76.32
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJG0139 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-43 A 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJG0138 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-43 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzo(a)anthracene	56-55-3	1	0.07	0.50	15.2	ug/kg	
Chrysene	218-01-9	1	0.07	0.50	16.3	ug/kg	
Benzo(b)fluoranthene	205-99-2	1	0.07	0.50	18.6	ug/kg	
Benzo(k)fluoranthene	207-08-9	1	0.10	0.50	8.84	ug/kg	
Benzo(a)pyrene	50-32-8	1	0.09	0.50	19.3	ug/kg	
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.09	0.50	15.4	ug/kg	
Dibenzo(a,h)anthracene	53-70-3	1	0.10	0.50	4.85	ug/kg	
<i>Surrogate: 2-Methylnaphthalene-d10</i>					32-120 %	63.3	%
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					21-133 %	121	%
<i>Surrogate: Fluoranthene-d10</i>					36-134 %	101	%



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PRDI-12-SC-0-45
21F0419-44 (Solid)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM		Sampled: 06/25/2021 10:50
Instrument: NT11 Analyst: VTS		Analyzed: 07/15/2021 19:53
Sample Preparation:	Preparation Method: EPA 3546 (Microwave) Low Level Preparation Batch: BJG0176 Prepared: 07/08/2021	Extract ID: 21F0419-44 A 01 Dry Weight: 10.01 g % Solids: 49.37
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJG0139 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-44 A 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJG0138 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-44 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzo(a)anthracene	56-55-3	1	0.07	0.50	65.9	ug/kg	E
Chrysene	218-01-9	1	0.07	0.50	67.9	ug/kg	E
Benzo(b)fluoranthene	205-99-2	1	0.07	0.50	71.1	ug/kg	E
Benzo(k)fluoranthene	207-08-9	1	0.10	0.50	44.6	ug/kg	
Benzo(a)pyrene	50-32-8	1	0.09	0.50	87.6	ug/kg	E
Indeno(1,2,3-cd)pyrene	193-39-5	1	0.09	0.50	64.5	ug/kg	E
Dibenzo(a,h)anthracene	53-70-3	1	0.10	0.50	24.6	ug/kg	
<i>Surrogate: 2-Methylnaphthalene-d10</i>					32-120 %	57.3	%
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					21-133 %	103	%
<i>Surrogate: Fluoranthene-d10</i>					36-134 %	87.5	%



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PRDI-12-SC-0-45
21F0419-44RE1 (Solid)

Semivolatile Organic Compounds - SIM

Method: EPA 8270E-SIM		Sampled: 06/25/2021 10:50
Instrument: NT11 Analyst: VTS		Analyzed: 07/16/2021 12:18
Sample Preparation:	Preparation Method: EPA 3546 (Microwave) Low Level Preparation Batch: BJG0176 Prepared: 07/08/2021	Extract ID: 21F0419-44RE1 A 01 Dry Weight: 10.01 g % Solids: 49.37
Sample Cleanup:	Cleanup Method: Silica Gel Cleanup Batch: CJG0139 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-44RE1 A 01
Sample Cleanup:	Cleanup Method: Sulfur Cleanup Batch: CJG0138 Cleaned: 15-Jul-2021	Initial Volume: 0.5 mL Final Volume: 0.5 mL Extract ID: 21F0419-44RE1 A 01

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzo(a)anthracene	56-55-3	5	0.36	2.50	95.7	ug/kg	D
Chrysene	218-01-9	5	0.35	2.50	96.4	ug/kg	D
Benzo(b)fluoranthene	205-99-2	5	0.33	2.50	94.6	ug/kg	D
Benzo(k)fluoranthene	207-08-9	5	0.50	2.50	63.6	ug/kg	D
Benzo(a)pyrene	50-32-8	5	0.43	2.50	122	ug/kg	D
Indeno(1,2,3-cd)pyrene	193-39-5	5	0.44	2.50	79.2	ug/kg	D
Dibenzo(a,h)anthracene	53-70-3	5	0.52	2.50	26.0	ug/kg	D
<i>Surrogate: 2-Methylnaphthalene-d10</i>					32-120 %	61.0 %	
<i>Surrogate: Dibenzo[a,h]anthracene-d14</i>					21-133 %	104 %	Q
<i>Surrogate: Fluoranthene-d10</i>					36-134 %	95.7 %	



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Dup-2-SC
21F0419-45 (Solid)

Volatile Organic Compounds

Method: EPA 8260D	Preparation Method: EPA 5035 (Sodium Bisulfate)	Sampled: 06/23/2021 11:05
Instrument: NT5 Analyst: PB	Preparation Batch: BJF0832	Analyzed: 06/30/2021 16:55
Sample Preparation:	Sample Size: 5.64 g (wet)	Extract ID: 21F0419-45 D
	Final Volume: 5 mL	Dry Weight: 3.91 g
		% Solids: 69.41

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.21	1.28	0.63	ug/kg	J
Naphthalene	91-20-3	1	3.15	6.39	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>					80-149 %	121 %	
<i>Surrogate: Toluene-d8</i>					77-120 %	102 %	
<i>Surrogate: 4-Bromofluorobenzene</i>					80-120 %	101 %	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>					80-120 %	103 %	



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Dup-2-SC
21F0419-45 (Solid)

Volatile Organic Compounds

Method: NWTPHg	Preparation Method: EPA 5035 (Methanol Extraction)	Sampled: 06/23/2021 11:05
Instrument: NT3 Analyst: PKC	Preparation Batch: BJJ0090	Analyzed: 07/03/2021 19:23
Sample Preparation:	Sample Size: 4.627 g (wet)	Extract ID: 21F0419-45 G
	Final Volume: 5 mL	Dry Weight: 3.21 g
		% Solids: 69.41

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	9990	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	100	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	87.0	%	



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Dup-2-SC
21F0419-45 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx			Sampled: 06/23/2021 11:05
Instrument: FID4 Analyst: CTO			Analyzed: 07/16/2021 05:42
Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Sample Size: 10.11 g (wet)	Extract ID: 21F0419-45 A 01
	Preparation Batch: BJG0137	Final Volume: 1 mL	Dry Weight: 7.02 g
	Prepared: 07/07/2021		% Solids: 69.41

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)	DRO	5	35.6	87.2	mg/kg	D
HC ID: DRO						
Motor Oil Range Organics (C24-C38)	RRO	5	71.3	236	mg/kg	D
HC ID: MOTOR OIL						
Surrogate: <i>o</i> -Terphenyl			50-150 %	94.2	%	



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Dup-2-SC
21F0419-45 (Solid)

Wet Chemistry

Method: EPA 9014			Sampled: 06/23/2021 11:05
Instrument: UV1800-1 Analyst: CKI			Analyzed: 07/06/2021 12:16
Sample Preparation:	Preparation Method: EPA 9010C m	Sample Size: 2.664 g (wet)	Extract ID: 21F0419-45 B
	Preparation Batch: BJG0059	Final Volume: 52.664 mL	Dry Weight: 1.69 g
	Prepared: 07/06/2021		% Solids: 63.31

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Cyanide, Total after Distillation	57-12-5	1	0.155	0.155	ND	mg/kg	U



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Dup-2-SC
21F0419-45 (Solid)

Wet Chemistry

Method: SM 2540 G-97 Sampled: 06/23/2021 11:05
Instrument: BAL2 Analyst: DOE Analyzed: 06/30/2021 11:02

Sample Preparation: Preparation Method: No Prep Wet Chem Extract ID: 21F0419-45
Preparation Batch: BJF0823 Dry Weight: 3.17 g
Prepared: 06/30/2021 Final Volume: 5 g % Solids: 63.31

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Solids		1	0.04	0.04	63.31	%	



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Dup-2-SC
21F0419-45RE1 (Solid)

Wet Chemistry

Method: EPA 9060A m	Instrument: TOC Cube Analyst: BF	Sampled: 06/23/2021 11:05	Analyzed: 07/21/2021 17:09
Sample Preparation:	Preparation Method: PSEP 1986 (modified)	Sample Size: 0.2764 g (wet)	Extract ID: 21F0419-45RE1 B
	Preparation Batch: BJG0118	Final Volume: 0.2764 mL	Dry Weight: 0.17 g
	Prepared: 07/06/2021		% Solids: 63.31

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Total Organic Carbon		1	0.02	0.02	3.87	%	



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Dup-3-SC
21F0419-46 (Solid)

Volatile Organic Compounds

Method: EPA 8260D	Sampled: 06/24/2021 12:20
Instrument: NT5 Analyst: PB	Analyzed: 06/30/2021 17:21
Sample Preparation:	Preparation Method: EPA 5035 (Sodium Bisulfate)
	Preparation Batch: BJF0832
	Sample Size: 9.32 g (wet)
	Final Volume: 5 mL
	Extract ID: 21F0419-46 D
	Dry Weight: 8.03 g
	% Solids: 86.12

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.10	0.62	ND	ug/kg	U
Naphthalene	91-20-3	1	1.53	3.11	ND	ug/kg	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-149 %</i>	<i>119</i>	<i>%</i>	
<i>Surrogate: Toluene-d8</i>				<i>77-120 %</i>	<i>101</i>	<i>%</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>				<i>80-120 %</i>	<i>101</i>	<i>%</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				<i>80-120 %</i>	<i>104</i>	<i>%</i>	



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Dup-3-SC
21F0419-46 (Solid)

Volatile Organic Compounds

Method: NWTPHg	Sampled: 06/24/2021 12:20
Instrument: NT3 Analyst: PKC	Analyzed: 07/06/2021 20:28
Sample Preparation:	Preparation Method: EPA 5035 (Methanol Extraction)
	Preparation Batch: BJG0122
	Sample Size: 9.991 g (wet)
	Final Volume: 5 mL
	Extract ID: 21F0419-46 G
	Dry Weight: 8.60 g
	% Solids: 86.12

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	50	3710	ND	ug/kg	U
Surrogate: Toluene-d8			80-120 %	99.1	%	
Surrogate: 4-Bromofluorobenzene			78-123 %	93.1	%	



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Dup-3-SC
21F0419-46 (Solid)

Petroleum Hydrocarbons

Method: NWTPH-Dx	Sampled: 06/24/2021 12:20	
Instrument: FID4 Analyst: CTO	Analyzed: 07/16/2021 06:03	
Sample Preparation:	Preparation Method: EPA 3546 (Microwave)	Extract ID: 21F0419-46 A 01
	Preparation Batch: BJG0137	Dry Weight: 8.65 g
	Prepared: 07/07/2021	% Solids: 86.12
	Sample Size: 10.04 g (wet)	
	Final Volume: 1 mL	

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Diesel Range Organics (C12-C24)		DRO 1	5.78	22.9	mg/kg	
HC ID: DIESEL						
Motor Oil Range Organics (C24-C38)		RRO 1	11.6	71.0	mg/kg	
HC ID: MOTOR OIL						
Surrogate: <i>o</i> -Terphenyl			50-150 %	86.9	%	



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TBlank-1_062521
21F0419-47 (Water)

Volatile Organic Compounds

Method: EPA 8260D Sampled: 06/22/2021 10:30
Instrument: NT2 Analyst: PKC Analyzed: 06/30/2021 13:12

Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-47 A
Preparation Batch: BJF0811 Sample Size: 10 mL
Prepared: 06/30/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Detection Limit	Reporting Limit	Result	Units	Notes
Benzene	71-43-2	1	0.05	0.20	ND	ug/L	U
Naphthalene	91-20-3	1	0.27	0.50	ND	ug/L	U
<i>Surrogate: 1,2-Dichloroethane-d4</i>				<i>80-129 %</i>	<i>97.5</i>	<i>%</i>	
<i>Surrogate: Toluene-d8</i>				<i>80-120 %</i>	<i>95.1</i>	<i>%</i>	
<i>Surrogate: 4-Bromofluorobenzene</i>				<i>80-120 %</i>	<i>90.9</i>	<i>%</i>	
<i>Surrogate: 1,2-Dichlorobenzene-d4</i>				<i>80-120 %</i>	<i>104</i>	<i>%</i>	



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TBlank-1_062521
21F0419-47 (Water)

Volatile Organic Compounds

Method: NWTPHg Sampled: 06/22/2021 10:30
Instrument: NT2 Analyst: PKC Analyzed: 06/30/2021 13:12
Sample Preparation: Preparation Method: EPA 5030C (Purge and Trap) Extract ID: 21F0419-47 A
Preparation Batch: BJF0811 Sample Size: 10 mL
Prepared: 06/30/2021 Final Volume: 10 mL

Analyte	CAS Number	Dilution	Reporting Limit	Result	Units	Notes
Gasoline Range Organics (Tol-Nap)	GRO	1	100	ND	ug/L	U
Surrogate: Toluene-d8			80-120 %	95.1	%	
Surrogate: 4-Bromofluorobenzene			80-120 %	90.9	%	



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Volatile Organic Compounds - Quality Control

Batch BJF0786 - EPA 5030C (Purge and Trap)

Instrument: NT2 Analyst: PKC

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJF0786-BLK1)										
					Prepared: 29-Jun-2021		Analyzed: 29-Jun-2021 18:45			
Gasoline Range Organics (Tol-Nap)	ND	100	ug/L							U
Surrogate: Toluene-d8	4.75		ug/L	5.00		95.0	80-120			
Surrogate: 4-Bromofluorobenzene	4.50		ug/L	5.00		90.1	80-120			
Blank (BJF0786-BLK2)										
					Prepared: 29-Jun-2021		Analyzed: 29-Jun-2021 18:45			
Benzene	ND	0.05	0.20	ug/L						U
Naphthalene	ND	0.27	0.50	ug/L						U
Surrogate: 1,2-Dichloroethane-d4	5.32		ug/L	5.00		106	80-129			
Surrogate: Toluene-d8	4.75		ug/L	5.00		95.0	80-120			
Surrogate: 4-Bromofluorobenzene	4.50		ug/L	5.00		90.1	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.15		ug/L	5.00		103	80-120			
LCS (BJF0786-BS1)										
					Prepared: 29-Jun-2021		Analyzed: 29-Jun-2021 16:33			
Gasoline Range Organics (Tol-Nap)	1040	100	ug/L	1000		104	72-128			
Surrogate: Toluene-d8	5.01		ug/L	5.00		100	80-120			
Surrogate: 4-Bromofluorobenzene	5.09		ug/L	5.00		102	80-120			
LCS (BJF0786-BS2)										
					Prepared: 29-Jun-2021		Analyzed: 29-Jun-2021 16:59			
Benzene	10.6	0.05	0.20	ug/L	10.0	106	80-120			
Naphthalene	9.22	0.27	0.50	ug/L	10.0	92.2	50-134			
Surrogate: 1,2-Dichloroethane-d4	4.73		ug/L	5.00		94.5	80-129			
Surrogate: Toluene-d8	5.07		ug/L	5.00		101	80-120			
Surrogate: 4-Bromofluorobenzene	5.09		ug/L	5.00		102	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	4.83		ug/L	5.00		96.7	80-120			
LCS Dup (BJF0786-BSD1)										
					Prepared: 29-Jun-2021		Analyzed: 29-Jun-2021 17:26			
Gasoline Range Organics (Tol-Nap)	945	100	ug/L	1000		94.5	72-128	9.40	30	
Surrogate: Toluene-d8	5.07		ug/L	5.00		101	80-120			
Surrogate: 4-Bromofluorobenzene	4.94		ug/L	5.00		98.8	80-120			
LCS Dup (BJF0786-BSD2)										
					Prepared: 29-Jun-2021		Analyzed: 29-Jun-2021 17:52			
Benzene	10.4	0.05	0.20	ug/L	10.0	104	80-120	2.08	30	
Naphthalene	8.79	0.27	0.50	ug/L	10.0	87.9	50-134	4.75	30	
Surrogate: 1,2-Dichloroethane-d4	4.86		ug/L	5.00		97.2	80-129			



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Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
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Volatile Organic Compounds - Quality Control

Batch BJF0786 - EPA 5030C (Purge and Trap)

Instrument: NT2 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BJF0786-BSD2)					Prepared: 29-Jun-2021		Analyzed: 29-Jun-2021 17:52				
Surrogate: Toluene-d8	5.05			ug/L	5.00	101		80-120			
Surrogate: 4-Bromofluorobenzene	5.03			ug/L	5.00	101		80-120			
Surrogate: 1,2-Dichlorobenzene-d4	4.93			ug/L	5.00	98.7		80-120			



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Volatile Organic Compounds - Quality Control

Batch BJF0792 - EPA 5035 (Sodium Bisulfate)

Instrument: NT5 Analyst: PB

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJF0792-BLK1)						Prepared: 29-Jun-2021 Analyzed: 29-Jun-2021 14:07					
Benzene	ND	0.17	1.00	ug/kg							U
Naphthalene	ND	2.46	5.00	ug/kg							U
Surrogate: 1,2-Dichloroethane-d4	49.4			ug/kg	50.0	98.8		80-149			
Surrogate: Toluene-d8	48.9			ug/kg	50.0	97.7		77-120			
Surrogate: 4-Bromofluorobenzene	51.0			ug/kg	50.0	102		80-120			
Surrogate: 1,2-Dichlorobenzene-d4	50.3			ug/kg	50.0	101		80-120			
LCS (BJF0792-BS1)						Prepared: 29-Jun-2021 Analyzed: 29-Jun-2021 13:02					
Benzene	49.2			ug/kg	50.0	98.4		80-120			
Naphthalene	55.6			ug/kg	50.0	111		29-125			
Surrogate: 1,2-Dichloroethane-d4	48.6			ug/kg	50.0	97.2		80-149			
Surrogate: Toluene-d8	49.0			ug/kg	50.0	98.0		77-120			
Surrogate: 4-Bromofluorobenzene	50.3			ug/kg	50.0	101		80-120			
Surrogate: 1,2-Dichlorobenzene-d4	50.1			ug/kg	50.0	100		80-120			
LCS Dup (BJF0792-BSD1)						Prepared: 29-Jun-2021 Analyzed: 29-Jun-2021 13:40					
Benzene	51.7			ug/kg	50.0	103		80-120	4.98	30	
Naphthalene	54.9			ug/kg	50.0	110		29-125	1.12	30	
Surrogate: 1,2-Dichloroethane-d4	49.0			ug/kg	50.0	98.0		80-149			
Surrogate: Toluene-d8	49.5			ug/kg	50.0	98.9		77-120			
Surrogate: 4-Bromofluorobenzene	50.7			ug/kg	50.0	101		80-120			
Surrogate: 1,2-Dichlorobenzene-d4	50.0			ug/kg	50.0	100		80-120			



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Volatile Organic Compounds - Quality Control

Batch BJF0811 - EPA 5030C (Purge and Trap)

Instrument: NT2 Analyst: PKC

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJF0811-BLK1)										
					Prepared: 30-Jun-2021	Analyzed: 30-Jun-2021 12:51				
Gasoline Range Organics (Tol-Nap)	ND	100	ug/L							U
Surrogate: Toluene-d8	4.79		ug/L	5.00		95.7	80-120			
Surrogate: 4-Bromofluorobenzene	4.68		ug/L	5.00		93.7	80-120			
Blank (BJF0811-BLK2)										
					Prepared: 30-Jun-2021	Analyzed: 30-Jun-2021 12:51				
Benzene	ND	0.05	0.20	ug/L						U
Naphthalene	ND	0.27	0.50	ug/L						U
Surrogate: 1,2-Dichloroethane-d4	4.76		ug/L	5.00		95.2	80-129			
Surrogate: Toluene-d8	4.79		ug/L	5.00		95.7	80-120			
Surrogate: 4-Bromofluorobenzene	4.68		ug/L	5.00		93.7	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.13		ug/L	5.00		103	80-120			
LCS (BJF0811-BS1)										
					Prepared: 30-Jun-2021	Analyzed: 30-Jun-2021 10:23				
Gasoline Range Organics (Tol-Nap)	994	100	ug/L	1000		99.4	72-128			
Surrogate: Toluene-d8	5.16		ug/L	5.00		103	80-120			
Surrogate: 4-Bromofluorobenzene	5.02		ug/L	5.00		100	80-120			
LCS (BJF0811-BS2)										
					Prepared: 30-Jun-2021	Analyzed: 30-Jun-2021 10:44				
Benzene	11.0	0.05	0.20	ug/L	10.0	110	80-120			
Naphthalene	8.54	0.27	0.50	ug/L	10.0	85.4	50-134			
Surrogate: 1,2-Dichloroethane-d4	4.43		ug/L	5.00		88.6	80-129			
Surrogate: Toluene-d8	5.06		ug/L	5.00		101	80-120			
Surrogate: 4-Bromofluorobenzene	4.85		ug/L	5.00		97.0	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.13		ug/L	5.00		103	80-120			
LCS Dup (BJF0811-BSD1)										
					Prepared: 30-Jun-2021	Analyzed: 30-Jun-2021 11:05				
Gasoline Range Organics (Tol-Nap)	1090	100	ug/L	1000		109	72-128	9.52	30	
Surrogate: Toluene-d8	5.14		ug/L	5.00		103	80-120			
Surrogate: 4-Bromofluorobenzene	4.99		ug/L	5.00		99.9	80-120			
LCS Dup (BJF0811-BSD2)										
					Prepared: 30-Jun-2021	Analyzed: 30-Jun-2021 11:26				
Benzene	11.5	0.05	0.20	ug/L	10.0	115	80-120	4.36	30	
Naphthalene	8.78	0.27	0.50	ug/L	10.0	87.8	50-134	2.80	30	
Surrogate: 1,2-Dichloroethane-d4	4.40		ug/L	5.00		87.9	80-129			



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Volatile Organic Compounds - Quality Control

Batch BJF0811 - EPA 5030C (Purge and Trap)

Instrument: NT2 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BJF0811-BSD2)					Prepared: 30-Jun-2021		Analyzed: 30-Jun-2021 11:26				
Surrogate: Toluene-d8	5.15			ug/L	5.00	103		80-120			
Surrogate: 4-Bromofluorobenzene	4.94			ug/L	5.00	98.8		80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.07			ug/L	5.00	101		80-120			



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Volatile Organic Compounds - Quality Control

Batch BJF0832 - EPA 5035 (Sodium Bisulfate)

Instrument: NT5 Analyst: PB

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJF0832-BLK1)											
						Prepared: 30-Jun-2021	Analyzed: 30-Jun-2021 12:09				
Benzene	ND	0.17	1.00	ug/kg							U
Naphthalene	ND	2.46	5.00	ug/kg							U
Surrogate: 1,2-Dichloroethane-d4	52.1			ug/kg	50.0	104		80-149			
Surrogate: Toluene-d8	50.8			ug/kg	50.0	102		77-120			
Surrogate: 4-Bromofluorobenzene	49.7			ug/kg	50.0	99.4		80-120			
Surrogate: 1,2-Dichlorobenzene-d4	50.4			ug/kg	50.0	101		80-120			
LCS (BJF0832-BS1)											
						Prepared: 30-Jun-2021	Analyzed: 30-Jun-2021 10:35				
Benzene	46.9			ug/kg	50.0		93.8	80-120			
Naphthalene	47.8			ug/kg	50.0		95.5	29-125			
Surrogate: 1,2-Dichloroethane-d4	52.1			ug/kg	50.0	104		80-149			
Surrogate: Toluene-d8	50.5			ug/kg	50.0	101		77-120			
Surrogate: 4-Bromofluorobenzene	50.4			ug/kg	50.0	101		80-120			
Surrogate: 1,2-Dichlorobenzene-d4	49.8			ug/kg	50.0	99.7		80-120			
LCS Dup (BJF0832-BSD1)											
						Prepared: 30-Jun-2021	Analyzed: 30-Jun-2021 11:00				
Benzene	48.9			ug/kg	50.0		97.7	80-120	4.04	30	
Naphthalene	51.0			ug/kg	50.0		102	29-125	6.48	30	
Surrogate: 1,2-Dichloroethane-d4	51.2			ug/kg	50.0	102		80-149			
Surrogate: Toluene-d8	50.8			ug/kg	50.0	102		77-120			
Surrogate: 4-Bromofluorobenzene	51.0			ug/kg	50.0	102		80-120			
Surrogate: 1,2-Dichlorobenzene-d4	50.5			ug/kg	50.0	101		80-120			



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Volatile Organic Compounds - Quality Control

Batch BJG0021 - EPA 5030C (Purge and Trap)

Instrument: NT3 Analyst: PKC

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJG0021-BLK1) Prepared: 02-Jul-2021 Analyzed: 02-Jul-2021 16:29										
Gasoline Range Organics (Tol-Nap)	ND	100	ug/L							U
Surrogate: Toluene-d8	4.92		ug/L	5.00		98.4	80-120			
Surrogate: 4-Bromofluorobenzene	5.18		ug/L	5.00		104	80-120			
Blank (BJG0021-BLK2) Prepared: 02-Jul-2021 Analyzed: 02-Jul-2021 16:29										
Benzene	ND	0.05	0.20	ug/L						U
Naphthalene	ND	0.27	0.50	ug/L						U
Surrogate: 1,2-Dichloroethane-d4	4.58		ug/L	5.00		91.5	80-129			
Surrogate: Toluene-d8	4.92		ug/L	5.00		98.4	80-120			
Surrogate: 4-Bromofluorobenzene	5.18		ug/L	5.00		104	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.35		ug/L	5.00		107	80-120			
LCS (BJG0021-BS1) Prepared: 02-Jul-2021 Analyzed: 02-Jul-2021 14:23										
Gasoline Range Organics (Tol-Nap)	1030	100	ug/L	1000		103	72-128			
Surrogate: Toluene-d8	4.90		ug/L	5.00		97.9	80-120			
Surrogate: 4-Bromofluorobenzene	5.13		ug/L	5.00		103	80-120			
LCS (BJG0021-BS2) Prepared: 02-Jul-2021 Analyzed: 02-Jul-2021 14:48										
Benzene	11.1	0.05	0.20	ug/L	10.0	111	80-120			
Naphthalene	11.3	0.27	0.50	ug/L	10.0	113	50-134			
Surrogate: 1,2-Dichloroethane-d4	4.74		ug/L	5.00		94.9	80-129			
Surrogate: Toluene-d8	4.94		ug/L	5.00		98.9	80-120			
Surrogate: 4-Bromofluorobenzene	5.25		ug/L	5.00		105	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	4.94		ug/L	5.00		98.8	80-120			
LCS Dup (BJG0021-BSD1) Prepared: 02-Jul-2021 Analyzed: 02-Jul-2021 15:14										
Gasoline Range Organics (Tol-Nap)	946	100	ug/L	1000		94.6	72-128	8.46	30	
Surrogate: Toluene-d8	4.99		ug/L	5.00		99.7	80-120			
Surrogate: 4-Bromofluorobenzene	5.30		ug/L	5.00		106	80-120			
LCS Dup (BJG0021-BSD2) Prepared: 02-Jul-2021 Analyzed: 02-Jul-2021 15:39										
Benzene	9.58	0.05	0.20	ug/L	10.0	95.8	80-120	15.00	30	
Naphthalene	9.95	0.27	0.50	ug/L	10.0	99.5	50-134	13.10	30	
Surrogate: 1,2-Dichloroethane-d4	5.17		ug/L	5.00		103	80-129			



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Volatile Organic Compounds - Quality Control

Batch BJG0021 - EPA 5030C (Purge and Trap)

Instrument: NT3 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BJG0021-BSD2)					Prepared: 02-Jul-2021 Analyzed: 02-Jul-2021 15:39						
Surrogate: Toluene-d8	4.85			ug/L	5.00	96.9		80-120			
Surrogate: 4-Bromofluorobenzene	5.24			ug/L	5.00	105		80-120			
Surrogate: 1,2-Dichlorobenzene-d4	4.86			ug/L	5.00	97.1		80-120			



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Volatile Organic Compounds - Quality Control

Batch BJG0090 - EPA 5035 (Methanol Extraction)

Instrument: NT3 Analyst: PKC

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJG0090-BLK1)		Prepared: 03-Jul-2021 Analyzed: 03-Jul-2021 12:41								
Gasoline Range Organics (Tol-Nap)	ND	5000	ug/kg							U
Surrogate: Toluene-d8	5.09		ug/kg	5.00		102	80-120			
Surrogate: 4-Bromofluorobenzene	4.83		ug/kg	5.00		96.6	78-123			
LCS (BJG0090-BS1)		Prepared: 03-Jul-2021 Analyzed: 03-Jul-2021 10:35								
Gasoline Range Organics (Tol-Nap)	47900	5000	ug/kg	50000		95.8	70-121			
Surrogate: Toluene-d8	4.96		ug/kg	5.00		99.2	80-120			
Surrogate: 4-Bromofluorobenzene	4.82		ug/kg	5.00		96.4	78-123			
LCS Dup (BJG0090-BSD1)		Prepared: 03-Jul-2021 Analyzed: 03-Jul-2021 11:25								
Gasoline Range Organics (Tol-Nap)	48000	5000	ug/kg	50000		95.9	70-121	0.17	30	
Surrogate: Toluene-d8	4.95		ug/kg	5.00		98.9	80-120			
Surrogate: 4-Bromofluorobenzene	4.83		ug/kg	5.00		96.6	78-123			



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Reported:
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Volatile Organic Compounds - Quality Control

Batch BJG0120 - EPA 5030C (Purge and Trap)

Instrument: NT3 Analyst: PKC

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJG0120-BLK1)										
					Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 12:13					
Gasoline Range Organics (Tol-Nap)	ND	100	ug/L							U
Surrogate: Toluene-d8	5.04		ug/L	5.00		101	80-120			
Surrogate: 4-Bromofluorobenzene	4.94		ug/L	5.00		98.8	80-120			
Blank (BJG0120-BLK2)										
					Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 12:13					
Benzene	ND	0.05	0.20	ug/L						U
Naphthalene	ND	0.27	0.50	ug/L						U
Surrogate: 1,2-Dichloroethane-d4	4.99		ug/L	5.00		99.9	80-129			
Surrogate: Toluene-d8	5.04		ug/L	5.00		101	80-120			
Surrogate: 4-Bromofluorobenzene	4.94		ug/L	5.00		98.8	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.15		ug/L	5.00		103	80-120			
LCS (BJG0120-BS1)										
					Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 10:07					
Gasoline Range Organics (Tol-Nap)	1010	100	ug/L	1000		101	72-128			
Surrogate: Toluene-d8	4.93		ug/L	5.00		98.6	80-120			
Surrogate: 4-Bromofluorobenzene	5.04		ug/L	5.00		101	80-120			
LCS (BJG0120-BS2)										
					Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 10:32					
Benzene	10.4	0.05	0.20	ug/L	10.0	104	80-120			
Naphthalene	9.94	0.27	0.50	ug/L	10.0	99.4	50-134			
Surrogate: 1,2-Dichloroethane-d4	4.91		ug/L	5.00		98.1	80-129			
Surrogate: Toluene-d8	5.10		ug/L	5.00		102	80-120			
Surrogate: 4-Bromofluorobenzene	4.96		ug/L	5.00		99.3	80-120			
Surrogate: 1,2-Dichlorobenzene-d4	5.22		ug/L	5.00		104	80-120			
LCS Dup (BJG0120-BSD1)										
					Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 10:57					
Gasoline Range Organics (Tol-Nap)	874	100	ug/L	1000		87.4	72-128	14.00	30	
Surrogate: Toluene-d8	5.00		ug/L	5.00		99.9	80-120			
Surrogate: 4-Bromofluorobenzene	4.98		ug/L	5.00		99.6	80-120			
LCS Dup (BJG0120-BSD2)										
					Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 11:23					
Benzene	10.6	0.05	0.20	ug/L	10.0	106	80-120	2.68	30	
Naphthalene	9.92	0.27	0.50	ug/L	10.0	99.2	50-134	0.16	30	
Surrogate: 1,2-Dichloroethane-d4	4.97		ug/L	5.00		99.4	80-129			



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Volatile Organic Compounds - Quality Control

Batch BJG0120 - EPA 5030C (Purge and Trap)

Instrument: NT3 Analyst: PKC

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
LCS Dup (BJG0120-BSD2)					Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 11:23						
Surrogate: Toluene-d8	5.02			ug/L	5.00	100		80-120			
Surrogate: 4-Bromofluorobenzene	5.13			ug/L	5.00	103		80-120			
Surrogate: 1,2-Dichlorobenzene-d4	4.96			ug/L	5.00	99.2		80-120			



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Volatile Organic Compounds - Quality Control

Batch BJG0122 - EPA 5035 (Methanol Extraction)

Instrument: NT3 Analyst: PKC

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJG0122-BLK1)		Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 12:13								
Gasoline Range Organics (Tol-Nap)	ND	5000	ug/kg							U
Surrogate: Toluene-d8	5.04		ug/kg	5.00		101	80-120			
Surrogate: 4-Bromofluorobenzene	4.94		ug/kg	5.00		98.8	78-123			
LCS (BJG0122-BS1)		Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 10:07								
Gasoline Range Organics (Tol-Nap)	50300	5000	ug/kg	50000		101	70-121			
Surrogate: Toluene-d8	4.93		ug/kg	5.00		98.6	80-120			
Surrogate: 4-Bromofluorobenzene	5.04		ug/kg	5.00		101	78-123			
LCS Dup (BJG0122-BSD1)		Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 10:57								
Gasoline Range Organics (Tol-Nap)	43700	5000	ug/kg	50000		87.4	70-121	14.00	30	
Surrogate: Toluene-d8	5.00		ug/kg	5.00		99.9	80-120			
Surrogate: 4-Bromofluorobenzene	4.98		ug/kg	5.00		99.6	78-123			



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Project: South State Street PRDI
Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
22-Jul-2021 19:04

Volatile Organic Compounds - Quality Control

Batch BJG0132 - No Prep - Volatiles

Instrument: NT5 Analyst: PB

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJG0132-BLK1)						Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 12:10					
Benzene	ND	0.17	1.00	ug/kg							U
Naphthalene	ND	2.46	5.00	ug/kg							U
Surrogate: 1,2-Dichloroethane-d4	52.3			ug/kg	50.0	105		80-149			
Surrogate: Toluene-d8	51.4			ug/kg	50.0	103		77-120			
Surrogate: 4-Bromofluorobenzene	49.4			ug/kg	50.0	98.7		80-120			
Surrogate: 1,2-Dichlorobenzene-d4	50.5			ug/kg	50.0	101		80-120			
LCS (BJG0132-BS1)						Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 11:08					
Benzene	52.2			ug/kg	50.0	104		80-120			
Naphthalene	51.3			ug/kg	50.0	103		29-125			
Surrogate: 1,2-Dichloroethane-d4	52.0			ug/kg	50.0	104		80-149			
Surrogate: Toluene-d8	50.9			ug/kg	50.0	102		77-120			
Surrogate: 4-Bromofluorobenzene	50.6			ug/kg	50.0	101		80-120			
Surrogate: 1,2-Dichlorobenzene-d4	49.5			ug/kg	50.0	99.1		80-120			
LCS Dup (BJG0132-BSD1)						Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 11:45					
Benzene	52.8			ug/kg	50.0	106		80-120	1.11	30	
Naphthalene	53.3			ug/kg	50.0	107		29-125	3.68	30	
Surrogate: 1,2-Dichloroethane-d4	52.1			ug/kg	50.0	104		80-149			
Surrogate: Toluene-d8	51.0			ug/kg	50.0	102		77-120			
Surrogate: 4-Bromofluorobenzene	50.8			ug/kg	50.0	102		80-120			
Surrogate: 1,2-Dichlorobenzene-d4	50.2			ug/kg	50.0	100		80-120			



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Project: South State Street PRDI
Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
22-Jul-2021 19:04

Semivolatile Organic Compounds - SIM - Quality Control

Batch BJG0176 - EPA 3546 (Microwave) Low Level

Instrument: NT11 Analyst: VTS

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJG0176-BLK1)											
						Prepared: 08-Jul-2021 Analyzed: 15-Jul-2021 14:21					
Benzo(a)anthracene	ND	0.07	0.50	ug/kg							U
Chrysene	ND	0.07	0.50	ug/kg							U
Benzo(b)fluoranthene	ND	0.07	0.50	ug/kg							U
Benzo(k)fluoranthene	ND	0.10	0.50	ug/kg							U
Benzo(a)pyrene	ND	0.09	0.50	ug/kg							U
Indeno(1,2,3-cd)pyrene	ND	0.09	0.50	ug/kg							U
Dibenzo(a,h)anthracene	ND	0.11	0.50	ug/kg							U
Surrogate: 2-Methylnaphthalene-d10	8.68			ug/kg	15.0		57.8	32-120			
Surrogate: Dibenzo[a,h]anthracene-d14	12.9			ug/kg	15.0		86.3	21-133			
Surrogate: Fluoranthene-d10	13.0			ug/kg	15.0		86.9	36-134			
LCS (BJG0176-BS1)											
						Prepared: 08-Jul-2021 Analyzed: 15-Jul-2021 14:51					
Benzo(a)anthracene	12.7	0.07	0.50	ug/kg	15.0		84.7	42-120			
Chrysene	12.1	0.07	0.50	ug/kg	15.0		81.0	48-120			
Benzo(b)fluoranthene	12.2	0.07	0.50	ug/kg	15.0		81.7	46-120			
Benzo(k)fluoranthene	12.4	0.10	0.50	ug/kg	15.0		82.3	46-120			
Benzo(a)pyrene	12.4	0.09	0.50	ug/kg	15.0		82.6	36-120			
Indeno(1,2,3-cd)pyrene	13.1	0.09	0.50	ug/kg	15.0		87.5	40-120			
Dibenzo(a,h)anthracene	13.1	0.11	0.50	ug/kg	15.0		87.5	38-120			
Surrogate: 2-Methylnaphthalene-d10	9.56			ug/kg	15.0		63.7	32-120			
Surrogate: Dibenzo[a,h]anthracene-d14	14.6			ug/kg	15.0		97.5	21-133			
Surrogate: Fluoranthene-d10	13.9			ug/kg	15.0		92.4	36-134			
Matrix Spike (BJG0176-MS1)											
			Source: 21F0419-31			Prepared: 08-Jul-2021 Analyzed: 15-Jul-2021 15:51					
Benzo(a)anthracene	91.1	0.07	0.48	ug/kg	14.4	114	-158	42-120			*, E
Chrysene	94.8	0.07	0.48	ug/kg	14.4	125	-211	48-120			*, E
Benzo(b)fluoranthene	98.6	0.06	0.48	ug/kg	14.4	113	-96.5	46-120			*, E
Benzo(k)fluoranthene	79.3	0.10	0.48	ug/kg	14.4	92.9	-94.5	46-120			*, E
Benzo(a)pyrene	155	0.08	0.48	ug/kg	14.4	162	-47.1	36-120			*, E
Indeno(1,2,3-cd)pyrene	141	0.08	0.48	ug/kg	14.4	121	136	40-120			*, E
Dibenzo(a,h)anthracene	71.2	0.10	0.48	ug/kg	14.4	55.5	109	38-120			E
Surrogate: 2-Methylnaphthalene-d10	9.74			ug/kg	14.4	10.1	67.7	32-120			
Surrogate: Dibenzo[a,h]anthracene-d14	20.5			ug/kg	14.4	19.8	142	21-133			*
Surrogate: Fluoranthene-d10	14.1			ug/kg	14.4	15.8	97.9	36-134			



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Project: South State Street PRDI
Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
22-Jul-2021 19:04

Semivolatile Organic Compounds - SIM - Quality Control

Batch BJJ0176 - EPA 3546 (Microwave) Low Level

Instrument: NT11 Analyst: VTS

QC Sample/Analyte	Detection Result	Reporting Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
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Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Matrix Spike Dup (BJJ0176-MSD1)	Source: 21F0419-31			Prepared: 08-Jul-2021		Analyzed: 15-Jul-2021 16:22					
Benzo(a)anthracene	103	0.07	0.48	ug/kg	14.4	114	-77.1	42-120	12.10	30	*, E
Chrysene	106	0.07	0.48	ug/kg	14.4	125	-136	48-120	10.80	30	*, E
Benzo(b)fluoranthene	108	0.06	0.48	ug/kg	14.4	113	-32.5	46-120	8.91	30	*, E
Benzo(k)fluoranthene	78.6	0.10	0.48	ug/kg	14.4	92.9	-99.3	46-120	0.88	30	*, E
Benzo(a)pyrene	149	0.08	0.48	ug/kg	14.4	162	-91.4	36-120	4.18	30	*, E
Indeno(1,2,3-cd)pyrene	117	0.08	0.48	ug/kg	14.4	121	-29.2	40-120	18.30	30	*, E
Dibenzo(a,h)anthracene	58.8	0.10	0.48	ug/kg	14.4	55.5	22.7	38-120	19.20	30	*, E
Surrogate: 2-Methylnaphthalene-d10	9.62			ug/kg	14.4	10.1	66.9	32-120			
Surrogate: Dibenzo[a,h]anthracene-d14	20.1			ug/kg	14.4	19.8	140	21-133			*
Surrogate: Fluoranthene-d10	14.3			ug/kg	14.4	15.8	99.6	36-134			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



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Project: South State Street PRDI
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Reported:
22-Jul-2021 19:04

Petroleum Hydrocarbons - Quality Control

Batch BJF0776 - EPA 3510C SepF

Instrument: FID4 Analyst: CTO

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJF0776-BLK1)		Prepared: 29-Jun-2021 Analyzed: 14-Jul-2021 18:02								
Diesel Range Organics (C12-C24)	ND	0.100	mg/L							U
Motor Oil Range Organics (C24-C38)	ND	0.200	mg/L							U
Surrogate: <i>o</i> -Terphenyl	0.184		mg/L	0.225		81.7	50-150			
LCS (BJF0776-BS1)		Prepared: 29-Jun-2021 Analyzed: 14-Jul-2021 18:22								
Diesel Range Organics (C12-C24)	2.37	0.100	mg/L	3.00		79.1	56-120			
Surrogate: <i>o</i> -Terphenyl	0.189		mg/L	0.225		84.0	50-150			
Matrix Spike (BJF0776-MS1)		Source: 21F0419-02		Prepared: 29-Jun-2021 Analyzed: 14-Jul-2021 19:23						
Diesel Range Organics (C12-C24)	5.65	0.100	mg/L	3.00	3.32	77.6	56-120			E
Surrogate: <i>o</i> -Terphenyl	0.199		mg/L	0.225	0.206	88.6	50-150			
Recovery limits for target analytes in MS/MSD QC samples are advisory only.										
Matrix Spike Dup (BJF0776-MSD1)		Source: 21F0419-02		Prepared: 29-Jun-2021 Analyzed: 14-Jul-2021 19:43						
Diesel Range Organics (C12-C24)	5.43	0.100	mg/L	3.00	3.32	70.5	56-120	3.84	30	E
Surrogate: <i>o</i> -Terphenyl	0.184		mg/L	0.225	0.206	81.9	50-150			
Recovery limits for target analytes in MS/MSD QC samples are advisory only.										



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Project: South State Street PRDI
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Reported:
22-Jul-2021 19:04

Petroleum Hydrocarbons - Quality Control

Batch BJG0096 - EPA 3546 (Microwave)

Instrument: FID4 Analyst: CTO

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJG0096-BLK1)		Prepared: 06-Jul-2021 Analyzed: 15-Jul-2021 17:30								
Diesel Range Organics (C12-C24)	ND	5.00	mg/kg							U
Motor Oil Range Organics (C24-C38)	ND	10.0	mg/kg							U
Surrogate: <i>o</i> -Terphenyl	9.55		mg/kg	11.3		84.9	50-150			

LCS (BJG0096-BS1)		Prepared: 06-Jul-2021 Analyzed: 15-Jul-2021 17:51								
Diesel Range Organics (C12-C24)	133	5.00	mg/kg	150		88.5	50-150			
Surrogate: <i>o</i> -Terphenyl	9.91		mg/kg	11.3		88.1	50-150			

Matrix Spike (BJG0096-MS1)		Source: 21F0419-13		Prepared: 06-Jul-2021 Analyzed: 15-Jul-2021 18:32						
Diesel Range Organics (C12-C24)	267	35.1	mg/kg	210	48.8	104	50-150			D
Surrogate: <i>o</i> -Terphenyl	14.6		mg/kg	15.8	14.5	92.4	50-150			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Matrix Spike Dup (BJG0096-MSD1)		Source: 21F0419-13		Prepared: 06-Jul-2021 Analyzed: 15-Jul-2021 18:52						
Diesel Range Organics (C12-C24)	235	35.1	mg/kg	210	48.8	88.6	50-150	12.70	30	D
Surrogate: <i>o</i> -Terphenyl	14.6		mg/kg	15.8	14.5	92.4	50-150			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



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Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
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Petroleum Hydrocarbons - Quality Control

Batch BJG0137 - EPA 3546 (Microwave)

Instrument: FID4 Analyst: CTO

QC Sample/Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJG0137-BLK1)		Prepared: 07-Jul-2021 Analyzed: 15-Jul-2021 23:57								
Diesel Range Organics (C12-C24)	ND	5.00	mg/kg							U
Motor Oil Range Organics (C24-C38)	ND	10.0	mg/kg							U
Surrogate: <i>o</i> -Terphenyl	9.59		mg/kg	11.3		85.2	50-150			

LCS (BJG0137-BS1)		Prepared: 07-Jul-2021 Analyzed: 16-Jul-2021 00:18								
Diesel Range Organics (C12-C24)	122	5.00	mg/kg	150		81.3	50-150			
Surrogate: <i>o</i> -Terphenyl	9.84		mg/kg	11.3		87.5	50-150			

Matrix Spike (BJG0137-MS1)		Source: 21F0419-26		Prepared: 07-Jul-2021 Analyzed: 16-Jul-2021 00:58						
Diesel Range Organics (C12-C24)	157	6.07	mg/kg	182	15.7	77.9	50-150			
Surrogate: <i>o</i> -Terphenyl	11.4		mg/kg	13.6	11.7	83.6	50-150			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Matrix Spike Dup (BJG0137-MSD1)		Source: 21F0419-26		Prepared: 07-Jul-2021 Analyzed: 16-Jul-2021 01:19						
Diesel Range Organics (C12-C24)	158	6.07	mg/kg	182	15.7	78.3	50-150	0.54	30	
Surrogate: <i>o</i> -Terphenyl	11.6		mg/kg	13.6	11.7	84.9	50-150			

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



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Wet Chemistry - Quality Control

Batch BJF0789 - No Prep Wet Chem

Instrument: BAL2 Analyst: DOE

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJF0789-BLK1)						Prepared: 29-Jun-2021 Analyzed: 29-Jun-2021 13:57					
Total Solids	ND	0.04	0.04	%							U



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Reported:
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Wet Chemistry - Quality Control

Batch BJF0820 - SM 4500-CN⁻ G-99

Instrument: UV1800-2 Analyst: CKI

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJF0820-BLK1)						Prepared: 30-Jun-2021 Analyzed: 01-Jul-2021 16:07					
Cyanide, Total	ND	0.0050	0.0050	mg/L							U
LCS (BJF0820-BS1)						Prepared: 30-Jun-2021 Analyzed: 01-Jul-2021 16:08					
Cyanide, Total	0.142	0.0050	0.0050	mg/L	0.149		95.2	80-120			
Duplicate (BJF0820-DUP1)						Source: 21F0419-01 Prepared: 30-Jun-2021 Analyzed: 01-Jul-2021 16:09					
Cyanide, Total	0.0110	0.0050	0.0050	mg/L		0.0080			31.60	20	L
Matrix Spike (BJF0820-MS1)						Source: 21F0419-01 Prepared: 30-Jun-2021 Analyzed: 01-Jul-2021 16:10					
Cyanide, Total	0.143	0.0050	0.0050	mg/L	0.150	0.0080	90.1	75-125			
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											
Matrix Spike Dup (BJF0820-MSD1)						Source: 21F0419-01 Prepared: 30-Jun-2021 Analyzed: 01-Jul-2021 16:10					
Cyanide, Total	0.146	0.0050	0.0050	mg/L	0.150	0.0080	92.1	75-125	2.08		
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											



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Wet Chemistry - Quality Control

Batch BJF0823 - No Prep Wet Chem

Instrument: BAL2 Analyst: DOE

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJF0823-BLK1)						Prepared: 30-Jun-2021 Analyzed: 30-Jun-2021 11:02					
Total Solids	ND	0.04	0.04	%							U
Duplicate (BJF0823-DUP1)						Source: 21F0419-30 Prepared: 30-Jun-2021 Analyzed: 30-Jun-2021 11:02					
Total Solids	80.88	0.04	0.04	%		83.09			2.70	20	



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Project Manager: Brian Tracy

Reported:
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Wet Chemistry - Quality Control

Batch BJG0011 - EPA 9010C m

Instrument: UV1800-2 Analyst: CKI

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJG0011-BLK1)						Prepared: 01-Jul-2021 Analyzed: 02-Jul-2021 12:52					
Cyanide, Total after Distillation	ND	0.099	0.099	mg/kg							U
LCS (BJG0011-BS1)						Prepared: 01-Jul-2021 Analyzed: 02-Jul-2021 12:52					
Cyanide, Total after Distillation	2.78	0.099	0.099	mg/kg	2.98		93.2	75-125			
Duplicate (BJG0011-DUP1)						Source: 21F0419-13 Prepared: 01-Jul-2021 Analyzed: 02-Jul-2021 12:55					
Cyanide, Total after Distillation	ND	0.408	0.408	mg/kg		ND					U
Matrix Spike (BJG0011-MS1)						Source: 21F0419-13 Prepared: 01-Jul-2021 Analyzed: 02-Jul-2021 12:55					
Cyanide, Total after Distillation	1.61	0.142	0.142	mg/kg	4.09	ND	39.4	75-125			*

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Matrix Spike Dup (BJG0011-MSD1)						Source: 21F0419-13 Prepared: 01-Jul-2021 Analyzed: 02-Jul-2021 12:56					
Cyanide, Total after Distillation	2.40	0.147	0.147	mg/kg	4.23	ND	56.8	75-125	39.60	200	*

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



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Wet Chemistry - Quality Control

Batch BJG0059 - EPA 9010C m

Instrument: UV1800-1 Analyst: CKI

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJG0059-BLK1)						Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 12:08					
Cyanide, Total after Distillation	ND	0.099	0.099	mg/kg							U
LCS (BJG0059-BS1)						Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 12:09					
Cyanide, Total after Distillation	2.76	0.099	0.099	mg/kg	2.98		92.5	75-125			
Duplicate (BJG0059-DUP1)						Source: 21F0419-37 Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 12:10					
Cyanide, Total after Distillation	ND	0.200	0.200	mg/kg		ND					U
Matrix Spike (BJG0059-MS1)						Source: 21F0419-37 Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 12:11					
Cyanide, Total after Distillation	2.82	0.194	0.194	mg/kg	5.59	ND	50.6	75-125			*

Recovery limits for target analytes in MS/MSD QC samples are advisory only.

Matrix Spike Dup (BJG0059-MSD1)						Source: 21F0419-37 Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 12:12					
Cyanide, Total after Distillation	3.07	0.195	0.195	mg/kg	5.60	ND	54.8	75-125	8.26	200	*

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



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Project: South State Street PRDI
Project Number: Project #186-890-03 Tsk 300
Project Manager: Brian Tracy

Reported:
22-Jul-2021 19:04

Wet Chemistry - Quality Control

Batch BJG0101 - SM 4500-CN⁻ I-99

Instrument: UV1800-2 Analyst: CKI

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJG0101-BLK1)						Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 17:10					
Cyanide, Weak Acid Dissociable	ND	0.005	0.005	mg/L							U
LCS (BJG0101-BS1)						Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 17:11					
Cyanide, Weak Acid Dissociable	0.143	0.005	0.005	mg/L	0.149		95.9	75-125			
Duplicate (BJG0101-DUP1)						Source: 21F0419-02 Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 17:12					
Cyanide, Weak Acid Dissociable	ND	0.005	0.005	mg/L		ND					U
Matrix Spike (BJG0101-MS1)						Source: 21F0419-02 Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 17:12					
Cyanide, Weak Acid Dissociable	0.139	0.005	0.005	mg/L	0.150	ND	92.8	75-125			
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											
Matrix Spike Dup (BJG0101-MSD1)						Source: 21F0419-02 Prepared: 06-Jul-2021 Analyzed: 06-Jul-2021 17:13					
Cyanide, Weak Acid Dissociable	0.140	0.005	0.005	mg/L	0.150	ND	93.5	75-125	0.72	200	

Recovery limits for target analytes in MS/MSD QC samples are advisory only.



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Wet Chemistry - Quality Control

Batch BJG0116 - PSEP 1986 (modified)

Instrument: TOC Cube Analyst: BF

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJG0116-BLK1)						Prepared: 06-Jul-2021 Analyzed: 14-Jul-2021 16:35					
Total Organic Carbon	ND	0.02	0.02	%							U
LCS (BJG0116-BS1)						Prepared: 06-Jul-2021 Analyzed: 14-Jul-2021 17:06					
Total Organic Carbon	45.5	0.02	0.02	%	44.4		102	80-120			
Reference (BJG0116-SRM1)						Prepared: 06-Jul-2021 Analyzed: 14-Jul-2021 17:38					
Total Organic Carbon	2.67	0.02	0.02	%	2.99		89.3	80-120			



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Wet Chemistry - Quality Control

Batch BJG0118 - PSEP 1986 (modified)

Instrument: TOC Cube Analyst: BF

QC Sample/Analyte	Result	Detection Limit	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Blank (BJG0118-BLK1)					Prepared: 06-Jul-2021 Analyzed: 15-Jul-2021 09:22						
Total Organic Carbon	ND	0.02	0.02	%							U
LCS (BJG0118-BS1)					Prepared: 06-Jul-2021 Analyzed: 15-Jul-2021 10:57						
Total Organic Carbon	44.0	0.02	0.02	%	44.4		99.0	80-120			
Duplicate (BJG0118-DUP1)					Source: 21F0419-30 Prepared: 06-Jul-2021 Analyzed: 15-Jul-2021 12:32						
Total Organic Carbon	0.96	0.02	0.02	%		0.91			4.76	20	
Matrix Spike (BJG0118-MS2)					Source: 21F0419-30 Prepared: 06-Jul-2021 Analyzed: 21-Jul-2021 16:05						
Total Organic Carbon	2.33	0.02	0.02	%	1.46	0.91	97.0	75-125			
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											
Matrix Spike Dup (BJG0118-MSD2)					Source: 21F0419-30 Prepared: 06-Jul-2021 Analyzed: 21-Jul-2021 16:37						
Total Organic Carbon	2.22	0.02	0.02	%	1.37	0.91	95.5	75-125	4.50	20	
Recovery limits for target analytes in MS/MSD QC samples are advisory only.											
Reference (BJG0118-SRM1)					Prepared: 06-Jul-2021 Analyzed: 15-Jul-2021 11:29						
Total Organic Carbon	2.71	0.02	0.02	%	2.99		90.5	80-120			



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Certified Analyses included in this Report

Analyte	Certifications
EPA 8260D in Solid	
Chloromethane	WADOE,DoD-ELAP,NELAP,ADEC
Chloromethane	DoD-ELAP,NELAP,ADEC
Vinyl Chloride	WADOE,DoD-ELAP,NELAP,ADEC
Vinyl Chloride	DoD-ELAP,NELAP,ADEC
Bromomethane	DoD-ELAP,NELAP,ADEC
Bromomethane	WADOE,DoD-ELAP,NELAP,ADEC
Chloroethane	DoD-ELAP,NELAP,ADEC
Chloroethane	WADOE,DoD-ELAP,NELAP,ADEC
Trichlorofluoromethane	WADOE,DoD-ELAP,NELAP,ADEC
Trichlorofluoromethane	DoD-ELAP,NELAP,ADEC
Acrolein	WADOE,DoD-ELAP,NELAP
Acrolein	DoD-ELAP,NELAP
1,1,2-Trichloro-1,2,2-Trifluoroethane	DoD-ELAP,NELAP,ADEC
1,1,2-Trichloro-1,2,2-Trifluoroethane	WADOE,DoD-ELAP,NELAP,ADEC
Acetone	WADOE,DoD-ELAP,NELAP
Acetone	DoD-ELAP,NELAP
1,1-Dichloroethene	DoD-ELAP,NELAP,ADEC
1,1-Dichloroethene	WADOE,DoD-ELAP,NELAP,ADEC
Iodomethane	WADOE,DoD-ELAP,NELAP,ADEC
Iodomethane	DoD-ELAP,NELAP,ADEC
Methylene Chloride	WADOE,DoD-ELAP,NELAP,ADEC
Methylene Chloride	DoD-ELAP,NELAP,ADEC
Acrylonitrile	DoD-ELAP,NELAP
Acrylonitrile	WADOE,DoD-ELAP,NELAP
Carbon Disulfide	WADOE,DoD-ELAP,NELAP,ADEC
Carbon Disulfide	DoD-ELAP,NELAP,ADEC
trans-1,2-Dichloroethene	DoD-ELAP,NELAP,ADEC
trans-1,2-Dichloroethene	WADOE,DoD-ELAP,NELAP,ADEC
Vinyl Acetate	DoD-ELAP,NELAP
Vinyl Acetate	WADOE,DoD-ELAP,NELAP
1,1-Dichloroethane	WADOE,DoD-ELAP,NELAP,ADEC
1,1-Dichloroethane	DoD-ELAP,NELAP,ADEC
2-Butanone	WADOE,DoD-ELAP,NELAP
2-Butanone	DoD-ELAP,NELAP
2,2-Dichloropropane	DoD-ELAP,NELAP



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2,2-Dichloropropane	WADOE,DoD-ELAP,NELAP
cis-1,2-Dichloroethene	DoD-ELAP,NELAP,ADEC
cis-1,2-Dichloroethene	WADOE,DoD-ELAP,NELAP,ADEC
Chloroform	WADOE,DoD-ELAP,NELAP,ADEC
Chloroform	DoD-ELAP,NELAP,ADEC
Bromochloromethane	WADOE,DoD-ELAP,NELAP,ADEC
Bromochloromethane	DoD-ELAP,NELAP,ADEC
1,1,1-Trichloroethane	WADOE,DoD-ELAP,NELAP,ADEC
1,1,1-Trichloroethane	DoD-ELAP,NELAP,ADEC
1,1-Dichloropropene	DoD-ELAP,NELAP,ADEC
1,1-Dichloropropene	WADOE,DoD-ELAP,NELAP,ADEC
Carbon tetrachloride	WADOE,DoD-ELAP,NELAP,ADEC
Carbon tetrachloride	DoD-ELAP,NELAP,ADEC
1,2-Dichloroethane	DoD-ELAP,NELAP,ADEC
1,2-Dichloroethane	WADOE,DoD-ELAP,NELAP,ADEC
Benzene	DoD-ELAP,NELAP,ADEC
Benzene	WADOE,DoD-ELAP,NELAP,ADEC
Trichloroethene	DoD-ELAP,NELAP,ADEC
Trichloroethene	WADOE,DoD-ELAP,NELAP,ADEC
1,2-Dichloropropane	DoD-ELAP,NELAP,ADEC
1,2-Dichloropropane	WADOE,DoD-ELAP,NELAP,ADEC
Bromodichloromethane	DoD-ELAP,NELAP,ADEC
Bromodichloromethane	WADOE,DoD-ELAP,NELAP,ADEC
Dibromomethane	DoD-ELAP,NELAP,ADEC
Dibromomethane	WADOE,DoD-ELAP,NELAP,ADEC
2-Chloroethyl vinyl ether	WADOE,DoD-ELAP,NELAP
2-Chloroethyl vinyl ether	DoD-ELAP,NELAP
4-Methyl-2-Pentanone	DoD-ELAP,NELAP
4-Methyl-2-Pentanone	WADOE,DoD-ELAP,NELAP
cis-1,3-Dichloropropene	DoD-ELAP,NELAP,ADEC
cis-1,3-Dichloropropene	WADOE,DoD-ELAP,NELAP,ADEC
Toluene	WADOE,DoD-ELAP,NELAP,ADEC
Toluene	DoD-ELAP,NELAP,ADEC
trans-1,3-Dichloropropene	DoD-ELAP,NELAP,ADEC
trans-1,3-Dichloropropene	WADOE,DoD-ELAP,NELAP,ADEC
2-Hexanone	DoD-ELAP,NELAP
2-Hexanone	WADOE,DoD-ELAP,NELAP
1,1,2-Trichloroethane	WADOE,DoD-ELAP,NELAP,ADEC
1,1,2-Trichloroethane	DoD-ELAP,NELAP,ADEC



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1,3-Dichloropropane	DoD-ELAP,NELAP,ADEC
1,3-Dichloropropane	WADOE,DoD-ELAP,NELAP,ADEC
Tetrachloroethene	DoD-ELAP,NELAP,ADEC
Tetrachloroethene	WADOE,DoD-ELAP,NELAP,ADEC
Dibromochloromethane	DoD-ELAP,NELAP,ADEC
Dibromochloromethane	WADOE,DoD-ELAP,NELAP,ADEC
1,2-Dibromoethane	WADOE,DoD-ELAP,NELAP,ADEC
1,2-Dibromoethane	DoD-ELAP,NELAP,ADEC
Chlorobenzene	DoD-ELAP,NELAP,ADEC
Chlorobenzene	WADOE,DoD-ELAP,NELAP,ADEC
Ethylbenzene	DoD-ELAP,NELAP,ADEC
Ethylbenzene	WADOE,DoD-ELAP,NELAP,ADEC
1,1,1,2-Tetrachloroethane	DoD-ELAP,NELAP,ADEC
1,1,1,2-Tetrachloroethane	WADOE,DoD-ELAP,NELAP,ADEC
m,p-Xylene	WADOE,DoD-ELAP,NELAP,ADEC
m,p-Xylene	DoD-ELAP,NELAP,ADEC
o-Xylene	DoD-ELAP,NELAP,ADEC
o-Xylene	WADOE,DoD-ELAP,NELAP,ADEC
Xylenes, total	WADOE
Xylenes, total	
Styrene	WADOE,DoD-ELAP,NELAP,ADEC
Styrene	DoD-ELAP,NELAP,ADEC
Bromoform	DoD-ELAP,NELAP,ADEC
Bromoform	WADOE,DoD-ELAP,NELAP,ADEC
1,1,2,2-Tetrachloroethane	WADOE,DoD-ELAP,NELAP,ADEC
1,1,2,2-Tetrachloroethane	DoD-ELAP,NELAP,ADEC
1,2,3-Trichloropropane	DoD-ELAP,NELAP,ADEC
1,2,3-Trichloropropane	WADOE,DoD-ELAP,NELAP,ADEC
trans-1,4-Dichloro 2-Butene	DoD-ELAP,NELAP
trans-1,4-Dichloro 2-Butene	WADOE,DoD-ELAP,NELAP
n-Propylbenzene	WADOE,DoD-ELAP,NELAP
n-Propylbenzene	DoD-ELAP,NELAP
Bromobenzene	DoD-ELAP,NELAP,ADEC
Bromobenzene	WADOE,DoD-ELAP,NELAP,ADEC
Isopropyl Benzene	DoD-ELAP,NELAP,ADEC
Isopropyl Benzene	WADOE,DoD-ELAP,NELAP,ADEC
2-Chlorotoluene	DoD-ELAP,NELAP
2-Chlorotoluene	WADOE,DoD-ELAP,NELAP
4-Chlorotoluene	DoD-ELAP,NELAP



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4-Chlorotoluene	WADOE,DoD-ELAP,NELAP
t-Butylbenzene	DoD-ELAP,NELAP
t-Butylbenzene	WADOE,DoD-ELAP,NELAP
1,3,5-Trimethylbenzene	WADOE,DoD-ELAP,NELAP
1,3,5-Trimethylbenzene	DoD-ELAP,NELAP
1,2,4-Trimethylbenzene	WADOE,DoD-ELAP,NELAP
1,2,4-Trimethylbenzene	DoD-ELAP,NELAP
s-Butylbenzene	DoD-ELAP,NELAP
s-Butylbenzene	WADOE,DoD-ELAP,NELAP
4-Isopropyl Toluene	WADOE,DoD-ELAP,NELAP
4-Isopropyl Toluene	DoD-ELAP,NELAP
1,3-Dichlorobenzene	WADOE,DoD-ELAP,NELAP
1,3-Dichlorobenzene	DoD-ELAP,NELAP
1,4-Dichlorobenzene	DoD-ELAP,NELAP
1,4-Dichlorobenzene	WADOE,DoD-ELAP,NELAP
n-Butylbenzene	WADOE,DoD-ELAP,NELAP
n-Butylbenzene	DoD-ELAP,NELAP
1,2-Dichlorobenzene	WADOE,DoD-ELAP,NELAP
1,2-Dichlorobenzene	DoD-ELAP,NELAP
1,2-Dibromo-3-chloropropane	DoD-ELAP,NELAP,ADEC
1,2-Dibromo-3-chloropropane	WADOE,DoD-ELAP,NELAP,ADEC
1,2,4-Trichlorobenzene	DoD-ELAP,NELAP,ADEC
1,2,4-Trichlorobenzene	WADOE,DoD-ELAP,NELAP,ADEC
Hexachloro-1,3-Butadiene	DoD-ELAP,NELAP,ADEC
Hexachloro-1,3-Butadiene	WADOE,DoD-ELAP,NELAP,ADEC
Naphthalene	DoD-ELAP,NELAP
Naphthalene	WADOE,DoD-ELAP,NELAP
1,2,3-Trichlorobenzene	DoD-ELAP,NELAP,ADEC
1,2,3-Trichlorobenzene	WADOE,DoD-ELAP,NELAP,ADEC
Dichlorodifluoromethane	DoD-ELAP,NELAP,ADEC
Dichlorodifluoromethane	WADOE,DoD-ELAP,NELAP,ADEC
Methyl tert-butyl Ether	DoD-ELAP,NELAP
Methyl tert-butyl Ether	WADOE,DoD-ELAP,NELAP
n-Hexane	
n-Hexane	WADOE
2-Pentanone	
2-Pentanone	WADOE
Dibromofluoromethane	WADOE
Dibromofluoromethane	



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4-Bromofluorobenzene
4-Bromofluorobenzene

WADOE

EPA 8260D in Water

Chloromethane	DoD-ELAP,ADEC,NELAP,WADOE
Chloromethane	DoD-ELAP,ADEC,NELAP
Vinyl Chloride	DoD-ELAP,ADEC,NELAP,WADOE
Vinyl Chloride	DoD-ELAP,ADEC,NELAP
Bromomethane	DoD-ELAP,ADEC,NELAP,WADOE
Bromomethane	DoD-ELAP,ADEC,NELAP
Chloroethane	DoD-ELAP,ADEC,NELAP,WADOE
Chloroethane	DoD-ELAP,ADEC,NELAP
Trichlorofluoromethane	DoD-ELAP,ADEC,NELAP,WADOE
Trichlorofluoromethane	DoD-ELAP,ADEC,NELAP
Acrolein	DoD-ELAP,NELAP
Acrolein	DoD-ELAP,NELAP,WADOE
1,1,2-Trichloro-1,2,2-Trifluoroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1,2-Trichloro-1,2,2-Trifluoroethane	DoD-ELAP,ADEC,NELAP
Acetone	DoD-ELAP,ADEC,NELAP
Acetone	DoD-ELAP,ADEC,NELAP,WADOE
1,1-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
1,1-Dichloroethene	DoD-ELAP,ADEC,NELAP
Iodomethane	DoD-ELAP,NELAP
Iodomethane	DoD-ELAP,NELAP,WADOE
Methylene Chloride	DoD-ELAP,ADEC,NELAP,WADOE
Methylene Chloride	DoD-ELAP,ADEC,NELAP
Acrylonitrile	DoD-ELAP,NELAP,WADOE
Acrylonitrile	DoD-ELAP,NELAP
Carbon Disulfide	DoD-ELAP,NELAP
Carbon Disulfide	DoD-ELAP,NELAP,WADOE
trans-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP
trans-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Vinyl Acetate	DoD-ELAP,NELAP,WADOE
Vinyl Acetate	DoD-ELAP,NELAP
1,1-Dichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1-Dichloroethane	DoD-ELAP,ADEC,NELAP
2-Butanone	DoD-ELAP,NELAP,WADOE
2-Butanone	DoD-ELAP,NELAP
2,2-Dichloropropane	DoD-ELAP,ADEC,NELAP
2,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE



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cis-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP
cis-1,2-Dichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Chloroform	DoD-ELAP,ADEC,NELAP,WADOE
Chloroform	DoD-ELAP,ADEC,NELAP
Bromochloromethane	DoD-ELAP,ADEC,NELAP
Bromochloromethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1,1-Trichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1,1-Trichloroethane	DoD-ELAP,ADEC,NELAP
1,1-Dichloropropene	DoD-ELAP,ADEC,NELAP
1,1-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
Carbon tetrachloride	DoD-ELAP,ADEC,NELAP
Carbon tetrachloride	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dichloroethane	DoD-ELAP,ADEC,NELAP
Benzene	DoD-ELAP,ADEC,NELAP,WADOE
Benzene	DoD-ELAP,ADEC,NELAP
Trichloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Trichloroethene	DoD-ELAP,ADEC,NELAP
1,2-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dichloropropane	DoD-ELAP,ADEC,NELAP
Bromodichloromethane	DoD-ELAP,ADEC,NELAP,WADOE
Bromodichloromethane	DoD-ELAP,ADEC,NELAP
Dibromomethane	DoD-ELAP,ADEC,NELAP,WADOE
Dibromomethane	DoD-ELAP,ADEC,NELAP
2-Chloroethyl vinyl ether	DoD-ELAP,ADEC,NELAP,WADOE
2-Chloroethyl vinyl ether	DoD-ELAP,ADEC,NELAP
4-Methyl-2-Pentanone	DoD-ELAP,NELAP
4-Methyl-2-Pentanone	DoD-ELAP,NELAP,WADOE
cis-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
cis-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP
Toluene	DoD-ELAP,ADEC,NELAP,WADOE
Toluene	DoD-ELAP,ADEC,NELAP
trans-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP
trans-1,3-Dichloropropene	DoD-ELAP,ADEC,NELAP,WADOE
2-Hexanone	DoD-ELAP,NELAP
2-Hexanone	DoD-ELAP,NELAP,WADOE
1,1,2-Trichloroethane	DoD-ELAP,ADEC,NELAP
1,1,2-Trichloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,3-Dichloropropane	DoD-ELAP,ADEC,NELAP



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1,3-Dichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
Tetrachloroethene	DoD-ELAP,ADEC,NELAP,WADOE
Tetrachloroethene	DoD-ELAP,ADEC,NELAP
Dibromochloromethane	DoD-ELAP,ADEC,NELAP,WADOE
Dibromochloromethane	DoD-ELAP,ADEC,NELAP
1,2-Dibromoethane	DoD-ELAP,NELAP
1,2-Dibromoethane	DoD-ELAP,NELAP,WADOE
Chlorobenzene	DoD-ELAP,ADEC,NELAP
Chlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
Ethylbenzene	DoD-ELAP,ADEC,NELAP,WADOE
Ethylbenzene	DoD-ELAP,ADEC,NELAP
1,1,1,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP
1,1,1,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,WADOE
m,p-Xylene	DoD-ELAP,ADEC,NELAP
m,p-Xylene	DoD-ELAP,ADEC,NELAP,WADOE
o-Xylene	DoD-ELAP,ADEC,NELAP
o-Xylene	DoD-ELAP,ADEC,NELAP,WADOE
Styrene	DoD-ELAP,NELAP
Styrene	DoD-ELAP,NELAP,WADOE
Bromoform	DoD-ELAP,NELAP
Bromoform	DoD-ELAP,NELAP,WADOE
1,1,2,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP,WADOE
1,1,2,2-Tetrachloroethane	DoD-ELAP,ADEC,NELAP
1,2,3-Trichloropropane	DoD-ELAP,ADEC,NELAP,WADOE
1,2,3-Trichloropropane	DoD-ELAP,ADEC,NELAP
trans-1,4-Dichloro 2-Butene	DoD-ELAP,ADEC,NELAP
trans-1,4-Dichloro 2-Butene	DoD-ELAP,ADEC,NELAP,WADOE
n-Propylbenzene	DoD-ELAP,NELAP,WADOE
n-Propylbenzene	DoD-ELAP,NELAP
Bromobenzene	DoD-ELAP,NELAP,WADOE
Bromobenzene	DoD-ELAP,NELAP
Isopropyl Benzene	DoD-ELAP,NELAP
Isopropyl Benzene	DoD-ELAP,NELAP,WADOE
2-Chlorotoluene	DoD-ELAP,ADEC,NELAP
2-Chlorotoluene	DoD-ELAP,ADEC,NELAP,WADOE
4-Chlorotoluene	DoD-ELAP,ADEC,NELAP,WADOE
4-Chlorotoluene	DoD-ELAP,ADEC,NELAP
t-Butylbenzene	DoD-ELAP,NELAP,WADOE
t-Butylbenzene	DoD-ELAP,NELAP



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1,3,5-Trimethylbenzene	DoD-ELAP,NELAP,WADOE
1,3,5-Trimethylbenzene	DoD-ELAP,NELAP
1,2,4-Trimethylbenzene	DoD-ELAP,NELAP,WADOE
1,2,4-Trimethylbenzene	DoD-ELAP,NELAP
s-Butylbenzene	DoD-ELAP,NELAP
s-Butylbenzene	DoD-ELAP,NELAP,WADOE
4-Isopropyl Toluene	DoD-ELAP,NELAP
4-Isopropyl Toluene	DoD-ELAP,NELAP,WADOE
1,3-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,3-Dichlorobenzene	DoD-ELAP,ADEC,NELAP
1,4-Dichlorobenzene	DoD-ELAP,ADEC,NELAP
1,4-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
n-Butylbenzene	DoD-ELAP,NELAP
n-Butylbenzene	DoD-ELAP,NELAP,WADOE
1,2-Dichlorobenzene	DoD-ELAP,ADEC,NELAP
1,2-Dichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dibromo-3-chloropropane	DoD-ELAP,ADEC,NELAP,WADOE
1,2-Dibromo-3-chloropropane	DoD-ELAP,ADEC,NELAP
1,2,4-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,2,4-Trichlorobenzene	DoD-ELAP,ADEC,NELAP
Hexachloro-1,3-Butadiene	DoD-ELAP,ADEC,NELAP,WADOE
Hexachloro-1,3-Butadiene	DoD-ELAP,ADEC,NELAP
Naphthalene	DoD-ELAP,ADEC,NELAP
Naphthalene	DoD-ELAP,ADEC,NELAP,WADOE
1,2,3-Trichlorobenzene	DoD-ELAP,ADEC,NELAP,WADOE
1,2,3-Trichlorobenzene	DoD-ELAP,ADEC,NELAP
Dichlorodifluoromethane	DoD-ELAP,ADEC,NELAP,WADOE
Dichlorodifluoromethane	DoD-ELAP,ADEC,NELAP
Methyl tert-butyl Ether	DoD-ELAP,ADEC,NELAP
Methyl tert-butyl Ether	DoD-ELAP,ADEC,NELAP,WADOE
n-Hexane	
n-Hexane	WADOE
2-Pentanone	WADOE
2-Pentanone	

EPA 9014 in Solid

Cyanide, Total after Distillation	DoD-ELAP,NELAP
Cyanide, Total after Distillation	DoD-ELAP,NELAP,WADOE

EPA 9014 in Water

Cyanide, Total	DoD-ELAP,NELAP
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Cyanide, Total DoD-ELAP,NELAP,WADOE

EPA 9060A m in Solid

Total Organic Carbon WADOE

Total Organic Carbon

NWTPH-Dx in Solid

Diesel Range Organics (C12-C24) DoD-ELAP,NELAP,WADOE

Diesel Range Organics (C12-C24) DoD-ELAP,NELAP

Diesel Range Organics (C10-C25) DoD-ELAP,NELAP

Diesel Range Organics (C10-C25) DoD-ELAP,NELAP,WADOE

Diesel Range Organics (Tol-C18) DoD-ELAP,NELAP

Diesel Range Organics (Tol-C18) DoD-ELAP,NELAP,WADOE

Diesel Range Organics (C10-C24) DoD-ELAP,NELAP

Diesel Range Organics (C10-C24) DoD-ELAP,NELAP,WADOE

Diesel Range Organics (C10-C28) DoD-ELAP,NELAP

Diesel Range Organics (C10-C28) DoD-ELAP,NELAP,WADOE

Diesel Range Organics (C12-C22) DoD-ELAP

Diesel Range Organics (C12-C22) DoD-ELAP

Motor Oil Range Organics (C24-C38) DoD-ELAP,NELAP,WADOE

Motor Oil Range Organics (C24-C38) DoD-ELAP,NELAP

Motor Oil Range Organics (C25-C36) DoD-ELAP,NELAP,WADOE

Motor Oil Range Organics (C25-C36) DoD-ELAP,NELAP

Motor Oil Range Organics (C24-C40) DoD-ELAP,NELAP

Motor Oil Range Organics (C24-C40) DoD-ELAP,NELAP,WADOE

Residual Range Organics (C23-C32) DoD-ELAP

Residual Range Organics (C23-C32) DoD-ELAP

Mineral Oil Range Organics (C16-C28) DoD-ELAP,NELAP,WADOE

Mineral Oil Range Organics (C16-C28) DoD-ELAP,NELAP

Mineral Spirits Range Organics (Tol-C12) DoD-ELAP,NELAP,WADOE

Mineral Spirits Range Organics (Tol-C12) DoD-ELAP,NELAP

JP8 Range Organics (C8-C18) DoD-ELAP,NELAP,WADOE

JP8 Range Organics (C8-C18) DoD-ELAP,NELAP

JP5 Range Organics (C10-C16) DoD-ELAP,NELAP

JP5 Range Organics (C10-C16) DoD-ELAP,NELAP,WADOE

JP4 Range Organics (Tol-C14) DoD-ELAP,NELAP

JP4 Range Organics (Tol-C14) DoD-ELAP,NELAP,WADOE

Jet-A Range Organics (C10-C18) DoD-ELAP,NELAP,WADOE

Jet-A Range Organics (C10-C18) DoD-ELAP,NELAP

Kerosene Range Organics (Tol-C18) DoD-ELAP,NELAP

Kerosene Range Organics (Tol-C18) DoD-ELAP,NELAP,WADOE



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Stoddard Range Organics (C8-C12)	DoD-ELAP,NELAP,WADOE
Stoddard Range Organics (C8-C12)	DoD-ELAP,NELAP
Creosote Range Organics (C12-C22)	DoD-ELAP,NELAP
Creosote Range Organics (C12-C22)	DoD-ELAP,NELAP,WADOE
Bunker C Range Organics (C10-C38)	DoD-ELAP,NELAP,WADOE
Bunker C Range Organics (C10-C38)	DoD-ELAP,NELAP
Transformer Oil Range Organics (C12-C28)	DoD-ELAP,NELAP
Transformer Oil Range Organics (C12-C28)	DoD-ELAP,NELAP,WADOE

NWTPH-Dx in Water

Diesel Range Organics (C12-C24)	DoD-ELAP,NELAP,WADOE
Diesel Range Organics (C12-C24)	DoD-ELAP,NELAP
Diesel Range Organics (C10-C25)	DoD-ELAP,NELAP
Diesel Range Organics (C10-C25)	DoD-ELAP,NELAP,WADOE
Diesel Range Organics (Tol-C18)	DoD-ELAP,NELAP,WADOE
Diesel Range Organics (Tol-C18)	DoD-ELAP,NELAP
Diesel Range Organics (C10-C24)	DoD-ELAP,NELAP
Diesel Range Organics (C10-C24)	DoD-ELAP,NELAP,WADOE
Diesel Range Organics (C10-C28)	DoD-ELAP,NELAP,WADOE
Diesel Range Organics (C10-C28)	DoD-ELAP,NELAP
Diesel Range Organics (C12-C22)	DoD-ELAP
Diesel Range Organics (C12-C22)	DoD-ELAP
Diesel Range Organics (C12-C25)	DoD-ELAP
Diesel Range Organics (C12-C25)	DoD-ELAP
Motor Oil Range Organics (C24-C38)	DoD-ELAP,NELAP,WADOE
Motor Oil Range Organics (C24-C38)	DoD-ELAP,NELAP
Motor Oil Range Organics (C25-C36)	DoD-ELAP,NELAP,WADOE
Motor Oil Range Organics (C25-C36)	DoD-ELAP,NELAP
Motor Oil Range Organics (C24-C40)	DoD-ELAP,NELAP
Motor Oil Range Organics (C24-C40)	DoD-ELAP,NELAP,WADOE
Residual Range Organics (C23-C32)	DoD-ELAP
Residual Range Organics (C23-C32)	DoD-ELAP
Mineral Spirits Range Organics (Tol-C12)	DoD-ELAP,NELAP,WADOE
Mineral Spirits Range Organics (Tol-C12)	DoD-ELAP,NELAP
Mineral Oil Range Organics (C16-C28)	DoD-ELAP,NELAP
Mineral Oil Range Organics (C16-C28)	DoD-ELAP,NELAP,WADOE
Kerosene Range Organics (Tol-C18)	DoD-ELAP,NELAP
Kerosene Range Organics (Tol-C18)	DoD-ELAP,NELAP,WADOE
JP8 Range Organics (C8-C18)	DoD-ELAP,NELAP
JP8 Range Organics (C8-C18)	DoD-ELAP,NELAP,WADOE



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JP5 Range Organics (C10-C16)	DoD-ELAP,NELAP
JP5 Range Organics (C10-C16)	DoD-ELAP,NELAP,WADOE
JP4 Range Organics (Tol-C14)	DoD-ELAP,NELAP,WADOE
JP4 Range Organics (Tol-C14)	DoD-ELAP,NELAP
Jet-A Range Organics (C10-C18)	DoD-ELAP,NELAP,WADOE
Jet-A Range Organics (C10-C18)	DoD-ELAP,NELAP
Creosote Range Organics (C12-C22)	DoD-ELAP,NELAP,WADOE
Creosote Range Organics (C12-C22)	DoD-ELAP,NELAP
Bunker C Range Organics (C10-C38)	DoD-ELAP,NELAP
Bunker C Range Organics (C10-C38)	DoD-ELAP,NELAP,WADOE
Stoddard Range Organics (C8-C12)	DoD-ELAP,NELAP
Stoddard Range Organics (C8-C12)	DoD-ELAP,NELAP,WADOE
Transformer Oil Range Organics (C12-C28)	DoD-ELAP,NELAP,WADOE
Transformer Oil Range Organics (C12-C28)	DoD-ELAP,NELAP

NWTPHg in Solid

Gasoline Range Organics (Tol-Nap)	DoD-ELAP
Gasoline Range Organics (Tol-Nap)	DoD-ELAP
Gasoline Range Organics (2MP-TMB)	DoD-ELAP
Gasoline Range Organics (2MP-TMB)	DoD-ELAP
Gasoline Range Organics (Tol-C12)	DoD-ELAP
Gasoline Range Organics (Tol-C12)	DoD-ELAP
Gasoline Range Organics (C6-C10)	DoD-ELAP
Gasoline Range Organics (C6-C10)	DoD-ELAP
Gasoline Range Organics (C5-C12)	DoD-ELAP
Gasoline Range Organics (C5-C12)	DoD-ELAP
4-Bromofluorobenzene (field spiked)	DoD-ELAP
4-Bromofluorobenzene (field spiked)	DoD-ELAP

NWTPHg in Water

Gasoline Range Organics (Tol-Nap)	WADOE,DoD-ELAP
Gasoline Range Organics (Tol-Nap)	DoD-ELAP
Gasoline Range Organics (2MP-TMB)	DoD-ELAP
Gasoline Range Organics (2MP-TMB)	WADOE,DoD-ELAP
Gasoline Range Organics (Tol-C12)	DoD-ELAP
Gasoline Range Organics (Tol-C12)	WADOE,DoD-ELAP
Gasoline Range Organics (C6-C10)	ADEC,DoD-ELAP
Gasoline Range Organics (C6-C10)	WADOE,ADEC,DoD-ELAP
Gasoline Range Organics (C5-C12)	DoD-ELAP
Gasoline Range Organics (C5-C12)	WADOE,DoD-ELAP



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SM 4500-CN⁻ I-97 in Water

Cyanide, Weak Acid Dissociable NELAP,WADOE
Cyanide, Weak Acid Dissociable NELAP

Code	Description	Number	Expires
ADEC	Alaska Dept of Environmental Conservation	17-015	03/28/2023
DoD-ELAP	DoD-Environmental Laboratory Accreditation Program	66169	02/28/2022
NELAP	ORELAP - Oregon Laboratory Accreditation Program	WA100006-012	05/12/2022



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Notes and Definitions

- * Flagged value is not within established control limits.
- D The reported value is from a dilution
- E The analyte concentration exceeds the upper limit of the calibration range of the instrument established by the initial calibration (ICAL)
- H Hold time violation - Hold time was exceeded.
- J Estimated concentration value detected below the reporting limit.
- L Analyte concentration is ≤ 5 times the reporting limit and the replicate control limit defaults to \pm RL instead of 20% RPD
- Q Indicates a detected analyte with an initial or continuing calibration that does not meet established acceptance criteria ($< 20\%$ RSD, $< 20\%$ drift or minimum RRF)
- U This analyte is not detected above the reporting limit (RL) or if noted, not detected above the limit of detection (LOD).
- DET Analyte DETECTED
- ND Analyte NOT DETECTED at or above the reporting limit
- NR Not Reported
- dry Sample results reported on a dry weight basis
- RPD Relative Percent Difference
- [2C] Indicates this result was quantified on the second column on a dual column analysis.