

010001

SOUTHWEST RESEARCH INSTITUTE

NUCLEAR PROJECT

CLIENT: Division 20

TASK ORDER: 051219-5

SRR: 28420

SDG: 271245

CASE: L. Yang

VTSR: December 16, 2005

PROJECT#: 06002.01.322

FINAL REPORT

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010002

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 12/16/05

Matrix: Liquid

Project No.: 06002.01.322

Task Order: 051219-5

SRR: 28420

Method: ICP SW846 6010B

Client ID	Lab Sample ID	Potassium Result (mg/L)	Sodium Result (mg/L)
Prep Blank	PBW-M20H1	<1.50	<1.50
Lab Control	LCSW-M20H1	99.4	98.0
True Value	-----	100	100
Recovery	-----	99.4%	98.0%
Cond.A-130°C 12/9/05	271245	<1.50	2.35
Duplicate result	271245	<1.50	2.64
RPD	-----	0.00%	11.6%
Spike result	271245	103	105
Spike added	-----	100	100
Recovery	-----	103%	103%
Cond.A-150°C 12/12/05	271246	<1.50	<1.50
Cond.A-180°C 12/13/05	271247	3.64	4.09
Cond.A-210°C 12/15/05	271248	13.2	20.4
Cond.A-230°C 12/15/05	271249	27.3	23.9

Reporting Limit:

1.50 mg/L

1.50 mg/L

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010003

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 12/16/05

Matrix: Solid

Project No.: 06002.01.322

Task Order: 051219-5

SRR: 28420

Method: ICP SW846 6010B

Client ID	Lab Sample ID	Potassium Result (mg/Kg)	Sodium Result (mg/Kg)
Prep Blank	PBW-M19E2	<30.0	<30.0
Lab Control	LCSW-M19E2	1960	1950
True Value	-----	2000	2000
Recovery	-----	98.0%	97.5%
Sol.A-230°C 12/15/05	271250	154000	170000
Duplicate result	271250	152000	173000
RPD	-----	1.31%	1.75%
Spike result	271250	157000	169000
Spike added	-----	1905	1905
Recovery	-----	157%	-52.5%

Reporting Limit:

30.0 mg/Kg

30.0 mg/Kg

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010004

Sample ID

Cond.A-130°C 12/9/05

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 12/16/05

Matrix: Liquid

Project No.: 06002.01.322

Lab System ID: 271245

SRR: 28420

Method: IC - EPA 300

Task Order: 051219-5

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	0.681	0.1
Fluoride	0.112	0.1
Nitrate-N	0.396	0.1
Nitrite-N	1.23	0.1
Phosphate-P	<0.1	0.1
Sulfate	<0.1	0.1

SOUTHWEST RESEARCH INSTITUTE

DUPLICATE SUMMARY

010005

Sample ID

Cond.A-130°C 12/9/05

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 12/16/05

Matrix: Liquid

Project No.: 06002.01.322

Lab System ID: 271245

SRR: 28420

Method: IC - EPA 300

Task Order: 051219-5

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Bromide	<0.1	<0.1	0.00%
Chloride	0.681	0.934	31.3%
Fluoride	0.112	0.113	0.89%
Nitrate-N	0.396	0.411	3.72%
Nitrite-N	1.23	1.22	0.82%
Phosphate-P	<0.1	<0.1	0.00%
Sulfate	<0.1	<0.1	0.00%

SOUTHWEST RESEARCH INSTITUTE

MATRIX SPIKE SUMMARY

010006

Sample ID

Cond.A-130°C 12/9/05

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 12/16/05

Matrix: Liquid

Project No.: 06002.01.322

Lab System ID: 271245

SRR: 28420

Method: IC - EPA 300

Task Order: 051219-5

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Bromide	<0.1	4.05	4.00	101%
Chloride	0.681	2.59	2.00	95.5%
Fluoride	0.112	0.860	1.00	74.8%
Nitrate-N	0.396	1.20	0.904	88.9%
Nitrite-N	1.23	2.73	1.59	94.3%
Phosphate-P	<0.1	1.92	1.91	101%
Sulfate	<0.1	4.03	4.00	101%

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010007

Sample ID

Cond.A-150°C 12/12/05

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 12/16/05

Matrix: Liquid

Project No.: 06002.01.322

Lab System ID: 271246

SRR: 28420

Method: IC - EPA 300

Task Order: 051219-5

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	0.358	0.1
Fluoride	0.118	0.1
Nitrate-N	0.450	0.1
Nitrite-N	0.330	0.1
Phosphate-P	<0.1	0.1
Sulfate	<0.1	0.1

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010008

Sample ID

Cond.A-180°C 12/13/05

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 12/16/05

Matrix: Liquid

Project No.: 06002.01.322

Lab System ID: 271247

SRR: 28420

Method: IC - EPA 300

Task Order: 051219-5

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	1.58	0.1
Fluoride	0.155	0.1
Nitrate-N	8.69	0.1
Nitrite-N	1.33	0.1
Phosphate-P	0.596	0.1
Sulfate	<0.1	0.1

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010009

Sample ID

Cond.A-210°C 12/15/05

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 12/16/05

Matrix: Liquid

Project No.: 06002.01.322

Lab System ID: 271248

SRR: 28420

Method: IC - EPA 300

Task Order: 051219-5

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<2	2
Chloride	116	2
Fluoride	2.19	2
Nitrate-N	204	2
Nitrite-N	2.37	2
Phosphate-P	2.47	2
Sulfate	<2	2

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010010

Sample ID

Cond.A-230°C 12/15/05

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 12/16/05

Matrix: Liquid

Project No.: 06002.01.322

Lab System ID: 271249

SRR: 28420

Method: IC - EPA 300

Task Order: 051219-5

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	13.7	2
Chloride	420	10
Fluoride	2.29	2
Nitrate-N	310	2
Nitrite-N	3.42	2
Phosphate-P	3.98	2
Sulfate	<2	2

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010011

Sample ID

Sol.A-230°C 12/15/05

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 12/16/05

Matrix: Solid

Project No.: 06002.01.322

Lab System ID: 271250

SRR: 28420

Method: IC - EPA 300

Task Order: 051219-5

Analysis	Sample Result (mg/Kg)	Reporting Limit (mg/Kg)
Bromide	<981	981
Chloride	108000	1960
Fluoride	<981	981
Nitrate-N	107000	1960
Nitrite-N	<981	981
Phosphate-P	18300	981
Sulfate	<981	981

SOUTHWEST RESEARCH INSTITUTE

DUPLICATE SUMMARY

010012

Sample ID

Sol.A-230°C 12/15/05

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 12/16/05

Matrix: Solid

Project No.: 06002.01.322

Lab System ID: 271250

SRR: 28420

Method: IC - EPA 300

Task Order: 051219-5

Analysis	Sample Result (mg/Kg)	Duplicate Result (mg/Kg)	RPD
Bromide	<981	<892	0.00%
Chloride	108000	110000	1.83%
Fluoride	<981	<981	0.00%
Nitrate-N	107000	107000	0.00%
Nitrite-N	<981	<892	0.00%
Phosphate-P	18300	18700	2.16%
Sulfate	<981	<892	0.00%

SOUTHWEST RESEARCH INSTITUTE

MATRIX SPIKE SUMMARY

010013

Sample ID

Sol.A-230°C 12/15/05

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 12/16/05

Matrix: Solid

Project No.: 06002.01.322

Lab System ID: 271250

SRR: 28420

Method: IC - EPA 300

Task Order: 051219-5

Analysis	Sample Result (mg/Kg)	Spike Result (mg/Kg)	Spike Added (mg/Kg)	Recovery
Bromide	<981	19900	19600	102%
Chloride	108000	137000	19600	148%
Fluoride	<981	4400	4900	89.8%
Nitrate-N	107000	116000	8858	102%
Nitrite-N	<981	7590	7800	97.3%
Phosphate-P	18300	28200	9340	106%
Sulfate	<981	19400	19600	99.0%

SOUTHWEST RESEARCH INSTITUTE

LABORATORY CONTROL SAMPLE

010014

Sample ID

LCSW - 12/20/05

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Liquid

Project No.: 06002.01.322

Lab System ID: NA

SRR: 28420

Method: IC - EPA 300

Task Order: 051219-5

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Bromide	391	400	97.8%
Chloride	200	200	100%
Fluoride	95.0	100	95.0%
Nitrate-N	83.2	90.4	92.0%
Nitrite-N	153	159	96.2%
Phosphate-P	188	191	98.4%
Sulfate	388	400	97.0%

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE

LABORATORY CONTROL SAMPLE

010015

Sample ID

LCSW - 12/21/05

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Liquid

Project No.: 06002.01.322

Lab System ID: NA

SRR: 28420

Method: IC - EPA 300

Task Order: 051219-5

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Bromide	402	400	101%
Chloride	204	200	102%
Fluoride	95.8	100	95.8%
Nitrate-N	86.1	90.4	95.2%
Nitrite-N	155	159	97.5%
Phosphate-P	194	191	102%
Sulfate	396	400	99.0%

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE

BLANK SUMMARY

010016

Sample ID

PBW - M19E3

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Solid

Project No.: 06002.01.322

Lab System ID: NA

SRR: 28420

Method: IC - EPA 300

Task Order: 051219-5

Analysis	Sample Result (mg/Kg)	Reporting Limit (mg/Kg)
Bromide	<10	10
Chloride	<10	10
Fluoride	<10	10
Nitrate-N	<10	10
Nitrite-N	<10	10
Phosphate-P	<10	10
Sulfate	<10	10

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE

BLANK SUMMARY

010017

Sample ID

PBW - 12/20/05

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Liquid

Project No.: 06002.01.322

Lab System ID: NA

SRR: 28420

Method: IC - EPA 300

Task Order: 051219-5

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	<0.1	0.1
Fluoride	<0.1	0.1
Nitrate-N	<0.1	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.1	0.1
Sulfate	<0.1	0.1

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE

BLANK SUMMARY

010018

Sample ID

PBW - 12/21/05

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Liquid

Project No.: 06002.01.322

Lab System ID: NA

SRR: 28420

Method: IC - EPA 300

Task Order: 051219-5

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	<0.1	0.1
Fluoride	<0.1	0.1
Nitrate-N	<0.1	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.1	0.1
Sulfate	<0.1	0.1

NA- Not Applicable.

010019

**SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT**

CLIENT: Division 20

TASK ORDER: 051219-5

SRR: 28420

SDG: 271245

CASE: L. Yang

VTSR: December 16, 2005

PROJECT#: 06002.01.322

Task Orders/01-QPP-015

Laboratory Task Order

TO #: 051219-5 Revision: 0

SDG: 271245
VTSR: 12/16/05
CASE: CNWRASRR #s: 28420
Client(s): Div. 20Project(s): 06002.01.322
Manager(s): SPIES, RADONNA
To PM: 12/22/05
To QA: 12/27/05
To Client: 12/29/05

010020

Instructions

DIVISION 20 - CNWRA. 1-WEEK TAT. Using 6-day TAT for PM/preliminary, 11-day TAT for DRG/QAU; 13-day TAT hardcopy; subject to change.

Work is 10 CFR 50 Appendix B, 10 CFR Part 21, contact MARK EHNSTROM (ext. 3530) or CHARLIE BUTCHER (ext. 5928, pager 271-5172) or JO ANN BOYD (ext. 2169) BEFORE STARTING ANY WORK ON THIS TASK ORDER.

**** NOTE **** Somewhere on your data, please make a notation indicating WHO and WHEN Mark Ehnstrom or Charlie Butcher or Jo Ann Boyd were contacted. This will help facilitate the final package to QA.

SIX samples received for NO3, CL, by IC analyses and Na an K by ICP analysis. Point of Contact is LIETAI YANG (x2483, lietai.yang@swri.org).

CONTACT PM WITH ANY ADDITIONAL QUESTIONS.

Documents Related to this task order: 20500[COC 28420]

Test: DIG-MISCACIDS
Section: METALPREP

Holding: 180 days from CED

Digestion Miscellaneous Acids

Cnt: 1

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
271250		1	Solid	Cond.A-230 °C 12/15/05	15 Dec 05	13 Jun 06

Test: DIL-DILUTION
Section: METALPREP

Holding: 28 days from CED

Prep, Dilution

Cnt: 5

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
271245		1	Liquid	Cond.A-130 °C 12/9/05	09 Dec 05	06 Jan 06
271246		1	Liquid	Cond.A-150 °C 12/12/05	12 Dec 05	09 Jan 06
271247		1	Liquid	Cond.A-180 °C 12/13/05	13 Dec 05	10 Jan 06
271248		1	Liquid	Cond.A-210 °C 12/15/05	15 Dec 05	12 Jan 06
271249		1	Liquid	Cond.A-230 °C 12/15/05	15 Dec 05	12 Jan 06

Test: IC-SWRI
Section: WETCHEM

Holding: 28 days from CED

Ion Chromatography by SwRI Method - Chloride and Nitrate

Cnt: 6

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
271245		1	Liquid	Cond.A-130 °C 12/9/05	09 Dec 05	06 Jan 06
271246		1	Liquid	Cond.A-150 °C 12/12/05	12 Dec 05	09 Jan 06
271247		1	Liquid	Cond.A-180 °C 12/13/05	13 Dec 05	10 Jan 06
271248		1	Liquid	Cond.A-210 °C 12/15/05	15 Dec 05	12 Jan 06
271249		1	Liquid	Cond.A-230 °C 12/15/05	15 Dec 05	12 Jan 06
271250		1	Solid	Cond.A-230 °C 12/15/05	15 Dec 05	12 Jan 06

Test: ICP-SWRI
Section: METALS

Holding: 180 days from CED

ICP Analysis by SwRI Method - Sodium and Potassium

Cnt: 6

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
271245		1	Liquid	Cond.A-130 °C 12/9/05	09 Dec 05	07 Jun 06
271246		1	Liquid	Cond.A-150 °C 12/12/05	12 Dec 05	10 Jun 06
271247		1	Liquid	Cond.A-180 °C 12/13/05	13 Dec 05	11 Jun 06
271248		1	Liquid	Cond.A-210 °C 12/15/05	15 Dec 05	13 Jun 06
271249		1	Liquid	Cond.A-230 °C 12/15/05	15 Dec 05	13 Jun 06

Laboratory Task Order

TO #: 051219-5 Revision: 0

SDG: 271245
VTSR: 12/16/05
CASE: CNWRASRR #'s: 28420
Client(s): Div. 20Project(s): 06002.01.322
Manager(s): SPIES, RADONNA
To PM: 12/22/05
To QA: 12/27/05
To Client: 12/29/05**010021**

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
271250		1	Solid	Cond.A-230 °C 12/15/05	15 Dec 05	13 Jun 06

Southwest Research Institute

Project: 06002.01.322
Case #: L. Yang
Client: Div. 20

Sample Receipt

Sample Receipt Number: 28420

VTSR: 12/16/05

010022

Time: 14:45:00

Manager: SPIES, RADONNA
Logged in by: Dino.Roman
Creation Date: 12/16/05

Notes

Samples were hand delivered intact at 22.0 °C

Parameters: Analysis/see Task Order.

See chain of custody as part of the SRR system for more information. Contact R. Spies at X3242 for questions.

*** Dino.Roman Dec 16 2005 4:50PM ***

System ID	Customer ID	CED	Matrix	Containers	Special Reqs.
271245	Cond.A-130 °C 12/9/05	12/09/05	Liquid	1	
271246	Cond.A-150 °C 12/12/05	12/12/05	Liquid	1	
271247	Cond.A-180 °C 12/13/05	12/13/05	Liquid	1	
271248	Cond.A-210 °C 12/15/05	12/15/05	Liquid	1	
271249	Cond.A-230 °C 12/15/05	12/15/05	Liquid	1	
271250	Cond.A-230 °C 12/15/05	12/15/05	Solid	1	
Containers: 6				Samples: 6	

These documents are associated with this receipt: 20500[COC 28420]

Thermometer: 027
Temperature: 22.0

Client: Div. 20

SR#: 28420

FRM-002

01-QPP-015
Division 01
Revision 5
June 2004

010023

Document No. _____



Chemistry and Chemical
Engineering Division

QUALITY PROJECT PLAN FOR

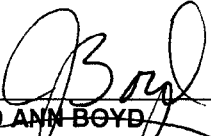
**PERFORMANCE OF CHEMICAL ANALYSES
FOR COMMERCIAL NUCLEAR POWER PLANTS
WITHIN THE DEPARTMENT OF ANALYTICAL
AND ENVIRONMENTAL CHEMISTRY**

SOUTHWEST RESEARCH INSTITUTE
Chemistry and Chemical Engineering Division
6220 CULEBRA ROAD, SAN ANTONIO, TEXAS 78238

QUALITY PROJECT PLAN FOR PERFORMANCE OF CHEMICAL ANALYSES
FOR COMMERCIAL NUCLEAR POWER PLANTS
WITHIN THE DEPARTMENT OF ANALYTICAL AND ENVIRONMENTAL CHEMISTRY


SwRI AUTHORIZATION SIGNATORIES

This is to certify that this Quality Project Plan of Southwest Research Institute (SwRI) has been reviewed and approved by the following personnel:


JO ANN BOYD
Quality Assurance Manager


(210) 522-2169

6/4/04
DATE


REZA KARIMI
Director, Department of Analytical and Environmental Chemistry

(210) 522-2412

6/4/04
DATE


MICHAEL G. MACNAUGHTON
Vice President, Chemistry and Chemical Engineering Division

(210) 522-5162

6/4/04
DATE


CHRISTOPHER HOBSON
Quality Assurance Engineer

(210) 522-5838

6/4/2004
DATE

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**PERFORMANCE OF CHEMICAL ANALYSES
FOR COMMERCIAL NUCLEAR POWER PLANTS WITHIN THE
DEPARTMENT OF ANALYTICAL AND ENVIRONMENTAL CHEMISTRY**

1.0 INTRODUCTION

This Quality Project Plan (QPP) defines the Quality Assurance (QA) program requirements for personnel providing the chemical analyses for commercial nuclear power plants. Southwest Research Institute (SwRI) **Program Quality Plan (PQP-Nuclear)**, *Nuclear Services* shall implement the QA requirements. Project activities controlled by the PQP-Nuclear shall be accomplished as specified by the appropriate sections of **01-QAP-004**, *Quality Assurance Plan for Analytical and Environmental Services* and/or nationally recognized testing methods as specified on individual purchase orders. This QPP shall be applied to all projects initiated for nuclear utilities in the Department of Analytical and Environmental Chemistry. If, as a result of complexity, duration, or other factors, it is determined that a unique, project-specific quality plan is required, the project QAE shall notify the Project Manager and a project-specific quality plan shall be generated in accordance with **SOP-01-4.2.1**, *Preparation and Revision of Documented Procedures*.

2.0 SCOPE

This Quality Project Plan shall be applied to the chemical analyses performed for commercial nuclear power plants by the Department of Analytical and Environmental Chemistry within the Chemistry and Chemical Engineering Division. Although the majority of the work performed for nuclear facilities resides within the Department of Analytical and Environmental Chemistry, other departments within the division may utilize this Quality Project Plan as deemed necessary when nuclear projects are conducted.

3.0 REFERENCES

- 3.1 *SwRI Quality System Manual – 2000*
- 3.2 *10 CFR 50, Appendix B, ASME NQA-1*
- 3.3 *SwRI Program Quality Plan (PQP-Nuclear), Nuclear Services*
- 3.4 *01-QAP-004, Quality Assurance Plan for Analytical and Environmental Services*

4.0 APPLICABLE SECTIONS OF SwRI PROGRAM QUALITY PLAN (PQP-NUCLEAR)

4.1 Indoctrination and Training

- 4.1.1 Personnel performing duties affecting quality shall receive quality training to the *SwRI Program Quality Plan (PQP-Nuclear), Nuclear Services* prior to performing any work on projects for nuclear utilities. This training will be conducted either by Institute Quality Systems (IQS) or Division 01 Quality Assurance personnel and documentation shall be evident in the personnel training files maintained in Division

01 Quality Assurance.

- 4.1.2 Indoctrination and training of personnel shall be conducted in accordance with **SOP-01-6.2.1, *Qualification and Training***.

4.2 Qualification of Personnel

- 4.2.1 Testing personnel shall be designated as qualified to perform applicable project activities as specified in **SOP-01-6.2.1, *Qualification and Training***.
- 4.2.2 During the performance of each testing process, testing personnel shall have access to the necessary documented procedures, i.e., QPP, QAP, Task Order, Division Quality System Standard Operating Procedures (SOPs), and applicable test/analytical procedures (TAPs) available for ready reference.
- 4.2.3 Any person who has not performed testing activities associated with any particular method being used for nuclear utilities projects for a period of one year shall be reevaluated prior to the conduct of the test.
- 4.2.4 Quality Assurance personnel witnessing the testing process for nuclear utilities shall have documented evidence of qualifications maintained by Institute Quality Systems or Division 01 Quality Assurance.

4.3 Design Control

Not applicable to activities conducted within the Department of Analytical and Environmental Chemistry.

4.4 Right of Access

- 4.4.1 Procurement documents shall provide for access to the suppliers' facilities and records for surveillance, inspection, or audit by SwRI and clients.
- 4.4.2 Where appropriate, quality clause **Q32** shall be noted on the procurement documents to indicate that right of access for inspection and surveillance of activities associated with the order shall be afforded to SwRI and clients.

4.5 Control of Supplier-Generated Documents

- 4.5.1 Client documents shall be controlled in accordance with **SOP-01-4.2.1, *Preparation and Revision of Documented Procedures***. These procedures provide the requirements for the preparation, review, approval, issue, distribution, and revision of documents controlled by the Chemistry and Chemical Engineering Division.
- 4.5.2 Documents may be controlled as Plans or Work Instructions and shall be accessible through the Division Intranet link, **Contract Requirements** as PDF files.
- 4.5.3 Nationally recognized test methods shall be of the most current issue or as specified in the purchase order. Task orders shall identify the applicable test methods to be used on the nuclear project.

4.6 Acceptance of Services Only

Not applicable to activities conducted within the Department of Analytical and Environmental Chemistry.

4.7 Commercial Grade Items

- 4.7.1 Where an item is to be incorporated into a test or deliverable to a client, and that item is not subject to design or specification requirements that are unique to nuclear facilities, used in applications other than nuclear facilities, and procured from the supplier on the specifications set forth in the manufacturers' published product and description, the item shall be considered "commercial grade".
- 4.7.2 Chemical reagents and standards used for testing purposes shall be ordered to specific chemical grades and certificates of analysis shall be required with each lot.
- 4.7.3 Controls for procurement planning, supplier selection, supplier performance evaluation, and acceptance of procured items and services other than chemical reagents and standards shall be as identified in **SOP-01-7.4.1**, *Purchasing*, and any referenced document within that procedure.
- 4.7.4 Receipt inspection of chemical reagents, standards, and test items for use on nuclear safety-related projects shall be performed by department personnel and documented on the *SwRI Receipt Traveler* or **FRM-109**, *Item Receipt Report*, as specified in **SOP-01-8.2.4**, *Monitoring and Measurement*. Any discrepancy such as a damaged container or container label shall be documented on the form and the client shall be contacted for disposition.
- 4.7.5 Prior to acceptance of a commercial grade item, the receipt inspection shall determine the following:
- (a) Damage was not sustained during shipment;
 - (b) The item has satisfied the specified acceptance criteria; and
 - (c) Specified documentation, as applicable to the item, was received and is acceptable.
- 4.7.6 Receipt inspection of chemical reagents and standards shall also consist of verification of chemical type, grade, container integrity, certificate of analysis, and shelf life, where applicable. Upon acceptance of chemical reagents and standards, the containers shall be labeled with the following:
- (a) Chemical name;
 - (b) Chemical grade;
 - (c) Lot code;

-
- (d) Date received; and
 - (e) Shelf life, when applicable.
- 4.7.7 Expired shelf life items shall not be used for testing purposes.
- 4.7.8 Lot codes of chemical reagents and standards used during equipment standardization and testing shall be recorded on the individual testing data sheets to provide traceability.
- 4.7.9 Samples supplied to SwRI for testing shall be received by the Sample Custodian and logged into the laboratory logbook. Sample documentation and sample custody shall be maintained in accordance with **TAP-01-0407-001**, *Sample Receipt Inspection*, and **TAP-01-0407-035**, *Organic and Inorganic Sample Security*.
- 4.7.10 Samples supplied to SwRI for testing shall be labeled with the following:
- (a) Sample control number;
 - (b) Purchase order number;
 - (c) Purchase order line item number, as applicable;
 - (d) Task order number;
 - (e) Nuclear QA label; and
 - (f) Sample retention date, when applicable.
- 4.7.11 In the event that samples are damaged upon receipt, a **Sample Discrepancy Record** shall be generated from the Division Intranet.
- 4.7.12 The testing task order shall list the project number, tests required, test methods required, and shall be labeled *Nuclear Quality*.
- 4.7.13 Identification and traceability shall be maintained in accordance with **SOP-01-7.5.1**, *Item Identification and Traceability*.

4.8 Inspection

- 4.8.1 Inspection for acceptance shall be performed by qualified persons other than those who conduct or directly supervise the work being inspected.
- 4.8.2 Institute Quality System (IQS) personnel shall perform surveillance activities as required to ensure compliance with the contract and this Quality Project Plan. Specific areas in which IQS may perform surveillance activities include, but are not limited to, the following:
 - (a) Receiving inspection and labeling of chemical reagents, standards, and testing samples;
 - (b) Testing processes;
 - (c) Calibration and major equipment;
 - (d) Sample and record retention; and
 - (e) Test records.

4.9 Inspection and Testing

- 4.9.1 Required tests for acceptance shall be conducted under appropriate environmental conditions using the tools and equipment necessary to conduct the test in a manner to fulfill test requirements and acceptance criteria.
- 4.9.2 Tests shall be conducted, controlled, and verified in accordance with **SOP-01-8.2.4, *Monitoring and Measurement***.
- 4.9.3 Controls for measuring and test equipment shall be as specified in **SOP-01-7.6.1, *Control of Measuring and Test Equipment***.
- 4.9.4 Controls for identification, segregation, reporting, and resolution of nonconforming items and conditions shall be as specified in **SOP-01-8.3.1, *Nonconformance Reporting***.

4.10 Handling, Storage, Packaging, Preservation, and Delivery

- 4.10.1 Controls for handling, storage, packaging, preservation, and delivery of items are identified in **SOP-01-7.5.3, *Handling, Storage, Packaging, Protection, and Delivery of Items***.
- 4.10.2 Samples specified on the purchase order to be returned to the client shall be prepared and packaged as specified on the purchase order. Each package shall be marked legibly and indelibly with the purchase order/release number and line item number(s) relevant to the package.

4.11 Quality Assurance Records

- 4.11.1 Quality assurance records shall furnish documentary evidence that items or activities meet specified quality requirements. Documents that ensure this evidence include **TAP-01-0407-014**, *Inventory of Case File Purges*, and **SOP-01-4.2.4**, *Storage and Maintenance of Quality Records*. These documents and this QPP ensure that QA records shall be legible, identifiable, retrievable, and maintained in dual storage.
- 4.11.2 Records shall be traceable to associated items and activities and shall accurately reflect the work accomplished or information required.
- 4.11.3 Documents shall be considered valid records only if stamped, initialed or signed and dated by authorized personnel or otherwise authenticated.
- 4.11.4 Records of test analyses performed by the Department of Analytical and Environmental Chemistry are classified as *nonpermanent* and shall be retained for a minimum of five years. Nonpermanent records are those required to show evidence that an activity was performed in accordance with the applicable requirements, but need not be retained for the life of the item. Based on the use of the final data, the client shall be responsible for determining and implementing permanent storage requirements.
- 4.11.5 In order to satisfy duplicate storage requirements, one copy of the QA record shall be maintained by the Project Manager in Building 70 and a separate copy shall be maintained in the Division Quality Assurance Archives in Building 201. Storage requirements shall be as stated in **SOP-01-4.2.4**, *Storage and Maintenance of Quality Records*, to ensure protection against the risk of damage or destruction.

4.12 10 CFR, Part 21

- 4.12.1 SwRI procurement documents shall include requirements for reporting and approving disposition of supplier nonconformances and, when required, compliance to 10 CFR, Part 21.
- 4.12.2 The Manager of Institute Quality Assurance or Director of Institute Quality Systems shall determine if a nonconforming condition is reportable under 10 CFR, Part 21, and initiate reporting and condition in accordance with the SwRI Operating Policies and Procedures (OPP). Safety hazards or defects that could create a substantial safety hazard shall be reported. Substantial safety hazard means a loss of safety function to the extent that there is a major reduction in the degree of protection provided to public health and safety.

4.13 Certified Test Report

The Project Manager and Institute Quality Assurance Manager as complying with all contractual requirements shall certify test reports. The certified test report shall reference the purchase order/release number, the test methods performed, and the purchase

order/release line item number.

4.14 Valid Documents List

The Department of Analytical and Environmental Chemistry task order shall specify all applicable documents and appropriate document revision level for each document. The task order shall then serve as the Valid Documents List (VDL) for each individual project.

5.0 HISTORY OF REVISIONS

Versions 0 through 3 of this plan are maintained on record in Division 01 Quality Assurance.

Revision 4

Title of document changed from the Standard Project Quality Plan *SPQP-CH/AN* to Quality Project Plan, *QPP-015*

Extensive revision to comply with Project Quality Plan PQP-Nuclear, *Nuclear Services*, which replaces SwRI NQAPM, *Nuclear Quality Assurance Program Manual*.

Revision 5

Revised 4.1.1 to include designated Division 01 QA staff to conduct pertinent nuclear training sessions to the SwRI Program Quality Plan (PQP-Nuclear), *Nuclear Services*

Revised step 4.2.4 to include Division QA as an entity along with IQS, to maintain documented evidence of qualifications



Southwest Research Institute®

PERSONNEL SIGNATURE SHEET FOR PLANS

010033

I have read, and understand the document listed below. By affixing my signature below, I am aware that I am responsible for abiding by and following the requirements identified in the plan specified below. If I become aware of any deviations from this document, I will inform my supervisor.

QPP-015, Performance of Chemical Analyses for Commercial Nuclear Power Plants within the Dept of Analytical & Environmental Chemistry (Rev 5/June 04)

(Document Title and Number)

Printed Name	Signature	Date	Extension
<u>David A. Aneda</u>	<u>DAVID A. ANEDA</u>	<u>6.7.2004</u>	<u>2776</u>
<u>Roger Presac</u>	<u>Roger Presac</u>	<u>6/7/04</u>	<u>3682</u>
<u>Jeanette Garcia</u>	<u>Jeanette Garcia</u>	<u>6/7/04</u>	<u>6569</u>
<u>CYNTHIA A. SAUCEDA</u>	<u>Cynthia Saucedo</u>	<u>06/07/2004</u>	<u>5896</u>
<u>JOE MORIN</u>	<u>Joe Morin</u>	<u>6/7/04</u>	<u>70250 2792</u>
<u>Dino Roman</u>	<u>D. Roman</u>	<u>6/7/04</u>	<u>X 3128</u>
<u>Priscilla Brockhouse</u>	<u>Priscilla Brockhouse</u>	<u>6/7/04</u>	<u>4078</u>
<u>MARGARET ACEVEDO</u>	<u>M. Acevedo</u>	<u>6-7-04</u>	<u>3725</u>
<u>Marissa Rodriguez</u>	<u>Marissa Rodriguez</u>	<u>6/7/04</u>	<u>2474</u>

Supervisor's/Manager's Signatures

The personnel whose signatures appear above have been trained and certified in the contents of this document:

**PERSONNEL SIGNATURE SHEET FOR PLANS**

I have read, and understand the document listed below. By affixing my signature below, I am aware that I am responsible for abiding by and following the requirements identified in the plan specified below. If I become aware of any deviations from this document, I will inform my supervisor.

QPP-015, Performance of Chemical Analyses for Commercial Nuclear Power Plants within the Dept of Analytical & Environmental Chemistry (Rev 5/June 04)

(Document Title and Number)

Printed Name	Signature	Date	Extension
ROBERT M. ACOSTA		06/04/04	x6847
Pamela R. Piccini		6/4/04	x2167
Charles R Cartwright		06/04/04	x5924
Jason D. HERRERA		6/4/04	2186
SHARON A. QUARREN		6/4/04	8641

Supervisor's/Manager's Signatures

The personnel whose signatures appear above have been trained and certified in the contents of this document:



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010035

PERSONNEL SIGNATURE SHEET FOR PLANS

I have read, and understand the document listed below. By affixing my signature below, I am aware that I am responsible for abiding by and following the requirements identified in the plan specified below. If I become aware of any deviations from this document, I will inform my supervisor.

QPP-015, Performance of Chemical Analyses for Commercial Nuclear Power Plants within the Dept of Analytical & Environmental Chemistry (Rev 5/June 04)

(Document Title and Number)

Printed Name	Signature	Date	Extension
Radonna Spies	<i>[Signature]</i>	6/14/04	X 3242
Valerie DeJesus	<i>[Signature]</i>	06/14/04	X 3129
Carolina Orduña	<i>[Signature]</i>	6/21/04	3146
Dakian Harris	<i>[Signature]</i>	6-21-04	12974
Jackie Ranges	<i>[Signature]</i>	6/21/04	3320
Warren A. Naegeli	<i>[Signature]</i>	6/21/04	5792
Michael Hardy	<i>[Signature]</i>	6/21/04	6079
JAMES Tipton	<i>[Signature]</i>	21-June-2004	2487
JAMES 1005	<i>[Signature]</i>	06/21/04	5897
Khaled Edrisi	<i>[Signature]</i>	6-21-04	6630
John Wilks	<i>[Signature]</i>	6-21-04	V-01 2536
Bernie Villaseñor	<i>[Signature]</i>	6-21-04	X 2762
Daniel Ramirez	<i>[Signature]</i>	6/21/04	X 3867
Terence O'Brien	<i>[Signature]</i>	6/21/04	X 3066

Supervisor's/Manager's Signatures

The personnel whose signatures appear above have been trained and certified in the contents of this document:

<i>[Signature]</i>	Mike Kurr	6-21-04	5428
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**SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT**

CLIENT: Division 20

TASK ORDER: 051219-5

SRR: 28420

SDG: 271245

CASE: L. Yang

VTSR: December 16, 2005

PROJECT#: 06002.01.322

Chain of Custody/Login Paperwork

Requested Turnaround:

010037

SAMPLE LOG-IN SHEET

010038

Lab Name

Southwest Research Institute

Received By (Print Name)

DINO ROMAN

Received By (Signature)

Dino Roman

Case Number

L. Yang

Sample Delivery Group No.

Remarks: 06002.01.322

Page 1 of 1

Log-in Date

12/16/2005

SAS Number

N/A

Remarks:

Condition of Sample
Shipment, etc

Corresponding

		EPA Sample #	Sample Tag #	Assigned Lab #	
1. Custody Seal(s)	Present/Absent* Intact/Broken	Cond.A-130 °C 12/9/05	None	271245	Intact
2. Custody Seal Nos.	N/A	Cond.A-150 °C 12/12/05	None	271246	Intact
		Cond.A-180 °C 12/13/05	None	271247	Intact
3. Chain-of Custody Records	<u>Present</u> /Absent*	Cond.A-210 °C 12/15/05	None	271248	Intact
4. Traffic Reports or Packing Lists	Present/ <u>Absent</u>	Cond.A-230 °C 12/15/05	None	271249	Intact
5. Airbill	Airbill/Sticker <u>Present</u> /Absent*	Cond.A-230 °C 12/15/05	None	271250	Intact
6. Airbill No	HAND DELIVERED				
7. Sample Tags	Present/ <u>Absent</u>				
Sample Tag Numbers	Listed/ <u>Not</u> listed on Chain of Custody				
8. Sample Condition	<u>Intact</u> /Broken*/ Leaking				
9. Cooler Temperature	22.0C				
10. Does Information on custody records, traffic reports, and sample tags agree?	<u>Yes</u> /No*				
11. Date Received at Lab	12/16/2005				
12. Time Received	14:45:00				

Sample Transfer

Fraction

Fraction

Area #

Area #

By

By

DINO ROMAN

On

On

12/16/2005

* Contact SMO and attach record of resolution

Reviewed By

Dino Roman
12.19.05

Date

Logbook No.

Logbook Page No.

Sample Receipt (28420)

5653

Section 2 of 2

010039

SOUTHWEST RESEARCH INSTITUTE

NUCLEAR PROJECT

CLIENT: Division 20

TASK ORDER: 051219-5

SRR: 28420

SDG: 271245

CASE: L. Yang

VTSR: December 16, 2005

PROJECT#: 06002.01.322

Copies of Login Book

Sample Login Book

Dec 16, 2005

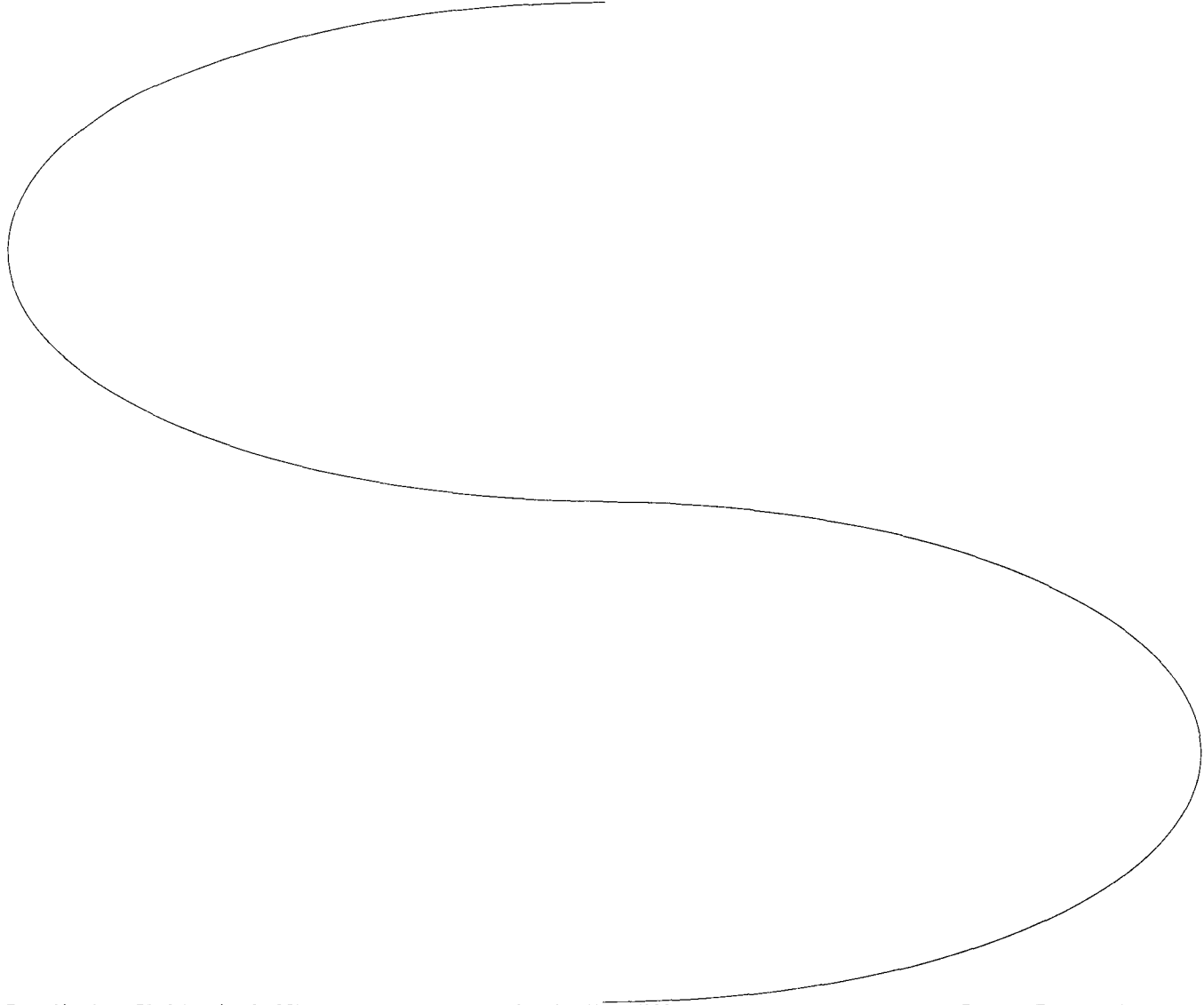
010040

SwRI Login Area
Division 1

Sample Receipt: 28420		Project: 06002.01.322	Client: Div. 20
VTSR Date: Dec 16, 2005		VTSR Time: 14:45:00	Manager: SPIES, RADONNA
System ID	Customer Sample ID	Matrix	
271245	Cond.A-130 °C 12/9/05	Liquid	
271246	Cond.A-150 °C 12/12/05	Liquid	
271247	Cond.A-180 °C 12/13/05	Liquid	
271248	Cond.A-210 °C 12/15/05	Liquid	
271249	Cond.A-230 °C 12/15/05	Liquid	
271250	Cond.A-230 °C 12/15/05	Solid	

Number of samples for today: 20

Number of Containers for today: 21



010041

**SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT**

CLIENT: Division 20

TASK ORDER: 051219-5

SRR: 28420

SDG: 271245

CASE: L. Yang

VTSR: December 16, 2005

PROJECT#: 06002.01.322

RAW DATA

271250 for K

82.407 ug/ml x df 20x 50ml

= 153830 mg/kg

0.5357g

= 154000 mg/kg

DIV. 20
TO#051219-5
Project No. 06002.01.322
Prep. Page 62-230, 62-232

12-21-05

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/kg	sigwt	Dilution	Calc RL	ug/ml	Date	Time
pbw-M19E2	K_766	30.0	U		mg/kg	30				0.300	2.587680386	2.59	1	30	0.025876804	12/20/05	2:27 PM
pbw-M19E2	Na589	30.0	U		mg/kg	30				0.300	-13.48247749	-13.5	1	30	-0.134824775	12/20/05	2:27 PM
lcsw-M19E2	K_766	1960			mg/kg	30		98.0%	2000	0.300	1959.590931	1960	1	30	19.59590931	12/20/05	2:29 PM
lcsw-M19E2	Na589	1950			mg/kg	30		97.5%	2000	0.300	1949.830739	1950	1	30	19.49830739	12/20/05	2:29 PM
271250	K_766	154000	✓		mg/kg	560				0.300	153830.1356	154000	20	560.015	82.40680362	12/20/05	2:32 PM
271250	Na589	170000			mg/kg	560				0.300	169905.4443	170000	20	560.015	91.0183465	12/20/05	2:32 PM
271250d	K_766	152000			mg/kg	553	1.3%			0.300	152301.8387	152000	20	553.097	82.60851731	12/20/05	2:34 PM
271250d	Na589	173000			mg/kg	553	1.7%			0.300	173181.6923	173000	20	553.097	93.93374988	12/20/05	2:34 PM
271250s	K_766	157000		N	mg/kg	572		157.5%	1905	0.300	156843.9354	157000	20	571.537	82.32738172	12/20/05	2:36 PM
271250s	Na589	169000		N	mg/kg	572		-52.5%	1905	0.300	168524.0003	169000	20	571.537	88.45824774	12/20/05	2:36 PM
pbw-M20H1	K_766	1.50	U		mg/L	1.5				0.300	0.425194146	0.425	1	1.5	0.085038829	12/20/05	2:46 PM
pbw-M20H1	Na589	1.50	U		mg/L	1.5				0.300	-0.731607848	-0.732	1	1.5	-0.14632157	12/20/05	2:46 PM
lcsw-M20H1	K_766	99.4			mg/L	1.5		99.4%	100	0.300	99.35311786	99.4	1	1.5	19.87062357	12/20/05	2:47 PM
lcsw-M20H1	Na589	98.0			mg/L	1.5		98.0%	100	0.300	97.99195422	98	1	1.5	19.59839084	12/20/05	2:47 PM
271245	K_766	1.50	U		mg/L	1.5				0.300	1.458639654	1.46	1	1.5	0.291727931	12/20/05	2:50 PM
271245	Na589	2.35			mg/L	1.5				0.300	2.348163824	2.35	1	1.5	0.469632765	12/20/05	2:50 PM
271245d	K_766	1.50	U		mg/L	1.5	0.0%			0.300	0.593565757	0.594	1	1.5	0.118713151	12/20/05	2:52 PM
271245d	Na589	2.64			mg/L	1.5	11.6%			0.300	2.643286561	2.64	1	1.5	0.528657312	12/20/05	2:52 PM
271245s	K_766	103			mg/L	1.5		103.0%	100	0.300	102.7917761	103	1	1.5	20.55835522	12/20/05	2:54 PM
271245s	Na589	105			mg/L	1.5		102.7%	100	0.300	104.6209652	105	1	1.5	20.92419304	12/20/05	2:54 PM
271246	K_766	1.50	U		mg/L	1.5				0.300	-0.201005435	-0.201	1	1.5	-0.040201087	12/20/05	2:57 PM
271246	Na589	1.50	U		mg/L	1.5				0.300	0.782959918	0.783	1	1.5	0.156591984	12/20/05	2:57 PM
271247	K_766	3.64			mg/L	1.5				0.300	3.639588681	3.64	1	1.5	0.727917736	12/20/05	3:00 PM
271247	Na589	4.09			mg/L	1.5				0.300	4.091738125	4.09	1	1.5	0.818347625	12/20/05	3:00 PM
271248	K_766	13.2			mg/L	1.5				0.300	13.17232105	13.2	1	1.5	2.63446421	12/20/05	3:03 PM
271248	Na589	20.4			mg/L	1.5				0.300	20.41835341	20.4	1	1.5	4.083670682	12/20/05	3:03 PM
271249	K_766	27.3			mg/L	1.5				0.300	27.30924636	27.3	1	1.5	5.461849273	12/20/05	3:06 PM
271249	Na589	23.9	✓		mg/L	1.5				0.300	23.91196635	23.9	1	1.5	4.78239327	12/20/05	3:06 PM

271249 for Na

4.7824 ug/ml x 5ml
1 ml

= 23.9 mg/L

12/21/05

010042

☐ 200.7 TAP No. 01-0406-028 Rev2/Mar02

☒ 6010B TAP No. 01-0406-130 Rev4/Oct05

☐ Other _____

QC STD. ID's

CCV 052401

CRI 052401

ICSA 052401

ICSAB 052401

ICP CAL.STD.

ID's 010043

Std0 052401

Std1 052401

Std2 052401

Std3 052401

Std4 052401

Std5 052401

Std6 052401

K ne

PROJ. NO. PROJECT TO# DATE MATRIX LOGBK PG

06002.01.322 DIV. 20 051219-5 12-20-05 Solid 62-230
62 232

INSTRUMENT: Spectro FILENAME: 05122013

File converted to wsl? ☐

De 12-20-05

010044

EVOLUTION by Micro-Active Australia Pty Ltd 2:03:18 PM December 20, 2005

Keep last result visible enabled ...

Starting run ...

Creating high priority queue entries ...

BACKGROUND CORRECTED INTENSITIES

Identity 1 : BLK_SC Identity 2 : Type : STD

Height : 1.0000 Volume : 1.00 Printed : 1:59:04 PM December 20, 2005

	K_766	Na589	Sc361
# 1	23.0	129.0	3942.0
# 2	20.0	104.0	3850.0
Mean	21.5	116.5	3896.0
SD	2.1	17.7	65.1
RSD	9.9	15.2	1.7

INTENSITIES

Identity 1 : BLK_SC Identity 2 : Type : STD

Height : 1.0000 Volume : 1.00 Printed : 1:59:04 PM December 20, 2005

	K_766	Na589	Sc361
# 1	0.0	0.0	3942.0
# 2	0.0	0.0	3850.0
Mean	0.0	0.0	3896.0
SD	0.0	0.0	65.1
RSD	8.2	13.5	1.7

BACKGROUND CORRECTED INTENSITIES

Identity 1 : CLP_STD1_SC Identity 2 : Type : STD

Height : 1.0000 Volume : 1.00 Printed : 2:01:56 PM December 20, 2005

	K_766	Na589
# 1	3915.5	21784.0
# 2	3795.5	21292.0
Mean	3855.5	21538.0
SD	84.9	347.9
RSD	2.2	1.6

INTENSITIES

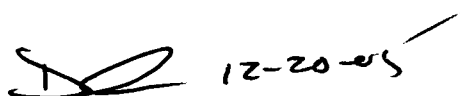
Identity 1 : CLP_STD1_SC Identity 2 : Type : STD

Height : 1.0000 Volume : 1.00 Printed : 2:01:56 PM December 20, 2005

	K_766	Na589
# 1	1.0	5.6
# 2	1.0	5.7
Mean	1.0	5.7
SD	0.0	0.0
RSD	0.1	0.4



Handwritten signature, possibly reading "Rough" or "Rough" over "12/20/05".



Handwritten signature, possibly reading "12-20-05".

BACKGROUND CORRECTED INTENSITIES

Identity 1 : CLP_CCV_SC Identity 2 : Type : CV

Height : 1.0000 Volume : 1.00 Printed : 2:04:48 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	1616.0	13239.5	3867.0	3867.0
# 2	1580.0	12981.5	3797.0	3797.0
Mean	1598.0	13110.5	3832.0	3832.0
SD	25.5	182.4	49.5	49.5
RSD	1.6	1.4	1.3	1.3

APPARENT CONCENTRATIONS

Identity 1 : CLP_CCV_SC Identity 2 : Type : CV

Height : 1.0000 Volume : 1.00 Printed : 2:04:48 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	20.4467	30.1176	3867.000	99.2545
# 2	20.3586	30.0747	3797.000	97.4550
Mean	20.4026	30.0962	3832.000	98.3548
SD	0.0623	0.0303	49.497	1.2724
RSD	0.3054	0.1007	1.292	1.2937

Checking calibration verification ...

Identity 1 : CLP_CCV_SC Identity 2 :

Report name	Low limit	Value	High limit
766	18.000	20.403	22.000
589	27.000	30.096	33.000

BACKGROUND CORRECTED INTENSITIES

Identity 1 : Calibration blank Identity 2 : Type : CB

Height : 1.0000 Volume : 1.00 Printed : 2:08:40 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	26.0	168.0	3813.0	3813.0
# 2	31.0	113.0	3815.0	3815.0
Mean	28.5	140.5	3814.0	3814.0
SD	3.5	38.9	1.4	1.4
RSD	12.4	27.7	0.0	0.0

APPARENT CONCENTRATIONS

Identity 1 : Calibration blank Identity 2 : Type : CB

Height : 1.0000 Volume : 1.00 Printed : 2:08:40 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	0.0645	0.1256	3813.000	97.8663
# 2	0.1293 L	-0.0025	3815.000	97.9177
Mean	0.0969	0.0616	3814.000	97.8920
SD	0.0458	0.0906	1.414	0.0364
RSD	47.3032	147.1811	0.037	0.0371

Checking calibration blank ...

K_766	0.250	0.097
Na589	0.250	0.062
Sc361	0.000	97.892

BACKGROUND CORRECTED INTENSITIES

EVOLUTION by Micro-Active Australia Pty Ltd 2:17:48 PM December 20, 2005

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Identity 1 : CRI Identity 2 : Type : CV

Weight : 1.0000 Volume : 1.00 Printed : 2:11:34 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	13.5	104.0	3841.0	3841.0
# 2	25.5	110.0	3735.0	3735.0
Mean	19.5	107.0	3788.0	3788.0
SD	8.5	4.2	75.0	75.0
RSD	43.5	4.0	2.0	2.0

PPARENT CONCENTRATIONS

Identity 1 : CRI Identity 2 : Type : CV

Weight : 1.0000 Volume : 1.00 Printed : 2:11:34 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1 L	-0.0994 L	-0.0251	3841.000	98.5861
# 2	0.0649 L	-0.0040	3735.000	95.8612
Mean L	-0.0172 L	-0.0145	3788.000	97.2237
SD	0.1161	0.0149	74.953	1.9268
RSD	674.1171	102.4728	1.979	1.9818

Checking calibration verification ...

Identity 1 : CRI Identity 2 :

Report name	Low limit	Value	High limit	
_766	0.900	-0.017	1.100	Failed
a589	0.900	-0.015	1.100	Failed

BACKGROUND CORRECTED INTENSITIES

Identity 1 : ICSA Identity 2 : Type : INTRF

Weight : 1.0000 Volume : 1.00 Printed : 2:14:26 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	28.5	100.5	3749.0	3749.0
# 2	18.5	107.5	3692.0	3692.0
Mean	23.5	104.0	3720.5	3720.5
SD	7.1	4.9	40.3	40.3
RSD	30.1	4.8	1.1	1.1

PPARENT CONCENTRATIONS

Identity 1 : ICSA Identity 2 : Type : INTRF

Weight : 1.0000 Volume : 1.00 Printed : 2:14:26 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	0.1033 L	-0.0275	3749.000	96.2211
# 2 L	-0.0252 L	-0.0070	3692.000	94.7558
Mean	0.0391 L	-0.0172	3720.500	95.4884
SD	0.0908	0.0145	40.305	1.0361
RSD	232.5337	84.1750	1.083	1.0851

BACKGROUND CORRECTED INTENSITIES

Identity 1 : ICSAB Identity 2 : Type : ICSAB

Weight : 1.0000 Volume : 1.00 Printed : 2:17:18 PM December 20, 2005

# 1	34.0	99.0	3712.0	3712.0
# 2	16.0	133.0	3694.0	3694.0
Mean	25.0	116.0	3703.0	3703.0
SD	12.7	24.0	12.7	12.7
RSD	50.9	20.7	0.3	0.3

EVOLUTION by Micro-Active Australia Pty Ltd 2:25:18 PM December 20, 2005

010047

PPARENT CONCENTRATIONS

Identity 1 : ICSAB Identity 2 : Type : ICSAB

Height : 1.0000 Volume : 1.00 Printed : 2:17:18 PM December 20, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.1805 L	-0.0287	3712.000	95.2699
# 2 L	-0.0589	0.0541	3694.000	94.8072
Mean	0.0608	0.0127	3703.000	95.0386
SD	0.1693	0.0586	12.728	0.3272
RSD	278.2549	459.9975	0.344	0.3443

Checking interference check standard ...

Identity 1 : ICSAB Identity 2 :

Report name	Low limit	Value	High limit	
_766	0.000	0.061	0.000	Failed
a589	0.000	0.013	0.000	Failed

BACKGROUND CORRECTED INTENSITIES

Identity 1 : CLP_CCv_SC Identity 2 : Type : CV

Height : 1.0000 Volume : 1.00 Printed : 2:21:10 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	1572.0	13153.5	3849.5	3849.5
# 2	1571.0	12889.5	3773.5	3773.5
Mean	1571.5	13021.5	3811.5	3811.5
SD	0.7	186.7	53.7	53.7
RSD	0.0	1.4	1.4	1.4

PPARENT CONCENTRATIONS

Identity 1 : CLP_CCv_SC Identity 2 : Type : CV

Height : 1.0000 Volume : 1.00 Printed : 2:21:12 PM December 20, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.9741	30.0575	3849.500	98.8046
# 2	20.3688	30.0473	3773.500	96.8509
Mean	20.1715	30.0524	3811.500	97.8278
SD	0.2791	0.0072	53.740	1.3815
RSD	1.3835	0.0239	1.410	1.4122

Checking calibration verification ...

Identity 1 : CLP_CCv_SC Identity 2 :

Report name	Low limit	Value	High limit
766	18.000	20.171	22.000
589	27.000	30.052	33.000

CKGROUND CORRECTED INTENSITIES

Identity 1 : Calibration blank Identity 2 : Type : CB

Height : 1.0000 Volume : 1.00 Printed : 2:25:04 PM December 20, 2005

	K_766	Na589	Sc	Sc361
.	10.0	115.5	3001.0	3001.0

Mean 12.5 107.0 3862.5 3862.5
 SD 9.2 12.0 40.3 40.3
 CRSD 73.5 11.2 1.0 1.0
 EVOLUTION by Micro-Active Australia Pty Ltd 2:29:50 PM December 20, 2005

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APPARENT CONCENTRATIONS

Identity 1 : Calibration blank Identity 2 : Type : CB
 Weight : 1.0000 Volume : 1.00 Printed : 2:25:04 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1 L	-0.0315 L	-0.0019	3891.000	99.8715
# 2 L	-0.1960 L	-0.0374	3834.000	98.4062
Mean L	-0.1138 L	-0.0197	3862.500	99.1388
SD	0.1163	0.0251	40.305	1.0361
CRSD	102.2571	127.4653	1.043	1.0451

Checking calibration blank ...

Identity 1 : Calibration blank Identity 2 :
 Report name CRDL Value
 _766 0.250 -0.114
 a589 0.250 -0.020
 c361 0.000 99.139

BACKGROUND CORRECTED INTENSITIES

Identity 1 : pbw-M19E2 Identity 2 : pg62-230 Type : SAMPLE
 Weight : 1.0000 Volume : 1.00 Printed : 2:27:56 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	31.0	83.0	3994.0	3994.0
# 2	17.0	34.0	3936.0	3936.0
Mean	24.0	58.5	3965.0	3965.0
SD	9.9	34.6	41.0	41.0
CRSD	41.2	59.2	1.0	1.0

APPARENT CONCENTRATIONS

Identity 1 : pbw-M19E2 Identity 2 : pg62-230 Type : SAMPLE
 Weight : 1.0000 Volume : 1.00 Printed : 2:27:56 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	0.1112 L	-0.0809	3994.000 H	102.5193
# 2 L	-0.0595 L	-0.1887	3936.000 H	101.0283
Mean	0.0259 L	-0.1348	3965.000 H	101.7738
SD	0.1207	0.0762	41.012	1.0543
CRSD	466.4248	56.5161	1.034	1.0359

BACKGROUND CORRECTED INTENSITIES

Identity 1 : lcsw-M19E2 Identity 2 : pg62-230 Type : SAMPLE
 Weight : 1.0000 Volume : 1.00 Printed : 2:29:40 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	1584.5	8808.5	3939.5	3939.5
# 2	1574.5	8747.5	3943.5	3943.5
Mean	1579.5	8778.0	3941.5	3941.5
SD	7.1	43.1	2.8	2.8
CRSD	0.4	0.5	0.1	0.1

APPARENT CONCENTRATIONS

EVOLUTION by Micro-Active Australia Pty Ltd 2:36:22 PM December 20, 2005

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	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.6689	19.5770	3939.500 H	101.1183
# 2	19.5229	19.4196	3943.500 H	101.2211
Mean	19.5959	19.4983	3941.500 H	101.1697
SD	0.1032	0.1113	2.828	0.0727
RSD	0.5267	0.5708	0.072	0.0719

BACKGROUND CORRECTED INTENSITIES

Identity 1 : 271250 df20 Identity 2 : pg62-230 Type : SAMPLE

Weight : 1.0000 Volume : 1.00 Printed : 2:32:46 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	6484.0	39896.0	3888.0	3888.0
# 2	6346.0	39245.0	3806.0	3806.0
Mean	6415.0	39570.5	3847.0	3847.0
SD	97.6	460.3	58.0	58.0
RSD	1.5	1.2	1.5	1.5

APPARENT CONCENTRATIONS

Identity 1 : 271250 df20 Identity 2 : pg62-230 Type : SAMPLE

Weight : 1.0000 Volume : 1.00 Printed : 2:32:46 PM December 20, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1 H	82.4149 H	90.7963	3888.000	99.7943
# 2 H	82.3987 H	91.2404	3806.000	97.6864
Mean H	82.4068 H	91.0183	3847.000	98.7404
SD	0.0115	0.3140	57.983	1.4906
RSD	0.0140	0.3449	1.507	1.5096

BACKGROUND CORRECTED INTENSITIES

Identity 1 : 271250d df20 Identity 2 : pg62-230 Type : SAMPLE

Weight : 1.0000 Volume : 1.00 Printed : 2:34:30 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	6525.5	41394.5	3901.5	3901.5
# 2	6591.5	41900.5	3945.5	3945.5
Mean	6558.5	41647.5	3923.5	3923.5
SD	46.7	357.8	31.1	31.1
RSD	0.7	0.9	0.8	0.8

APPARENT CONCENTRATIONS

Identity 1 : 271250d df20 Identity 2 : pg62-230 Type : SAMPLE

Weight : 1.0000 Volume : 1.00 Printed : 2:34:30 PM December 20, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1 H	82.6562 H	93.8897	3901.500 H	100.1414
# 2 H	82.5608 H	93.9778	3945.500 H	101.2725
Mean H	82.6085 H	93.9337	3923.500 H	100.7069
SD	0.0675	0.0623	31.113	0.7998
RSD	0.0817	0.0663	0.793	0.7942

BACKGROUND CORRECTED INTENSITIES

	K_766	Na589	Sc	Sc361
# 1	6596.0	39592.5	3968.0	3968.0
# 2	6538.0	39229.5	3916.0	3916.0

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	K_766	Na589	Sc	Sc361
Mean	6567.0	39411.0	3942.0	3942.0
SD	41.0	256.7	36.8	36.8
RSD	0.6	0.7	0.9	0.9

PPARENT CONCENTRATIONS

Identity 1 : 271250s df20 Identity 2 : pg62-230 Type : SAMPLE
 Height : 1.0000 Volume : 1.00 Printed : 2:36:12 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1 H	82.1473 H	88.2817	3968.000 H	101.8509
# 2 H	82.5074 H	88.6348	3916.000 H	100.5141
Mean H	82.3274 H	88.4582	3942.000 H	101.1825
SD	0.2546	0.2497	36.770	0.9452
RSD	0.3093	0.2823	0.933	0.9342

BACKGROUND CORRECTED INTENSITIES

Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
 Height : 1.0000 Volume : 1.00 Printed : 2:39:20 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	1581.5	13031.0	3836.5	3836.5
# 2	1562.5	12991.0	3820.5	3820.5
Mean	1572.0	13011.0	3828.5	3828.5
SD	13.4	28.3	11.3	11.3
RSD	0.9	0.2	0.3	0.3

PPARENT CONCENTRATIONS

Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
 Height : 1.0000 Volume : 1.00 Printed : 2:39:20 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	20.1655	29.8769	3836.500	98.4704
# 2	20.0045	29.9102	3820.500	98.0591
Mean	20.0850	29.8935	3828.500	98.2648
SD	0.1138	0.0236	11.314	0.2908
RSD	0.5668	0.0788	0.296	0.2960

Checking calibration verification ...

Identity 1 : CLP_CCV_SC Identity 2 :
 Report name Low limit Value High limit
 _766 18.000 20.085 22.000
 a589 27.000 29.894 33.000

BACKGROUND CORRECTED INTENSITIES

Identity 1 : Calibration blank Identity 2 : Type : CB
 Height : 1.0000 Volume : 1.00 Printed : 2:43:12 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	36.5	105.5	3882.0	3882.0
# 2	32.5	101.5	3818.0	3818.0
Mean	34.5	103.5	3850.0	3850.0
SD	2.0	2.0	45.0	45.0

APPARENT CONCENTRATIONS

Identity 1 : Calibration blank Identity 2 : Type : CB
 Weight : 1.0000 Volume : 1.00 Printed : 2:43:12 PM December 20, 2005
 EVOLUTION by Micro-Active Australia Pty Ltd 2:48:18 PM December 20, 2005

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	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.1926 L	-0.0242	3882.000	99.6401
# 2	0.1484 L	-0.0294	3818.000	97.9949
Mean	0.1705 L	-0.0268	3850.000	98.8175
SD	0.0312	0.0037	45.255	1.1634
RSD	18.3016	13.8555	1.175	1.1773

Checking calibration blank ...

Identity 1 : Calibration blank Identity 2 :

Report name	CRDL	Value
_766	0.250	0.171
a589	0.250	-0.027
c361	0.000	98.817

BACKGROUND CORRECTED INTENSITIES

Identity 1 : pbw-M20H1 Identity 2 : Type : SAMPLE
 Weight : 1.0000 Volume : 1.00 Printed : 2:46:06 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	41.0	58.5	4226.0	4226.0
# 2	20.0	54.5	4197.0	4197.0
Mean	30.5	56.5	4211.5	4211.5
SD	14.8	2.8	20.5	20.5
RSD	48.7	5.0	0.5	0.5

APPARENT CONCENTRATIONS

Identity 1 : pbw-M20H1 Identity 2 : Type : SAMPLE
 Weight : 1.0000 Volume : 1.00 Printed : 2:46:06 PM December 20, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.2074 L	-0.1425	4226.000 H	108.4833
# 2 L	-0.0373 L	-0.1501	4197.000 H	107.7378
Mean	0.0850 L	-0.1463	4211.500 H	108.1105
SD	0.1731	0.0054	20.506	0.5271
RSD	203.5255	3.6770	0.487	0.4876

BACKGROUND CORRECTED INTENSITIES

Identity 1 : lcsv-M20H1 Identity 2 : Type : SAMPLE
 Weight : 1.0000 Volume : 1.00 Printed : 2:47:48 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	1594.0	8845.0	3921.5	3921.5
# 2	1577.0	8626.0	3883.5	3883.5
Mean	1585.5	8735.5	3902.5	3902.5
SD	12.0	154.9	26.9	26.9
RSD	0.8	1.8	0.7	0.7

PARENT CONCENTRATIONS

Identity 1 : lcsv-M20H1 Identity 2 : Type : SAMPLE
 Weight : 1.0000 Volume : 1.00 Printed : 2:47:48 PM December 20, 2005

# 1	19.8805	19.7507	3921.500 H	100.6555
# 2	19.8607	19.4461	3883.500	99.6787

Mean	19.8706	19.5984	3902.500 H	100.1671
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EVOLUTION by Micro-Active Australia Pty Ltd 2:54:48 PM December 20, 2005

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SD	0.0140	0.2154	26.870	0.6907
RSD	0.0706	1.0989	0.689	0.6896

BACKGROUND CORRECTED INTENSITIES

Identity 1 : 271245 Identity 2 : Type : SAMPLE

Weight : 1.0000 Volume : 1.00 Printed : 2:50:56 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	42.5	314.5	3831.5	3831.5
# 2	44.5	317.5	3799.5	3799.5
Mean	43.5	316.0	3815.5	3815.5
SD	1.4	2.1	22.6	22.6
RSD	3.3	0.7	0.6	0.6

APPARENT CONCENTRATIONS

Identity 1 : 271245 Identity 2 : Type : SAMPLE

Weight : 1.0000 Volume : 1.00 Printed : 2:50:56 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	0.2764	0.4631	3831.500	98.3419
# 2	0.3071	0.4762	3799.500	97.5193
Mean	0.2917	0.4696	3815.500	97.9306
SD	0.0217	0.0093	22.627	0.5817
RSD	7.4489	1.9787	0.593	0.5940

BACKGROUND CORRECTED INTENSITIES

Identity 1 : 271245d Identity 2 : Type : SAMPLE

Weight : 1.0000 Volume : 1.00 Printed : 2:52:40 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	32.5	338.5	3922.5	3922.5
# 2	29.5	362.5	3912.5	3912.5
Mean	31.0	350.5	3917.5	3917.5
SD	2.1	17.0	7.1	7.1
RSD	6.8	4.8	0.2	0.2

APPARENT CONCENTRATIONS

Identity 1 : 271245d Identity 2 : Type : SAMPLE

Weight : 1.0000 Volume : 1.00 Printed : 2:52:40 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	0.1372	0.5005	3922.500 H	100.6812
# 2	0.1002	0.5569	3912.500 H	100.4242
Mean	0.1187	0.5287	3917.500 H	100.5527
SD	0.0261	0.0399	7.071	0.1818
RSD	22.0201	7.5430	0.180	0.1808

BACKGROUND CORRECTED INTENSITIES

Identity 1 : 271245s Identity 2 : Type : SAMPLE

Weight : 1.0000 Volume : 1.00 Printed : 2:54:24 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	0.1372	0.5005	3922.500 H	100.6812
# 2	0.1002	0.5569	3912.500 H	100.4242
Mean	0.1187	0.5287	3917.500 H	100.5527
SD	0.0261	0.0399	7.071	0.1818
RSD	22.0201	7.5430	0.180	0.1808

Mean 1624.5 9232.0 3866.5 3866.5
SD 4.2 151.3 10.6 10.6
RSD 0.3 1.6 0.3 0.3
EVOLUTION by Micro-Active Australia Pty Ltd 3:03:18 PM December 20, 2005

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APPARENT CONCENTRATIONS

Identity 1 : 271245s Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:54:24 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	20.5603	21.2109	3859.000	99.0488
# 2	20.5564	20.6375	3874.000	99.4344
Mean	20.5584	20.9242	3866.500	99.2416
SD	0.0027	0.4054	10.607	0.2727
RSD	0.0133	1.9376	0.274	0.2747

BACKGROUND CORRECTED INTENSITIES

Identity 1 : 271246 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:57:16 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	13.5	175.5	3848.0	3848.0
# 2	22.5	188.5	3809.0	3809.0
Mean	18.0	182.0	3828.5	3828.5
SD	6.4	9.2	27.6	27.6
RSD	35.4	5.1	0.7	0.7

APPARENT CONCENTRATIONS

Identity 1 : 271246 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:57:16 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1 L	-0.0997	0.1394	3848.000	98.7661
# 2	0.0193	0.1738	3809.000	97.7635
Mean L	-0.0402	0.1566	3828.500	98.2648
SD	0.0841	0.0243	27.577	0.7089
RSD	209.1993	15.5480	0.720	0.7214

BACKGROUND CORRECTED INTENSITIES

Identity 1 : 271247 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:00:14 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	77.0	456.0	3817.5	3817.5
# 2	77.0	475.0	3806.5	3806.5
Mean	77.0	465.5	3812.0	3812.0
SD	0.0	13.4	7.8	7.8
RSD	0.0	2.9	0.2	0.2

APPARENT CONCENTRATIONS

Identity 1 : 271247 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:00:14 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	0.7265	0.7947	3817.500	97.9820
# 2	0.7204	0.8420	3806.500	97.6000

Mean	0.7279	0.8183	3812.000	97.8406
SD	0.0020	0.0335	7.778	0.2000
RSD	0.2807	4.0921	0.204	0.2044

010054

EVOLUTION by Micro-Active Australia Pty Ltd 3:09:18 PM December 20, 2005

BACKGROUND CORRECTED INTENSITIES

Identity 1 : 271248 Identity 2 : Type : SAMPLE

Weight : 1.0000 Volume : 1.00 Printed : 3:03:06 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	228.5	1905.0	3861.0	3861.0
# 2	221.5	1855.0	3811.0	3811.0
Mean	225.0	1880.0	3836.0	3836.0
SD	4.9	35.4	35.4	35.4
RSD	2.2	1.9	0.9	0.9

APPARENT CONCENTRATIONS

Identity 1 : 271248 Identity 2 : Type : SAMPLE

Weight : 1.0000 Volume : 1.00 Printed : 3:03:06 PM December 20, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	2.6608	4.1132	3861.000	99.1003
# 2	2.6082	4.0542	3811.000	97.8149
Mean	2.6345	4.0837	3836.000	98.4576
SD	0.0372	0.0417	35.355	0.9089
RSD	1.4111	1.0213	0.922	0.9231

BACKGROUND CORRECTED INTENSITIES

Identity 1 : 271249 Identity 2 : Type : SAMPLE

Weight : 1.0000 Volume : 1.00 Printed : 3:06:00 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	446.0	2229.5	3853.5	3853.5
# 2	441.0	2132.5	3814.5	3814.5
Mean	443.5	2181.0	3834.0	3834.0
SD	3.5	68.6	27.6	27.6
RSD	0.8	3.1	0.7	0.7

APPARENT CONCENTRATIONS

Identity 1 : 271249 Identity 2 : Type : SAMPLE

Weight : 1.0000 Volume : 1.00 Printed : 3:06:00 PM December 20, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	5.4650	4.8690	3853.500	98.9075
# 2	5.4587	4.6958	3814.500	97.9049
Mean	5.4618	4.7824	3834.000	98.4062
SD	0.0045	0.1225	27.577	0.7089
RSD	0.0818	2.5605	0.719	0.7204

BACKGROUND CORRECTED INTENSITIES

Identity 1 : CLP_CCV_SC Identity 2 : Type : CV

Weight : 1.0000 Volume : 1.00 Printed : 3:08:52 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	1544.0	12968.5	3832.5	3832.5
# 2	1542.0	12799.5	3775.5	3775.5

Mean	1543.0	12884.0	3804.0	3804.0
------	--------	---------	--------	--------

RSD 0.1 0.9 1.1 1.1

APPARENT CONCENTRATIONS

Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
 EVOLUTION by Micro-Active Australia Pty Ltd 3:15:48 PM December 20, 2005

010055

Weight : 1.0000 Volume : 1.00 Printed : 3:08:52 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1	19.7017	29.7636	3832.500	98.3676
# 2	19.9770	29.8197	3775.500	96.9023
Mean	19.8394	29.7917	3804.000	97.6350
D	0.1947	0.0397	40.305	1.0361
RSD	0.9812	0.1332	1.060	1.0612

Checking calibration verification ...

Identity 1 : CLP_CCV_SC Identity 2 :

Report name	Low limit	Value	High limit
_766	18.000	19.839	22.000
Na589	27.000	29.792	33.000

BACKGROUND CORRECTED INTENSITIES

Identity 1 : Calibration blank Identity 2 : Type : CB

Weight : 1.0000 Volume : 1.00 Printed : 3:12:44 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	18.5	58.0	3834.0	3834.0
# 2	11.5	108.0	3796.0	3796.0
Mean	15.0	83.0	3815.0	3815.0
D	4.9	35.4	26.9	26.9
RSD	33.0	42.6	0.7	0.7

APPARENT CONCENTRATIONS

Identity 1 : Calibration blank Identity 2 : Type : CB

Weight : 1.0000 Volume : 1.00 Printed : 3:12:44 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1 L	-0.0344 L	-0.1311	3834.000	98.4062
# 2 L	-0.1234 L	-0.0129	3796.000	97.4293
Mean L	-0.0789 L	-0.0720	3815.000	97.9177
D	0.0630	0.0836	26.870	0.6907
RSD	79.8051	116.1204	0.704	0.7054

Checking calibration blank ...

Identity 1 : Calibration blank Identity 2 :

Report name	CRDL	Value
_766	0.250	-0.079
Na589	0.250	-0.072
Sc361	0.000	97.918

BACKGROUND CORRECTED INTENSITIES

Identity 1 : CRI Identity 2 : Type : CV

Weight : 1.0000 Volume : 1.00 Printed : 3:15:36 PM December 20, 2005

	K_766	Na589	Sc	Sc361
1	8.0	90.0	3833.5	3833.5
2	18.0	109.0	3747.5	3747.5
Mean	13.0	99.5	3790.5	3790.5
D	0.0	0.0	0.0	0.0
RSD	0.0	0.0	0.0	0.0

APPARENT CONCENTRATIONS

Identity 1 : CRI Identity 2 : Type : CV
 Weight : 1.0000 Volume : 1.00 Printed : 3:15:36 PM December 20, 2005
 EVOLUTION by Micro-Active Australia Pty Ltd 3:21:48 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1 L	-0.1701 L	-0.0570	3833.500	98.3933
# 2 L	-0.0355 L	-0.0072	3747.500	96.1825
Mean L	-0.1028 L	-0.0321	3790.500	97.2879
SD	0.0952	0.0352	60.811	1.5633
RSD	92.6351	109.5342	1.604	1.6068

Checking calibration verification ...

Identity 1 : CRI Identity 2 :
 Report name Low limit Value High limit
 _766 0.900 -0.103 1.100 Failed
 a589 0.900 -0.032 1.100 Failed

BACKGROUND CORRECTED INTENSITIES

Identity 1 : ICSA Identity 2 : Type : INTRF
 Weight : 1.0000 Volume : 1.00 Printed : 3:18:30 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	17.5	95.5	3722.5	3722.5
# 2	24.5	83.5	3710.5	3710.5
Mean	21.0	89.5	3716.5	3716.5
SD	4.9	8.5	8.5	8.5
RSD	23.6	9.5	0.2	0.2

APPARENT CONCENTRATIONS

Identity 1 : ICSA Identity 2 : Type : INTRF
 Weight : 1.0000 Volume : 1.00 Printed : 3:18:30 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm
# 1 L	-0.0405 L	-0.0377	3722.500	95.5398
# 2	0.0538 L	-0.0657	3710.500	95.2314
Mean	0.0066 L	-0.0517	3716.500	95.3856
SD	0.0667	0.0198	8.485	0.2181
RSD	1007.0489	38.2635	0.228	0.2287

BACKGROUND CORRECTED INTENSITIES

Identity 1 : ICSAB Identity 2 : Type : ICSAB
 Weight : 1.0000 Volume : 1.00 Printed : 3:21:22 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	22.5	85.5	3729.0	3729.0
# 2	26.5	91.5	3632.0	3632.0
Mean	24.5	88.5	3680.5	3680.5
SD	2.8	4.2	68.6	68.6
RSD	11.5	4.8	1.9	1.9

APPARENT CONCENTRATIONS

Identity 1 : ICSAB Identity 2 : Type : ICSAB
 Weight : 1.0000 Volume : 1.00 Printed : 3:21:22 PM December 20, 2005

	K_766	Na589	Sc	Sc361
	ppm	ppm		ppm

2 0.0881 L -0.0418 3632.000 93.2134
 Mean 0.0568 L -0.0518 3680.500 94.4602
 SD 0.0443 0.0142 68.589 1.7632
 EVOLUTION by Micro-Active Australia Pty Ltd 3:29:20 PM December 20, 2005
 CRSD 77.8601 27.4076 1.864 1.8666

010057

Checking interference check standard ...

Identity 1 : ICSAB Identity 2 :

Report name	Low limit	Value	High limit	
K_766	0.000	0.057	0.000	Failed
Na589	0.000	-0.052	0.000	Failed

BACKGROUND CORRECTED INTENSITIES

Identity 1 : CLP_CCv_SC Identity 2 : Type : CV

Height : 1.0000 Volume : 1.00 Printed : 3:25:14 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	1558.0	13065.5	3845.5	3845.5
# 2	1538.0	12804.5	3781.5	3781.5
Mean	1548.0	12935.0	3813.5	3813.5
SD	14.1	184.6	45.3	45.3
RSD	0.9	1.4	1.2	1.2

PPARENT CONCENTRATIONS

Identity 1 : CLP_CCv_SC Identity 2 : Type : CV

Height : 1.0000 Volume : 1.00 Printed : 3:25:14 PM December 20, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.8147	29.8859	3845.500	98.7018
# 2	19.8924	29.7837	3781.500	97.0566
Mean	19.8536	29.8348	3813.500	97.8792
SD	0.0550	0.0723	45.255	1.1634
RSD	0.2769	0.2422	1.187	1.1886

Checking calibration verification ...

Identity 1 : CLP_CCv_SC Identity 2 :

Report name	Low limit	Value	High limit
K_766	18.000	19.854	22.000
Na589	27.000	29.835	33.000

BACKGROUND CORRECTED INTENSITIES

Identity 1 : Calibration blank Identity 2 : Type : CB

Height : 1.0000 Volume : 1.00 Printed : 3:29:10 PM December 20, 2005

	K_766	Na589	Sc	Sc361
# 1	34.5	125.0	3878.5	3878.5
# 2	38.5	86.0	3759.5	3759.5
Mean	36.5	105.5	3819.0	3819.0
SD	2.8	27.6	84.1	84.1
RSD	7.7	26.1	2.2	2.2

PPARENT CONCENTRATIONS

Identity 1 : Calibration blank Identity 2 : Type : CB

Height : 1.0000 Volume : 1.00 Printed : 3:29:10 PM December 20, 2005

	K_766 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.1674	0.0206	3878.500	99.5501

Mean	0.2008 L	-0.0209	3819.000	98.0206
SD	0.0472	0.0587	84.146	2.1631
CRSD	23.4953	281.4103	2.203	2.2068

010058

EVOLUTION by Micro-Active Australia Pty Ltd 3:39:48 PM December 20, 2005

Checking calibration blank ...

Identity 1 : Calibration blank Identity 2 :

Report name	CRDL	Value
_766	0.250	0.201
la589	0.250	-0.021
lc361	0.000	98.021

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 62 230

CLIENT(S): Div. 20
TASK ORDER(S): 051219-5 SDG(S): 271245 010059
PROJECT NO(S): 06002. 01. 322
METHOD: 3005A 3050B 3050B-7.5 3010A 3020A 7760A 7740A HClO₄ HClO₄/H₂SO₄
Microwave Fusion Teflon Rock OTHER HNO₃
MATRIX: Water Soil Biota Solid Liquid TCLP Ext OTHER
INSTRUMENT: GFAA ICP ICP-MS IC FLAA HYDRIDE OTHER
ACID INORG #: HNO₃# 5484 HCl# H₂SO₄# HClO₄# HF# H₂O₂#
INTERNAL STD: Sc @ 10 PPM Be @ 10 PPM SOURCE: INORG# EXP: AMT:
Oven/Hotplate/Block ID: 1 Temperature (°C): 95°C

SAMPLE IDENTIFICATION	pH	WT (g)	I.V. (mL)	F.V. (mL)
PRW-M19E2				50
LCSW-M19E2 *				↓
271250		0.5357		↓
✓ d		0.5424		↓
271250S**		0.5249		↓
				5197 ^{WOS} 02/02/06
* Spiked 1 ml, and ** 500 µl Spike-1 (Spec # 5175, exp. 4/06)				
200 µl ICAL-1 (Spec # 5288, exp. 6/06)				
Balance # 12				
Pipet KE 12/19/05				
pipette:				
200 µl TMK-2				
500 µl TME5				
- wt. 0.5g into a centrifuge tube,				
- added 2ml HNO ₃ heat on the digestion block, for 30 min.				
- Adj. Volume to 50ml W/DI-water				
12-19-05 KE				
LOCATION: S6 B5				

PREPARED BY: Khalid E. S.

REVIEWED BY: B. J. Williams

DISPOSAL INT/DATE/LOC: _____

DATE: 12-19-05

DATE: 12-20-05

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 62 232

CLIENT(S): Div. 20 010060
TASK ORDER(S): 051219-5 SDG(S): 271245
PROJECT NO(S): 06002.01.322
METHOD: 3005A 3050B 3050B-7.5 3010A 3020A 7760A 7740A HClO₄ HClO₄/H₂SO₄
Microwave Fusion Teflon Rock OTHER dilutions
MATRIX: Water Soil Biota Solid Liquid ✓ TCLP Ext OTHER
INSTRUMENT: GFAA ICP ✓ ICP-MS IC FLAA HYDRIDE OTHER
ACID INORG #: HNO₃# 5484 HCl# 5476 H₂SO₄# HClO₄# HF# H₂O₂#
INTERNAL STD: Sc @ 10 PPM ✓ Be @ 10 PPM SOURCE: EV INORG# 5404 EXP: 14/16 AMT: 50uL
Oven/Hotplate/Block ID: N/A Temperature (°C): N/A

Sample Identification	df	WT(g)	I.V.(ml)	F.V.(ml)
PBW-M20H1	1		5	5
LCSW-L15H1*	1		5	5
271245	5		1	5
271245d	5		1	5
271245s*	5		1	5
271246	5		1	5
271247	5		1	5
271248	5		1	5
271249	5		1	5

*20uL ICAL-1 Spex#5288 exp. 06/06

PBW&LCSW are prepared as 10mls 1%HNO₃ / 5% HCL

Conducted Chrome filter
→ Mary E. Harrison
12-19-05 242 pm
JC 12-22-05

LOCATION:

N/A

PREPARED BY: [Signature]DATE: 12-20-05REVIEWED BY: [Signature]DATE: 12-21-05

DISPOSAL INT/DATE/LOC: _____

SOUTHWEST RESEARCH INSTITUTE®

6220 Culebra Rd
San Antonio, Texas 78228

010061

SPECTRO ICP DAILY LOG

ANALYST [Signature]

DATE 12-20-05

POWER: 5W

FLAWS:


Aux 40
Coolant 60
Mass Flow Controller 886

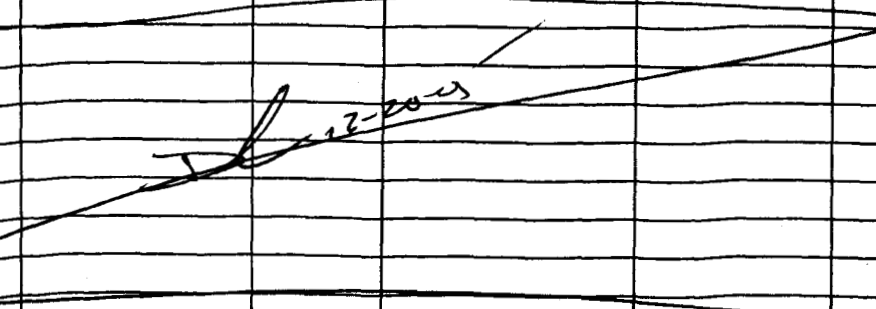
CURRENT	PROPOSED	
5136	5151	Na
4771	4789	Fe
4960	4978	Sr

Na
Fe
Sr

QC PREP DATE:

CCV/ICV	05m01
CRI	05m01
ICSA	05m01
ICSAB	05m12

CLP_STD1_SC	05m01
CLP_STD2_SC	
CLP_STD3_SC	
CLP_STD4_SC	
CLP_STD5_SC	
BLK_SC	

FILE	CLIENT	TO#	PROJECT NO.	METHOD	PREP PAGE
051220	CH2M-Hill	0512148	11543.12.006	200.7	62-223
051220A	DIV 20	051219-5	06007.01.322	6010.3	62-230/232
					

COMMENTS: _____

MAINTENANCE:

Cleaned Torch: _____ YES
 Changed Pump Tubing: _____ YES
 Cleaned Optics: _____ YES
 Polished Optics: _____ YES

OTHER: _____

REVIEWED BY:

DATE: 12/21/05

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 051401

010062

Date Prepared: 12-1-05

Prepared By: [Signature]

Make up as needed in 1000ml volumetric flask.

Added ☒ 10 ml HNO3 INORG #: 5455

Added ☒ 50 ml HCL INORG #: 5422

Added ☒ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: 5-1-06 INORG #: 5175

ICP Calibration Blank/ICB/CCB Solution

ID: BLK-

Date Prepared: _____

Prepared By: _____

Make up as needed in 1000ml volumetric flask.

Added _____ 10 ml HNO3 INORG #: _____

Added _____ 50 ml HCL INORG #: _____

Added _____ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: _____ INORG #: _____

ICP Calibration Blank/ICB/CCB Solution

ID: BLK-

Date Prepared: _____

Prepared By: _____

Make up as needed in 1000ml volumetric flask.

Added _____ 10 ml HNO3 INORG #: _____

Added _____ 50 ml HCL INORG #: _____

Added _____ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: _____ INORG #: _____

ICP Calibration Blank/ICB/CCB Solution

ID: BLK-

Date Prepared: _____

Prepared By: _____

Make up as needed in 1000ml volumetric flask.

Added _____ 10 ml HNO3 INORG #: _____

Added _____ 50 ml HCL INORG #: _____

Added _____ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: _____ INORG #: _____

ICP ICV/CCV SOLUTION

010063

CCV- 05 mol

Date Prepared: 12-1-05 Prepared By: DLHNO3 INORG #: 5455 HCl INORG #: 5422

Make up as needed in 1000ml volumetric flask in 1% HNO3 AND 5% HCl.

Element	Std Conc (ppm)	Amt added	Check	Source	Inorg #	Stock Conc (ppm)	Exp Date
Sc	10	1ml	/	INORGVENT	5175	10000	5-1-06
B	5	5ml	/	SPEX	4966	1000	1-15-06
Li	5	5ml	/	SPEX	5327	1000	8-15-06
Mo	5	5ml	/	SPEX	5326	1000	8-15-06
P	5	5ml	/	SPEX	5280	1000	6-30-06
Si	5	5ml	/	SPEX	5238	1000	2-28-06
Ti	5	5ml	/	SPEX	5040	1000	2-28-06
Sr	5	5ml	/	SPEX	5246	1000	5-30-06
Sn	5	5ml	/	SPEX	5237	1000	2-28-06
Bi	5	5ml	/	SPEX	5432	1000	10-15-06
La	5	5ml	/	SPEX	5325	1000	8-15-06
Y	5	5ml	/	SPEX	5431	1000	10-15-06
Pd	1	1ml	/	SPEX	4967	1000	1-15-06
S	1	1ml	/	SPEX	5296	1000	7-15-06
Th	1	1ml	/	SPEX	5358	1000	8-30-06
U	1	1ml	/	SPEX	5279	1000	6-30-06
W	1	1ml	/	SPEX	5314	1000	7-30-06
Zr	5	5ml	/	SPEX	5039	1000	2-28-06
Na	10	1ml	/	SPEX	4998	10000	1-30-06
ICV-2A	vary	10ml	/	SPEX	5429	mix	10-15-06
ICV-2B	vary	1ml	/	SPEX	5430	mix	10-15-06
ICV-2C	vary	10ml	/	SPEX	5428	mix	10-15-06

Expiration Date: 1-15-06

ICP Calibration Standards

010064

Date Prepared: 12-1-05

Prepared By: 

HNO3 INORG #: 5455

HCl INORG #: 5422

Make up as needed in 500 ml volumetric flasks in 1% HNO3 and 5% HCl.

Prepared	Standard Name	Element	Std Conc (ppm)	Added ml	Check	Source	INORG #	Stock Conc (ppm)	Exp Date
12-1-05	STD1-05mMol	Al	50	2.50	/	INORVENT	5405	10000	10-1-06
		Ca	50	2.50	/	INORVENT	4988	10000	2-1-06
		Fe	50	2.50	/	INORVENT	5044	10000	3-1-06
		K	50	2.50	/	INORVENT	5471	10000	12-1-06
		Mg	25	1.25	/	INORVENT	5312	10000	8-1-06
		Na	50	2.50	/	INORVENT	5310	10000	8-1-06
		Li	10	5.00	/	INORVENT	5244	1000	6-1-06
		Sc	10	0.500	/	INORVENT	5175	10000	5-1-06
12-1-05	STD2-05mMol	Ba	10	5.00	/	INORVENT	5027	1000	3-1-06
		Be	5	2.50	/	INORVENT	5253	1000	6-1-06
		Cr	10	5.00	/	INORVENT	5470	1000	12-1-06
		Cu	10	5.00	/	INORVENT	5049	1000	3-1-06
		Ni	10	5.00	/	INORVENT	5043	1000	3-1-06
		Sc	10	0.500	/	INORVENT	5175	10000	5-1-06
12-1-05	STD3-05mMol	Cd	10	5.00	/	INORVENT	5041	1000	3-1-06
		Co	10	5.00	/	INORVENT	5044	1000	3-1-06
		Mn	10	5.00	/	INORVENT	4989	1000	2-1-06
		V	10	5.00	/	INORVENT	5472	1000	12-1-06
		Zn	10	5.00	/	INORVENT	4915	1000	1-1-06
		Sc	10	0.500	/	INORVENT	5175	10000	5-1-06
12-1-05	STD4-05mMol	Ag	2	1.00	/	INORVENT	5406	1000	10-1-06
		As	10	5.00	/	INORVENT	4987	1000	2-1-06
		Pb	10	5.00	/	INORVENT	5255	1000	6-1-06
		Sb	10	5.00	/	INORVENT	5042	1000	3-1-06
		Se	10	5.00	/	INORVENT	5313	1000	8-1-06
		TL	10	5.00	/	INORVENT	4990	1000	2-1-06
		Sc	10	0.500	/	INORVENT	5175	10000	5-1-06
12-1-05	STD5-05mMol	B	10	5.00	/	INORVENT	5047	1000	3-1-06
		Mo	10	5.00	/	INORVENT	5050	1000	3-1-06
		P	10	5.00	/	INORVENT	5254	1000	6-1-06
		Si	10	5.00	/	INORVENT	5046	1000	3-1-06
		Ti	10	5.00	/	INORVENT	5474	1000	12-1-06
		Sr	10	5.00	/	INORVENT	5243	1000	6-1-06
		Sn	10	5.00	/	INORVENT	5174	1000	5-1-06
		Bi	5	2.50	/	INORVENT	5309	1000	8-1-06
12-1-05	STD6-05mMol	Sc	10	0.500	/	INORVENT	5175	10000	5-1-06
		La	10	5.00	/	INORVENT	5407	1000	10-1-06
		Na	1	0.05	/	INORVENT	5310	10000	8-1-06
		Pd	10	5.00	/	INORVENT	5045	1000	3-1-06
		S	10	5.00	/	INORVENT	4917	1000	1-1-06
		Th	10	5.00	/	INORVENT	5469	1000	12-1-06
		U	10	5.00	/	INORVENT	5408	1000	10-1-06
		W	5	2.50	/	INORVENT	5308	1000	8-1-06
		Y	10	5.00	/	INORVENT	5200	1000	3-1-06
		Zr	10	5.00	/	INORVENT	5311	1000	8-1-06
		SC	10	0.500	/	INORVENT	5175	10000	5-1-06

Expiration Dates:

STD1: 2-1-06

STD4: 2-1-06

STD2: 2-1-06

STD5: 2-1-06

STD3: 1-1-06

STD6: 1-1-06

Div 20
06002.01.322
TO# 051219-5

Woodan A. Naegel
12/22/05

Analyst: RSS
Method: EPA 300
TAP 01-0406-042 Rev
Sig Fig: 3

RSS

Date
Analyzed

	System ID	Analyte	Conc. mg/L	Weight g	FV ml	RESULT mg/Kg	Qual	DL	TV	%REC %RPD
12/20/05	PBW-M19E3	Fluoride	0.000	1.0	50	10	U	10		
12/20/05	PBW-M19E3	Chloride	0.037	1.0	50	10	U	10		
12/20/05	PBW-M19E3	Nitrite-N	0.000	1.0	50	10	U	10		
12/20/05	PBW-M19E3	Bromide	0.000	1.0	50	10	U	10		
12/20/05	PBW-M19E3	Nitrate-N	0.000	1.0	50	10	U	10		
12/20/05	PBW-M19E3	Phosphate-P	0.092	1.0	50	10	U	10		
12/20/05	PBW-M19E3	Sulfate	0.000	1.0	50	10	U	10		
12/20/05	271250	Fluoride	0.000	1.0194	50	981	U	981		
12/21/05	271250	Chloride	2211.305	1.0194	50	108000		1960		
12/20/05	271250	Nitrite-N	0.000	1.0194	50	981	U	981		
12/20/05	271250	Bromide	0.000	1.0194	50	981	U	981		
12/21/05	271250	Nitrate-N	2176.692	1.0194	50	107000		1960		
12/20/05	271250	Phosphate-P	373.608	1.0194	50	18300		981		
12/20/05	271250	Sulfate	0.000	1.0194	50	981	U	981		
12/20/05	271250D	Fluoride	0.000	1.0194	50	981	U	981		0.00%
12/21/05	271250D	Chloride	2464.516	1.1208	50	110000		1780		1.83%
12/20/05	271250D	Nitrite-N	0.000	1.1208	50	892	U	892		0.00%
12/20/05	271250D	Bromide	0.000	1.1208	50	892	U	892		0.00%
12/21/05	271250D	Nitrate-N	2392.584	1.1208	50	107000		1780		0.00%
12/20/05	271250D	Phosphate-P	419.901	1.1208	50	18700		892		2.16%
12/20/05	271250D	Sulfate	0.000	1.1208	50	892	U	892		0.00%
12/20/05	271250S	Fluoride	89.699	1.0194	50	4400		981	4900	89.8%
12/21/05	271250S	Chloride	2802.948	1.0194	50	137000		1960	19600	148%
12/20/05	271250S	Nitrite-N	154.646	1.0194	50	7590		981	7800	97.3%
12/20/05	271250S	Bromide	406.635	1.0194	50	19900		981	19600	102%
12/21/05	271250S	Nitrate-N	2358.152	1.0194	50	116000		1960	8858	102%
12/20/05	271250S	Phosphate-P	574.656	1.0194	50	28200		981	9340	106%
12/20/05	271250S	Sulfate	396.393	1.0194	50	19400		981	19600	99.0%

010065

RSS
12/22/05
↓

U = Undetected

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 62 231

CLIENT(S): DIV- 20

TASK ORDER(S): 051219-5 SDG(S): 271245 **010066**

PROJECT NO(S): 06002-01-322

METHOD: 3005A 3050B 3050B-7.5 3010A 3020A 7760A 7740A HClO₄ HClO₄/H₂SO₄
Microwave Fusion Teflon Rock OTHER water diss.

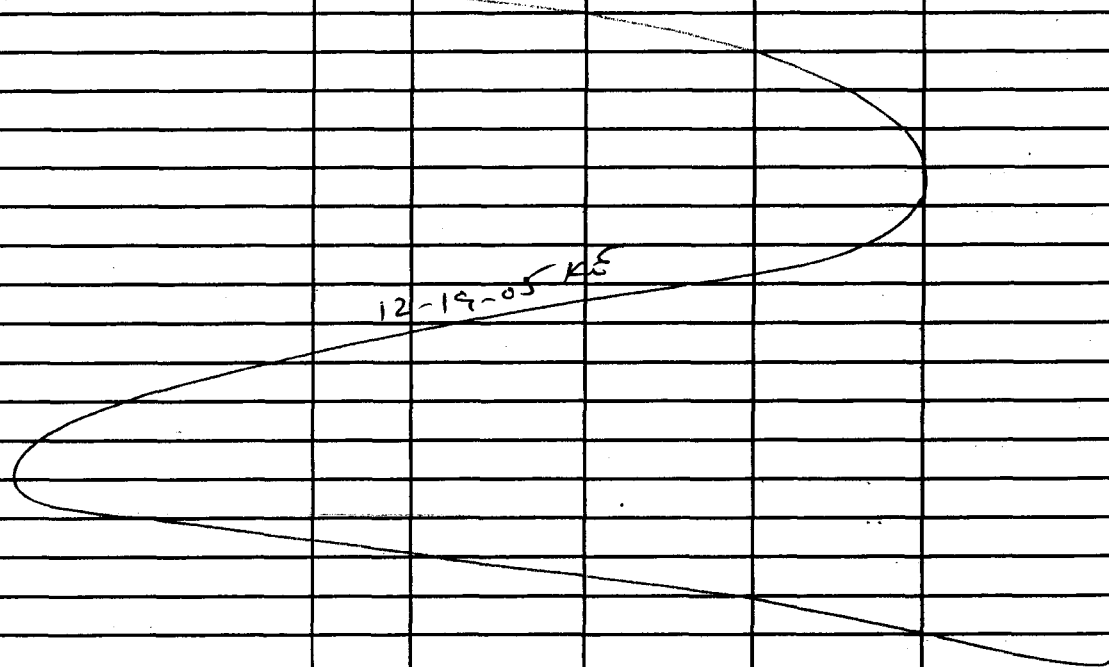
MATRIX: Water Soil Biota Solid ☒ Liquid TCLP Ext OTHER

INSTRUMENT: GFAA ICP ICP-MS IC ☒ FLAA HYDRIDE OTHER

ACID INORG #: HNO₃# N/A HCl# N/A H₂SO₄# HClO₄# HF# H₂O₂#

INTERNAL STD: Sc @ 10 PPM Be @ 10 PPM SOURCE: INORG# EXP: AMT:

Oven/Hotplate/ Block ID: N/A Temperature (°C):

SAMPLE IDENTIFICATION	pH	WT (g)	I.V. (mL)	F.V. (mL)
PBW-M19E3				50
271250		1.0194		↓
↓ ↓		1.1208		↓
- wt. 1g into a centrifuge tube, - adj. volume to 50ml w/ DI-water.				
				
12-19-05 K ⁵				
LOCATION: 56 B5				

PREPARED BY: Kelley

DATE: 12-19-05

REVIEWED BY: B. J. [Signature]

DATE: 12-20-05

DISPOSAL INT/DATE/LOC: _____

Div 20
06002.01.322
TO# 051219-5

Analyst: RSS
Method: 300
Sig Fig: 3

TAP#: 01-0406-042 Rev. 4

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Date Analyzed	System ID	Analyte	Conc. mg/L	RESULT mg/L	Qual	DL	TV	%REC %RPD
12/21/05	271245	Fluoride	0.112	0.112		0.1		
12/21/05	271245	Chloride	0.681	0.681		0.1		
12/21/05	271245	Nitrite-N	1.231	1.23		0.1		
12/21/05	271245	Bromide	0.000	0.1	U	0.1		
12/21/05	271245	Nitrate-N	0.396	0.396		0.1		
12/21/05	271245	Phosphate-P	0.000	0.1	U	0.1		
12/21/05	271245	Sulfate	0.063	0.1	U	0.1		
12/21/05	271245D	Fluoride	0.113	0.113		0.1		0.89%
12/21/05	271245D	Chloride	0.934	0.934		0.1		31.3%
12/21/05	271245D	Nitrite-N	1.216	1.22		0.1		0.82%
12/21/05	271245D	Bromide	0.000	0.1	U	0.1		0.00%
12/21/05	271245D	Nitrate-N	0.411	0.411		0.1		3.72%
12/21/05	271245D	Phosphate-P	0.000	0.1	U	0.1		0.00%
12/21/05	271245D	Sulfate	0.077	0.1	U	0.1		0.00%
12/21/05	271245S	Fluoride	0.860	0.860		0.1	1	74.8%
12/21/05	271245S	Chloride	2.593	2.59		0.1	2	95.5%
12/21/05	271245S	Nitrite-N	2.727	2.73		0.1	1.59	94.3%
12/21/05	271245S	Bromide	4.049	4.05		0.1	4	101%
12/21/05	271245S	Nitrate-N	1.204	1.20		0.1	0.904	88.9%
12/21/05	271245S	Phosphate-P	1.918	1.92		0.1	1.91	101%
12/21/05	271245S	Sulfate	4.025	4.03		0.1	4	101%
12/21/05	271246	Fluoride	0.118	0.118		0.1		
12/21/05	271246	Chloride	0.358	0.358		0.1		
12/21/05	271246	Nitrite-N	0.330	0.330		0.1		
12/21/05	271246	Bromide	0.000	0.1	U	0.1		
12/21/05	271246	Nitrate-N	0.450	0.450		0.1		
12/21/05	271246	Phosphate-P	0.066	0.1	U	0.1		
12/21/05	271246	Sulfate	0.059	0.1	U	0.1		
12/21/05	271247	Fluoride	0.155	0.155		0.1		
12/21/05	271247	Chloride	1.582	1.58		0.1		
12/21/05	271247	Nitrite-N	1.331	1.33		0.1		
12/21/05	271247	Bromide	0.080	0.1	U	0.1		
12/21/05	271247	Nitrate-N	8.687	8.69		0.1		
12/21/05	271247	Phosphate-P	0.596	0.596		0.1		
12/21/05	271247	Sulfate	0.098	0.1	U	0.1		
12/20/05	271248	Fluoride	2.187	2.19		2		
12/20/05	271248	Chloride	115.655	116		2		
12/20/05	271248	Nitrite-N	2.372	2.37		2		
12/20/05	271248	Bromide	0.000	2	U	2		
12/20/05	271248	Nitrate-N	203.821	204		2		
12/20/05	271248	Phosphate-P	2.468	2.47		2		
12/20/05	271248	Sulfate	0.776	2	U	2		
12/20/05	271249	Fluoride	2.286	2.29		2		
12/21/05	271249	Chloride	420.050	420		10		
12/20/05	271249	Nitrite-N	3.422	3.42		2		
12/20/05	271249	Bromide	13.703	13.7		2		
12/20/05	271249	Nitrate-N	310.009	310		2		
12/20/05	271249	Phosphate-P	3.984	3.98		2		
12/20/05	271249	Sulfate	0.000	2	U	2		

U = Undetected

Div 20
06002.01.322
TO# 051219-5

Analyst: RSS
Method: 300
Sig Fig: 3

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TAP#: 01-0406-042 Rev. 4

Date
Analyzed

	System ID	Analyte	Conc. mg/L	RESULT mg/L	Qual	DL	TV	%REC %RPD
12/20/05	ICV (LCS)	Fluoride	94.985	95		0	100	95.0%
12/20/05	ICV (LCS)	Chloride	199.707	200		0.1	200	100%
12/20/05	ICV (LCS)	Nitrite-N	152.990	153		0.1	159	96.2%
12/20/05	ICV (LCS)	Bromide	390.662	391		0.1	400	97.8%
12/20/05	ICV (LCS)	Nitrate-N	83.191	83.2		0.1	90.4	92.0%
12/20/05	ICV (LCS)	Phosphate-P	187.544	188		0.1	191	98.4%
12/20/05	ICV (LCS)	Sulfate	388.074	388		0.1	400	97.0%
12/20/05	ICB (PB)	Fluoride	0.000	0.1	U	0.1		
12/20/05	ICB (PB)	Chloride	0.000	0.1	U	0.1		
12/20/05	ICB (PB)	Nitrite-N	0.000	0.1	U	0.1		
12/20/05	ICB (PB)	Bromide	0.000	0.1	U	0.1		
12/20/05	ICB (PB)	Nitrate-N	0.000	0.1	U	0.1		
12/20/05	ICB (PB)	Phosphate-P	0.000	0.1	U	0.1		
12/20/05	ICB (PB)	Sulfate	0.000	0.1	U	0.1		
12/20/05	CCV	Fluoride	97.883	97.9		0.1	100	97.9%
12/20/05	CCV	Chloride	210.028	210		0.1	200	105%
12/20/05	CCV	Nitrite-N	157.699	158		0.1	159	99.4%
12/20/05	CCV	Bromide	401.414	401		0.1	400	100%
12/20/05	CCV	Nitrate-N	84.881	84.9		0.1	90.4	93.9%
12/20/05	CCV	Phosphate-P	189.168	189		0.1	191	99.0%
12/20/05	CCV	Sulfate	390.957	391		0.1	400	97.8%
12/20/05	CCB	Fluoride	0.000	0.1	U	0.1		
12/20/05	CCB	Chloride	0.036	0.1	U	0.1		
12/20/05	CCB	Nitrite-N	0.000	0.1	U	0.1		
12/20/05	CCB	Bromide	0.000	0.1	U	0.1		
12/20/05	CCB	Nitrate-N	0.000	0.1	U	0.1		
12/20/05	CCB	Phosphate-P	0.076	0.1	U	0.1		
12/20/05	CCB	Sulfate	0.000	0.1	U	0.1		
12/20/05	CCV	Fluoride	99.628	99.6		0.1	100	99.6%
12/20/05	CCV	Chloride	207.729	208		0.1	200	104%
12/20/05	CCV	Nitrite-N	155.013	155		0.1	159	97.5%
12/20/05	CCV	Bromide	399.986	400		0.1	400	100%
12/20/05	CCV	Nitrate-N	85.118	85.1		0.1	90.4	94.1%
12/20/05	CCV	Phosphate-P	190.901	191		0.1	191	100%
12/20/05	CCV	Sulfate	394.742	395		0.1	400	98.8%
12/20/05	CCB	Fluoride	0.000	0.1	U	0.1		
12/20/05	CCB	Chloride	0.038	0.1	U	0.1		
12/20/05	CCB	Nitrite-N	0.000	0.1	U	0.1		
12/20/05	CCB	Bromide	0.000	0.1	U	0.1		
12/20/05	CCB	Nitrate-N	0.000	0.1	U	0.1		
12/20/05	CCB	Phosphate-P	0.000	0.1	U	0.1		
12/20/05	CCB	Sulfate	0.090	0.1	U	0.1		
12/21/05	ICV (LCS)	Fluoride	95.822	95.8		0	100	95.8%
12/21/05	ICV (LCS)	Chloride	203.581	204		0.1	200	102%
12/21/05	ICV (LCS)	Nitrite-N	154.921	155		0.1	159	97.5%
12/21/05	ICV (LCS)	Bromide	401.732	402		0.1	400	100.5%
12/21/05	ICV (LCS)	Nitrate-N	86.075	86.1		0.1	90.4	95.2%
12/21/05	ICV (LCS)	Phosphate-P	193.644	194		0.1	191	101.6%
12/21/05	ICV (LCS)	Sulfate	396.278	396		0.1	400	99.0%
12/21/05	ICB (PB)	Fluoride	0.000	0.1	U	0.1		
12/21/05	ICB (PB)	Chloride	0.047	0.1	U	0.1		
12/21/05	ICB (PB)	Nitrite-N	0.000	0.1	U	0.1		
12/21/05	ICB (PB)	Bromide	0.000	0.1	U	0.1		

U = Undetected

Div 20
06002.01.322
TO# 051219-5

Analyst: RSS
Method: 300
Sig Fig: 3

010069

TAP#: 01-0406-042 Rev. 4

Date Analyzed	System ID	Analyte	Conc. mg/L	RESULT mg/L	Qual	DL	TV	%REC %RPD
12/21/05	ICB (PB)	Nitrate-N	0.000	0.1	U	0.1		
12/21/05	ICB (PB)	Phosphate-P	0.000	0.1	U	0.1		
12/21/05	ICB (PB)	Sulfate	0.000	0.1	U	0.1		
12/21/05	CCV	Fluoride	97.459	97.5		0.1	100	97.5%
12/21/05	CCV	Chloride	206.748	207		0.1	200	104%
12/21/05	CCV	Nitrite-N	156.139	156		0.1	159	98.1%
12/21/05	CCV	Bromide	407.268	407		0.1	400	102%
12/21/05	CCV	Nitrate-N	86.900	86.9		0.1	90.4	96.1%
12/21/05	CCV	Phosphate-P	193.094	193		0.1	191	101%
12/21/05	CCV	Sulfate	401.138	401		0.1	400	100%
12/21/05	CCB	Fluoride	0.000	0.1	U	0.1		
12/21/05	CCB	Chloride	0.035	0.1	U	0.1		
12/21/05	CCB	Nitrite-N	0.000	0.1	U	0.1		
12/21/05	CCB	Bromide	0.000	0.1	U	0.1		
12/21/05	CCB	Nitrate-N	0.000	0.1	U	0.1		
12/21/05	CCB	Phosphate-P	0.000	0.1	U	0.1		
12/21/05	CCB	Sulfate	0.000	0.1	U	0.1		

U = Undetected

Line	Sample	Sample Type	Level	Method	Data File	Dilution
1	ICV	Sample		anions051116.met	051220_a001.dxd	20
2	ICB	Sample		anions051116.met	051220_002.dxd	1
3	271245	Sample		anions051116.met	051220_003.dxd	1
4	271245D	Sample		anions051116.met	051220_004.dxd	1
5	271245S	Sample		anions051116.met	051220_005.dxd	1
6	271246	Sample		anions051116.met	051220_006.dxd	1
7	271247	Sample		anions051116.met	051220_007.dxd	1
8	271249 DF100	Sample		anions051116.met	051220_008.dxd	100
9	271250 DF200	Sample		anions051116.met	051220_009.dxd	200
10	271250D DF200	Sample		anions051116.met	051220_010.dxd	200
11	271250S DF200	Sample		anions051116.met	051220_011.dxd	200
12	CCV	Sample		anions051116.met	051220_012.dxd	20
13	CCB	Sample		anions051116.met	051220_013.dxd	1

010070

Default Method Path: C:\PEAKNET\METHOD
Default Data Path: C:\PEAKNET\DATA\051221
Comment:
DIV 20 06002.01.322 TO#051219-5

XELUANT - 17.0 uS
1.0 mM SODIUM BICARBONATE (INORG #2626) & 3.5 mM SODIUM CARBONATE (INORG#3757)

- ICV Sources:
- 1) SPEX LOT#28-164AS (INORG#5467)
 - F = 100 mg/L
 - Cl = 200 mg/L
 - Br = 400 mg/L
 - NO3N = 90.4 mg/L
 - PO4P = 191 mg/L
 - SO4 = 400 mg/L
 - 2) 128-01-IC5
 - NO2N 159 mg/L

R. Spier
12/21/05

Sample Name : ICV
Dilution Factor : 20.00
Injection Number : 1
Data File Name : c:\peaknet\data\051221\051220_A001.DXD
Method File Name : c:\peaknet\method\anions051116.met
Schedule File Name : c:\peaknet\schedule\21dec05.sch

Date Time Collected : 12/21/05 3:40:15 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-SN#018097 AG14-#019940
System Operator : RSPIES

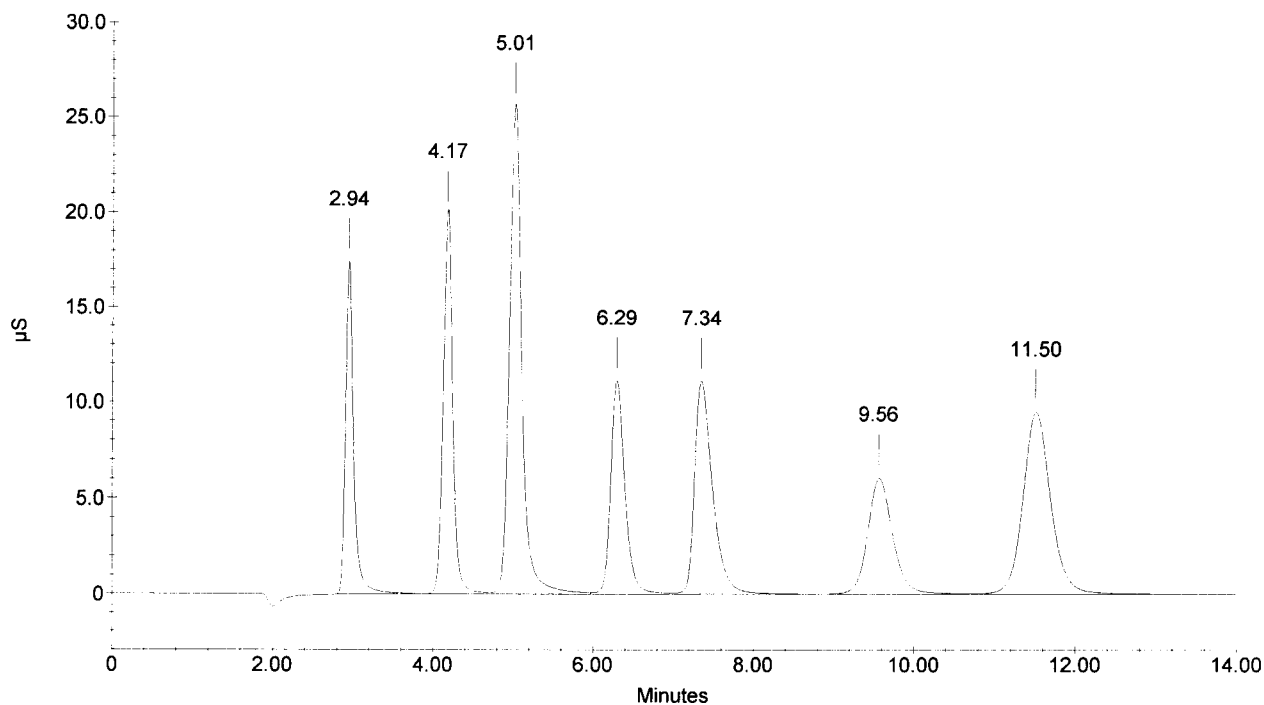
010071

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.94	FLUORIDE	95.822	173684	1220081	2	-2.21
2	4.17	CHLORIDE	203.581	198735	1647479	2	-2.11
3	5.01	NITRITE-N	154.921	255703	2790269	2	-2.53
4	6.29	BROMIDE	401.732	110807	1368058	2	-2.33
5	7.34	NITRATE-N	86.075	110559	1743957	2	-0.36
6	9.56	PHOSPHATE-P	193.644	59972	1315700	2	-2.48
7	11.50	SULFATE	396.278	94263	2264875	2	-2.60

0.00	---total(s)---	12350419
	1532.053	

ICV



Sample Name : ICB
 Dilution Factor : 1.00
 Injection Number : 2
 Data File Name : c:\peaknet\data\051221\051220_002.DXD
 Method File Name : c:\peaknet\method\anions051116.met
 Schedule File Name : c:\peaknet\schedule\21dec05.sch

Date Time Collected : 12/21/05 3:56:55 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-SN#018097 AG14-#01997
 System Operator : RSPIES

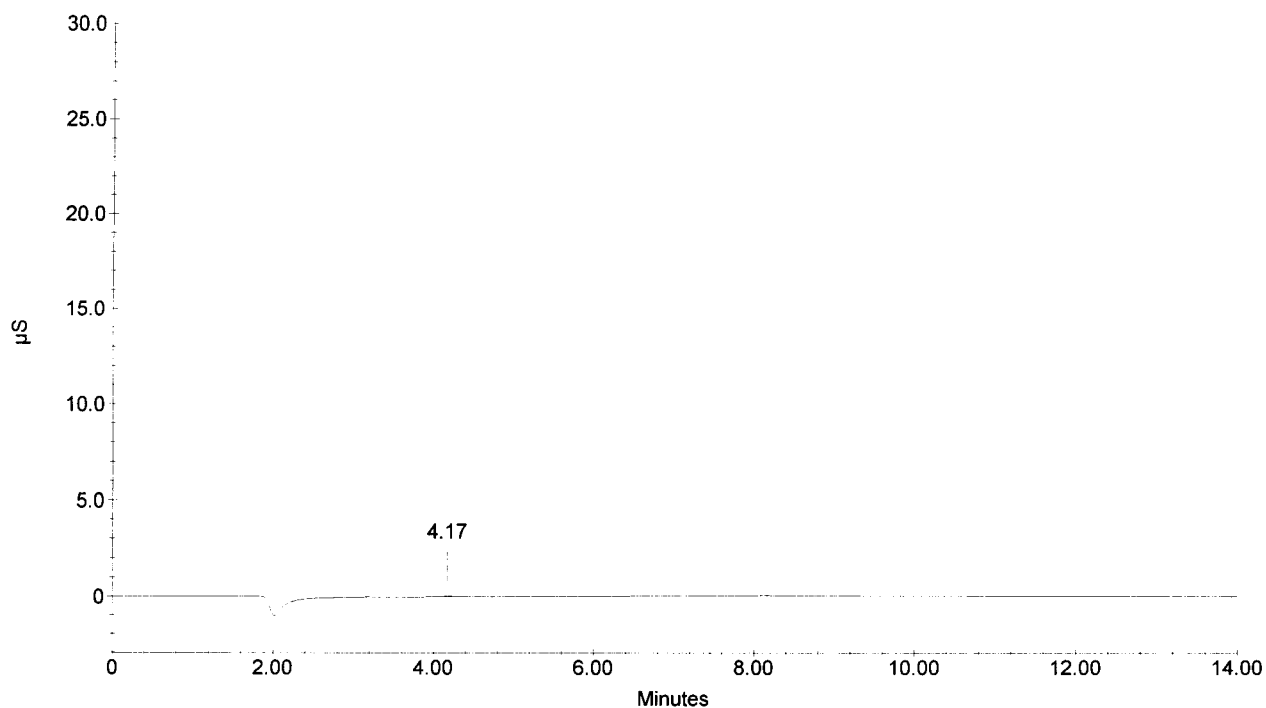
010072

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	4.17	CHLORIDE	0.047	346	2585	1	-2.11
1	4.17	CHLORIDE	0.047	346	2585	1	-2.11
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					

0.00	---total(s)---	5170
	0.093	

ICB



Sample Name : 271245

Dilution Factor : 1.00

Injection Number : 3

Data File Name : c:\peaknet\data\051221\051220_003.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\21dec05.sch

Date Time Collected : 12/21/05 4:13:37 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

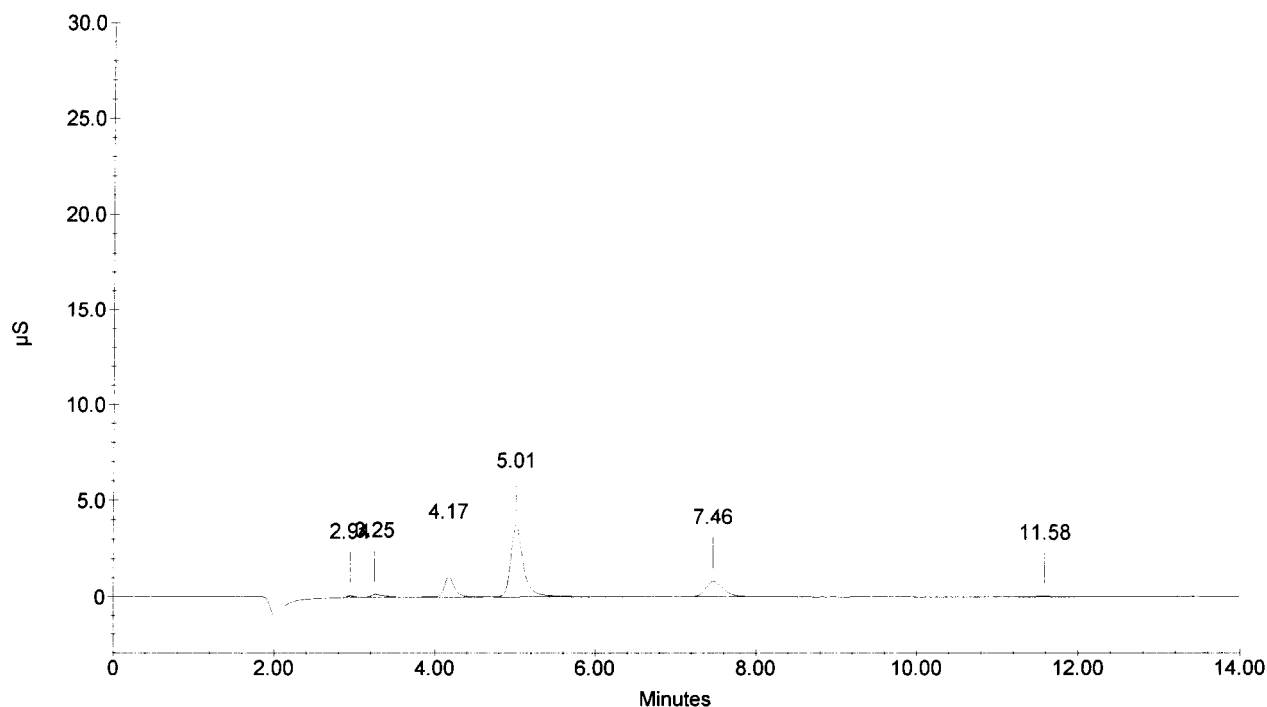
010073

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.94	FLUORIDE	0.112 ✓	870	4819	1	-2.21
3	4.17	CHLORIDE	0.681 ✓	11022	98857	2	-2.11
4	5.01	NITRITE-N	1.231 ✓	37376	416733	2	-2.53
		BROMIDE	✓				
5	7.46	NITRATE-N	0.396 ✓	8173	126518	1	1.27
		PHOSPHATE-P	✓				
6	11.58	SULFATE	0.063 ✓	227	4440	1	-1.92

0.00	---total(s)---	651368
	2.483	

271245



Sample Name : 271245D
Dilution Factor : 1.00
Injection Number : 4
Data File Name : c:\peaknet\data\051221\051220_004.DXD
Method File Name : c:\peaknet\method\anions051116.met
Schedule File Name : c:\peaknet\schedule\21dec05.sch

Date Time Collected : 12/21/05 4:30:21 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-SN#018097 AG14-#019940
System Operator : RSPIES

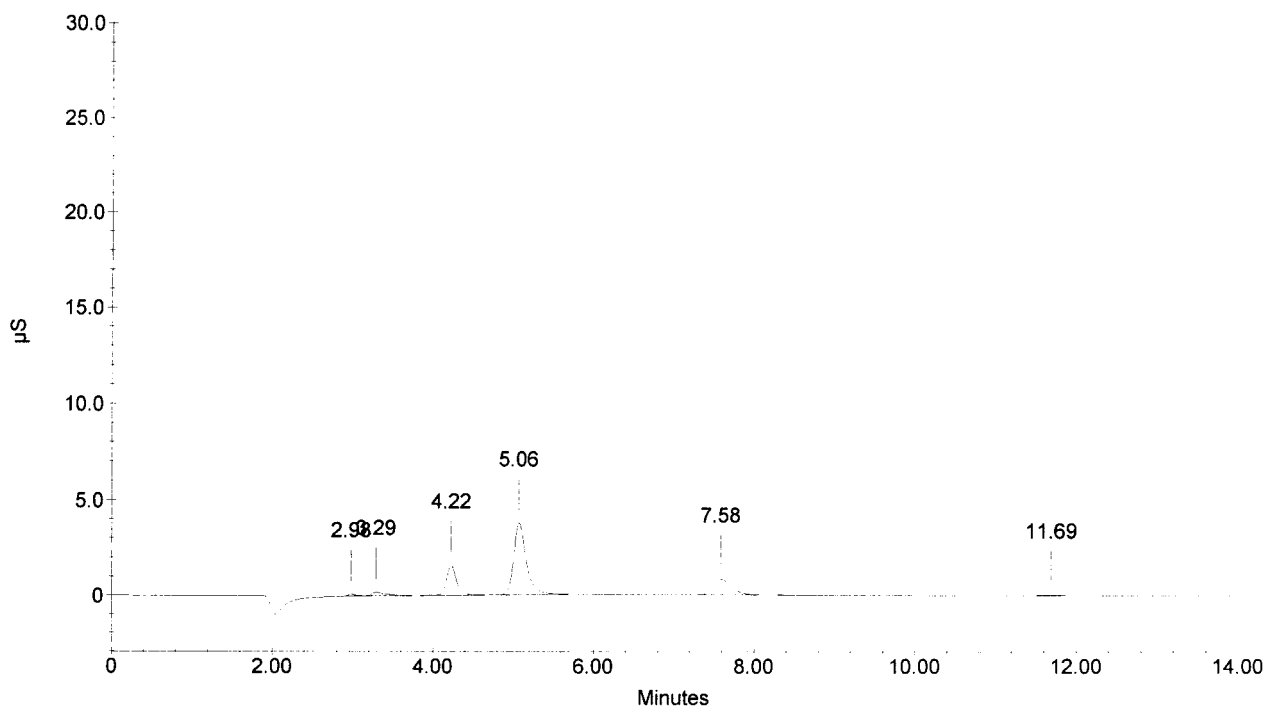
010074

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.98	FLUORIDE	0.113 ✓	881	4874	1	-0.89
3	4.22	CHLORIDE	0.934 ✓	15838	137557	1	-0.86
4	5.06	NITRITE-N BROMIDE	1.216 ✓	37084	411071	1	-1.49
5	7.58	NITRATE-N PHOSPHATE-P	0.411 ✓	8203	132648	1	2.89
6	11.69	SULFATE	0.077 ✓	249	5891	1	-1.02

0.00	---total(s)---	692041
	2.750	

271245D



Sample Name : 271245S
Dilution Factor : 1.00
Injection Number : 5
Data File Name : c:\peaknet\data\051221\051220_005.DXD
Method File Name : c:\peaknet\method\anions051116.met
Schedule File Name : c:\peaknet\schedule\21dec05.sch

Date Time Collected : 12/21/05 4:47:04 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-SN#018097 AG14-#019940
System Operator : RSPIES

010075

Peak Information : All Components

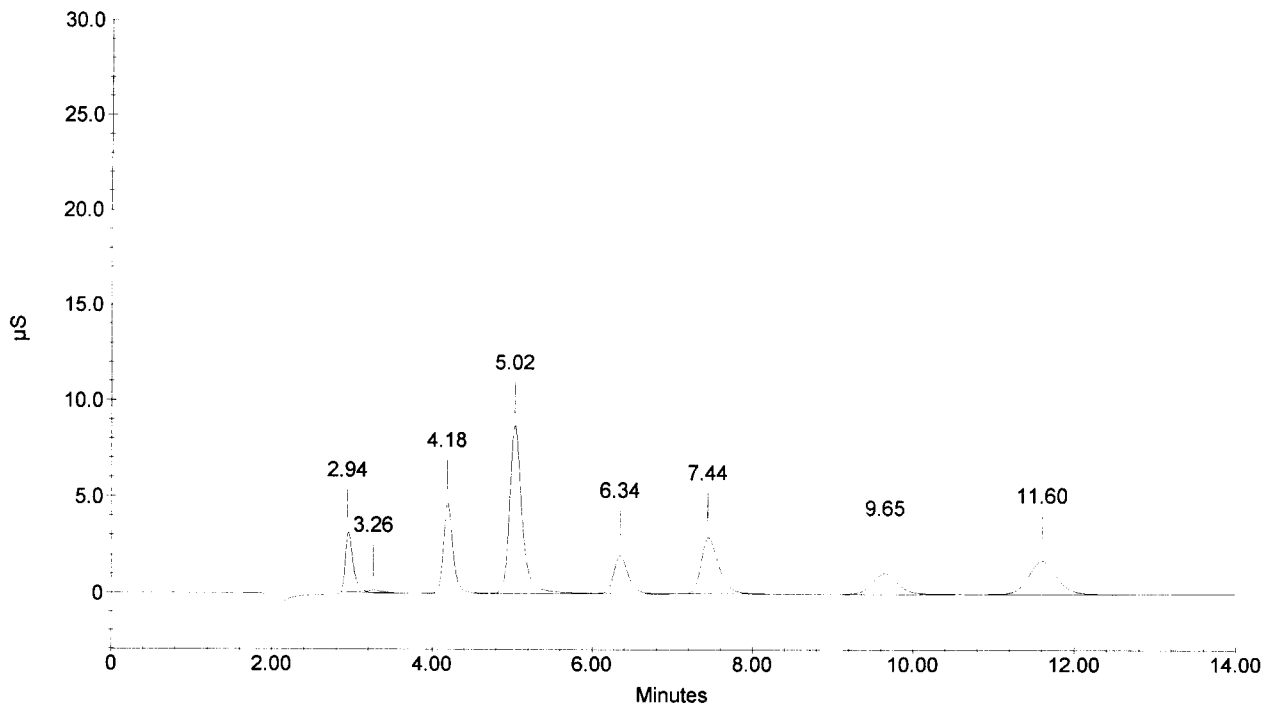
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.94	FLUORIDE	0.860 ✓	29562	197867	3	-2.21
3	4.18	CHLORIDE	2.593 ✓	46101	394007	2	-1.80
4	5.02	NITRITE-N	2.727 ✓	86592	956281	2	-2.27
5	6.34	BROMIDE	4.049 ✓	19899	254494	2	-1.50
6	7.44	NITRATE-N	1.204 ✓	28896	453724	2	0.90
7	9.65	PHOSPHATE-P	1.918 ✓	10758	242629	1	-1.53
8	11.60	SULFATE	4.025 ✓	17355	428036	1	-1.81

0.00

---total(s)---
17.376

2927038

271245S



Sample Name : 271246

Dilution Factor : 1.00

Injection Number : 6

Data File Name : c:\peaknet\data\051221\051220_006.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\21dec05.sch

Date Time Collected : 12/21/05 5:03:48 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

010076

Peak Information : All Components

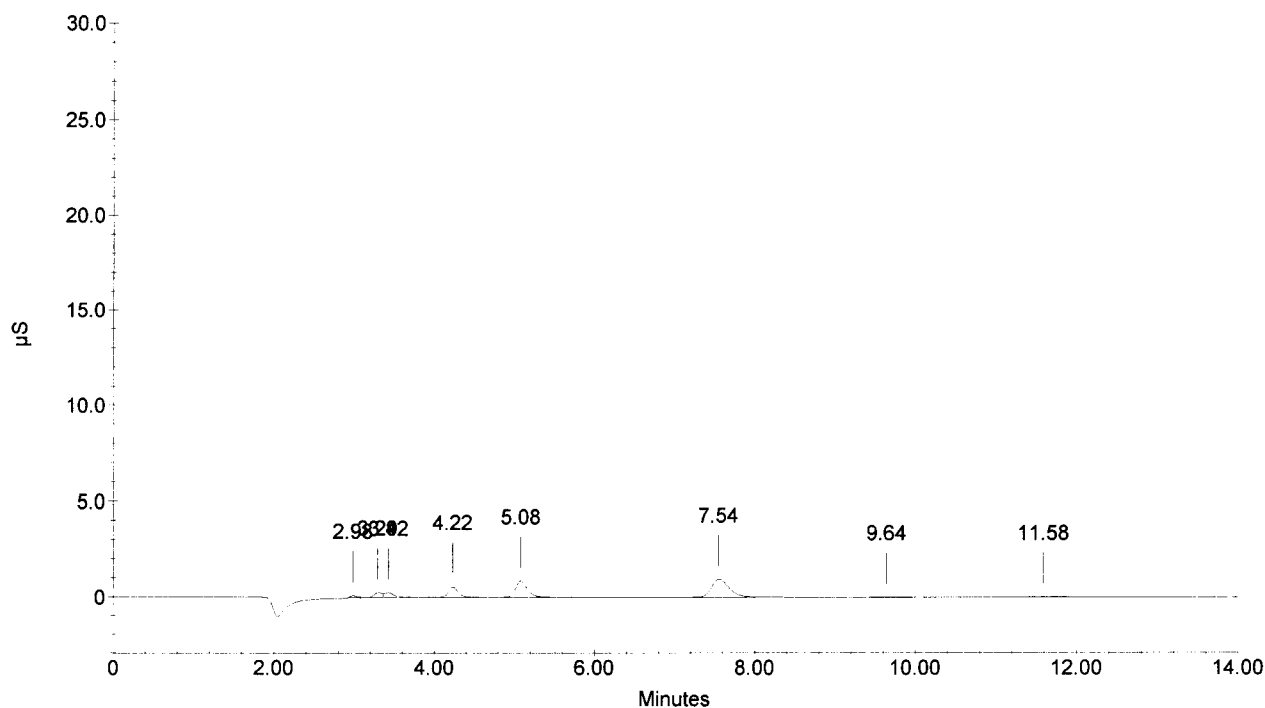
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.98	FLUORIDE	0.118 ✓	1083	6259	1	-0.89
4	4.22	CHLORIDE	0.358 ✓	5558	49760	1	-0.86
5	5.08	NITRITE-N	0.330 ✓	8622	92836	1	-1.23
		BROMIDE	✓				
6	7.54	NITRATE-N	0.450 ✓	9422	148291	1	2.35
7	9.64	PHOSPHATE-P	0.066 ✓	119	2752	1	-1.67
8	11.58	SULFATE	0.059 ✓	168	4011	1	-1.92

0.00

---total(s)---
1.380

303909

271246



Sample Name : 271247

Dilution Factor : 1.00

Injection Number : 7

Data File Name : c:\peaknet\data\051221\051220_007.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\21dec05.sch

Date Time Collected : 12/21/05 5:20:31 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

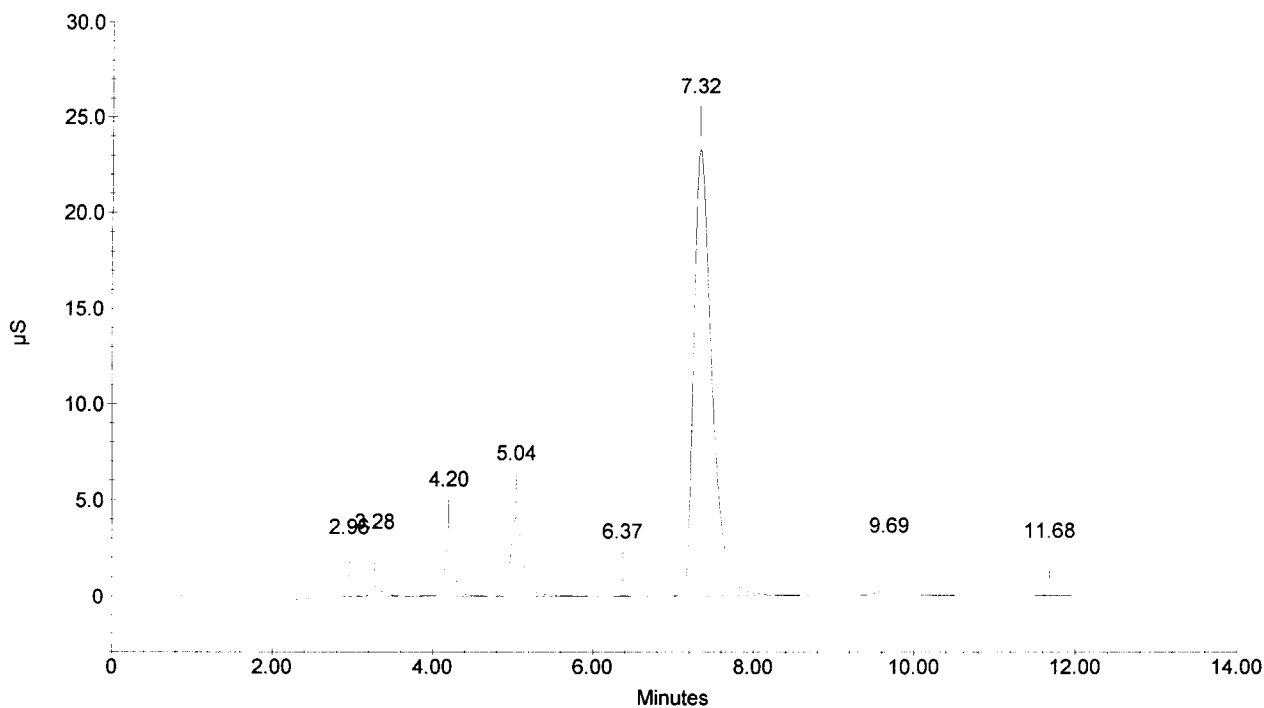
010077

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.96	FLUORIDE	0.155✓	2614	15885	1	-1.77
3	4.20	CHLORIDE	1.582✓	27303	237024	2	-1.49
4	5.04	NITRITE-N	1.331✓	40951	452574	2	-2.01
5	6.37	BROMIDE	0.080✓	252	2599	1	-1.09
6	7.32	NITRATE-N	8.687✓	232995	3679186	1	-0.72
7	9.69	PHOSPHATE-P	0.596✓	2839	70816	1	-1.12
8	11.68	SULFATE	0.098✓	348	8172	1	-1.13

0.00	---total(s)---	4466255
	12.529	

271247



Sample Name : 271249 DF100

Dilution Factor : 100.00

Injection Number : 8

Data File Name : c:\peaknet\data\051221\051220_008.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\21dec05.sch

Date Time Collected : 12/21/05 5:37:16 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

010078

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.96	FLUORIDE	9.693	162	812	1	-1.77
3	4.18	CHLORIDE	420.050 ✓	78197	648125	3	-1.80
4	5.01	NITRITE-N	8.357	432	4683	4	-2.53
5	6.34	BROMIDE	15.886	618	7553	1	-1.50
6	7.37	NITRATE-N	290.210	73338	1153174	1	0.00
7	9.65	PHOSPHATE-P SULFATE	8.057	217	4656	1	-1.53

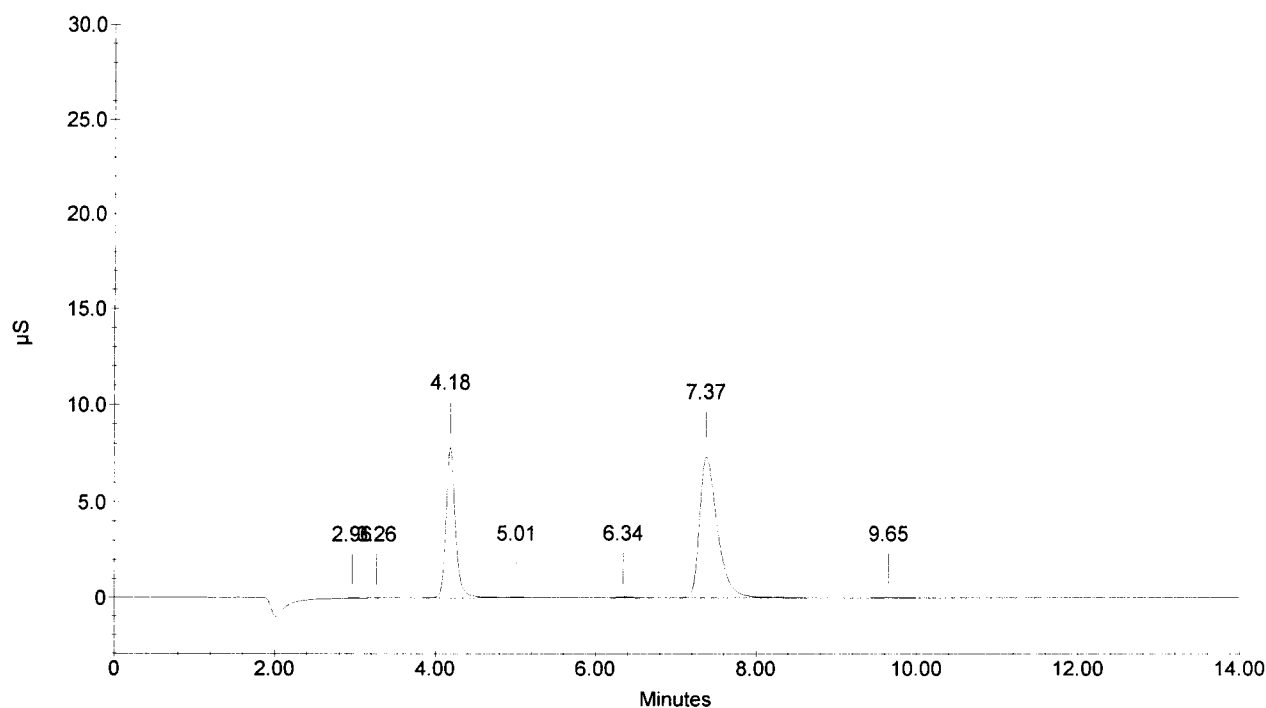
0.00

---total(s)---

752.252

1819004

271249 DF100



Sample Name : 271250 DF200

Dilution Factor : 200.00

Injection Number : 9

Data File Name : c:\peaknet\data\051221\051220_009.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\21dec05.sch

Date Time Collected : 12/21/05 5:53:59 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

010079

Peak Information : All Components

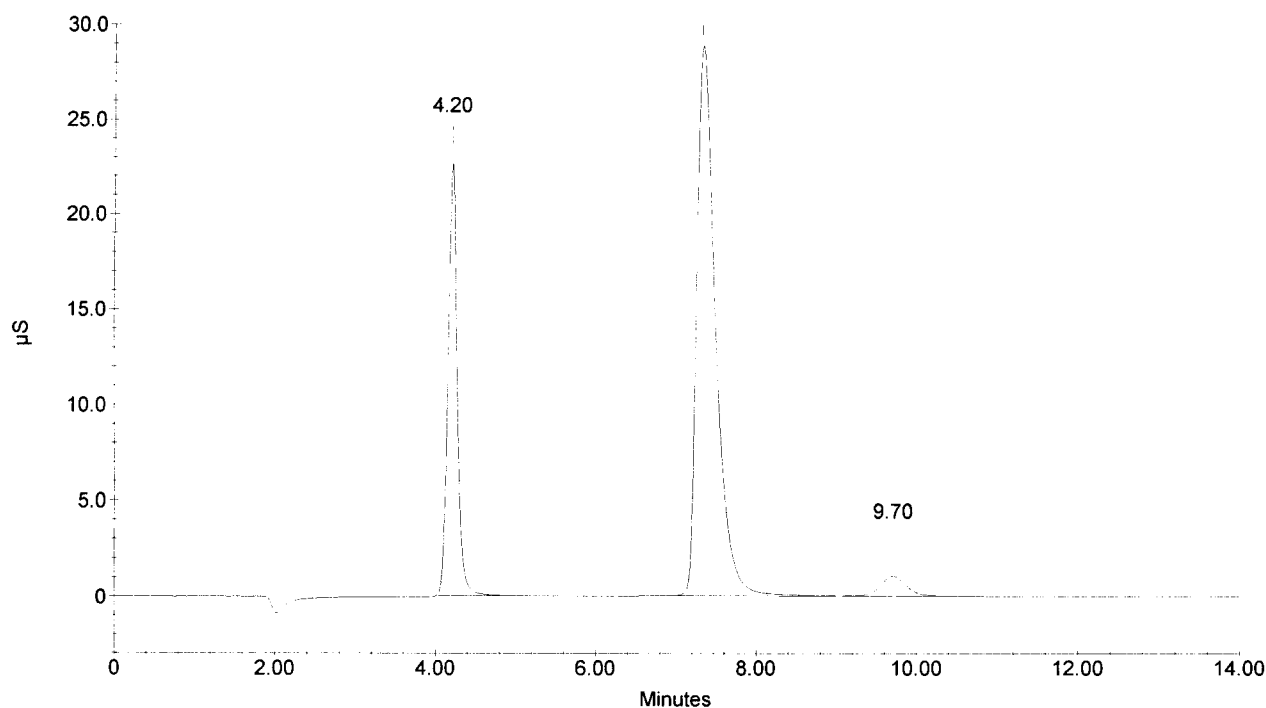
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	4.20	CHLORIDE	2211.305	223421	1802373	1	-1.49
1	4.20	CHLORIDE	2211.305	223421	1802373	1	-1.49
		NITRITE-N					
		BROMIDE					
2	7.32	NITRATE-N	2176.692	287296	4705904	2	-0.72
3	9.70	PHOSPHATE-P	372.744	10425	235523	2	-0.99
		SULFATE					

0.00

---total(s)---
6972.045

8546172

271250 DF200



Sample Name : 271250D DF200

Dilution Factor : 200.00

Injection Number : 10

Data File Name : c:\peaknet\data\051221\051220_010.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\21dec05.sch

Date Time Collected : 12/21/05 6:10:41 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

010080

Peak Information : All Components

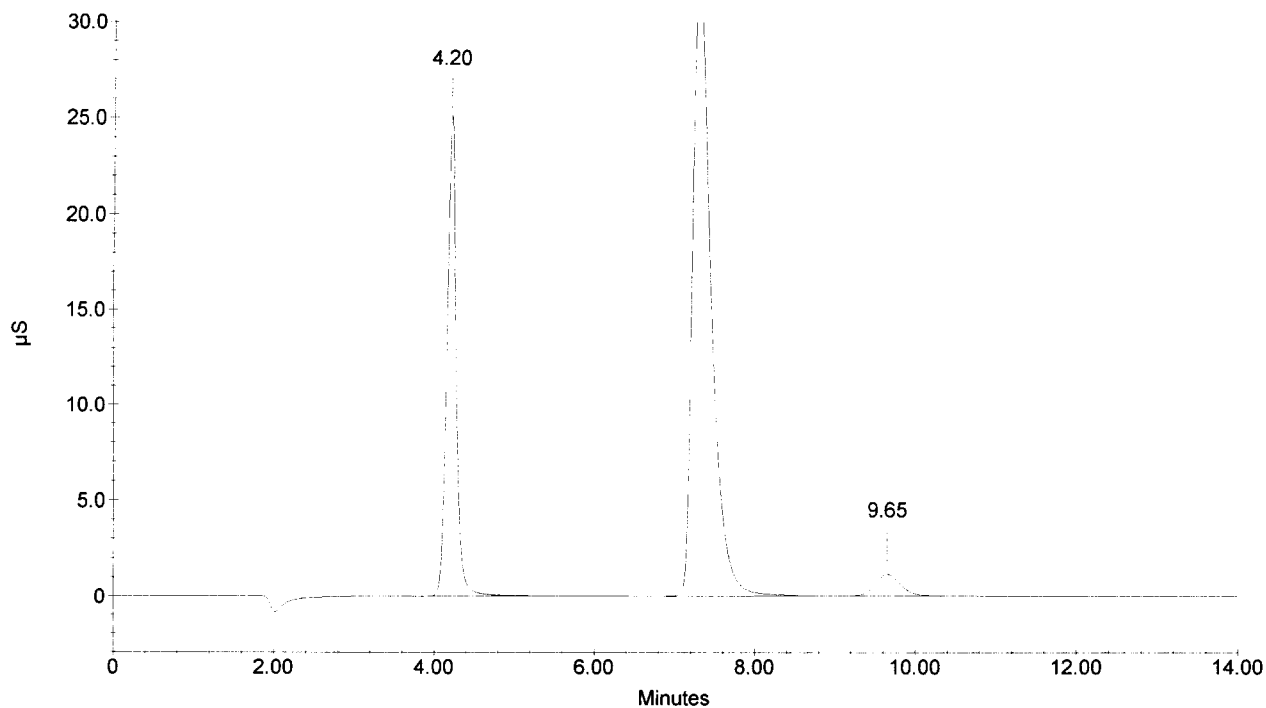
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	4.20	CHLORIDE	2464.516	247514	2030095	1	-1.49
1	4.20	CHLORIDE	2464.516	247514	2030095	1	-1.49
		NITRITE-N					
		BROMIDE					
2	7.28	NITRATE-N	2392.584	324996	5226562	2	-1.27
3	9.65	PHOSPHATE-P	413.717	11649	262379	2	-1.53
		SULFATE					

0.00

---total(s)---
7735.333

9549131

271250D DF200



Sample Name : 271250S DF200

Dilution Factor : 200.00

Injection Number : 11

Data File Name : c:\peaknet\data\051221\051220_011.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\21dec05.sch

Date Time Collected : 12/21/05 6:27:25 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

010081

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.97	FLUORIDE	183.023	29047	212008	1	-1.33
2	4.25	CHLORIDE	2802.948	281825	2342821	2	-0.23
3	5.09	NITRITE-N	304.981	45400	522394	2	-0.97
4	6.44	BROMIDE	790.013	19333	248098	2	-0.05
5	7.38	NITRATE-N	2358.152	316464	5142774	2	0.18
6	9.66	PHOSPHATE-P	743.239	21818	480971	1	-1.39
7	11.61	SULFATE	763.420	16584	405472	1	-1.69

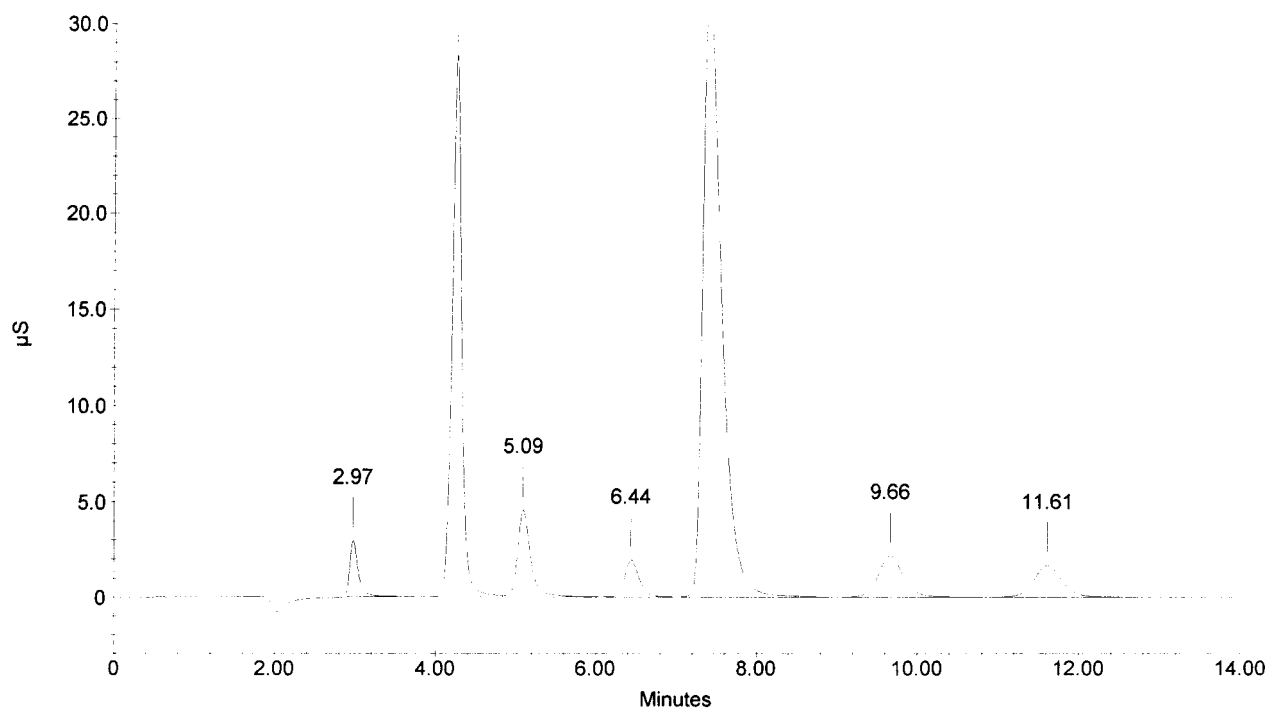
0.00

---total(s)---

7945.776

9354538

271250S DF200



Sample Name : CCV
 Dilution Factor : 20.00
 Injection Number : 12
 Data File Name : c:\peaknet\data\051221\051220_012.DXD
 Method File Name : c:\peaknet\method\anions051116.met
 Schedule File Name : c:\peaknet\schedule\21dec05.sch

Date Time Collected : 12/21/05 6:44:07 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-SN#018097 AG14-#019940
 System Operator : RSPIES

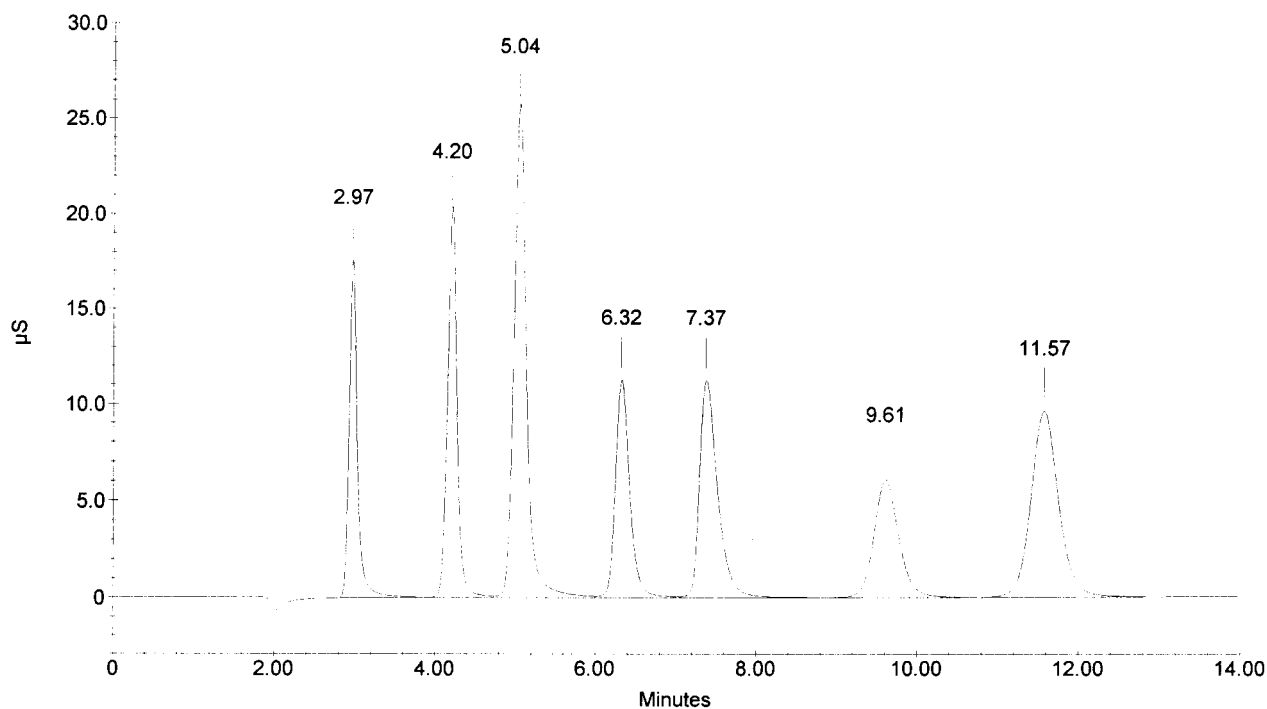
010082

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.97	FLUORIDE	97.459	175400	1241508	2	-1.33
2	4.20	CHLORIDE	206.748	199245	1675257	2	-1.49
3	5.04	NITRITE-N	156.139	254529	2812743	2	-2.01
4	6.32	BROMIDE	407.268	112024	1388911	2	-1.92
5	7.37	NITRATE-N	86.900	111797	1761524	2	0.00
6	9.61	PHOSPHATE-P	193.094	60759	1311684	1	-1.94
7	11.57	SULFATE	401.138	95866	2295364	1	-2.03

0.00	---total(s)---	12486991
	1548.745	

CCV



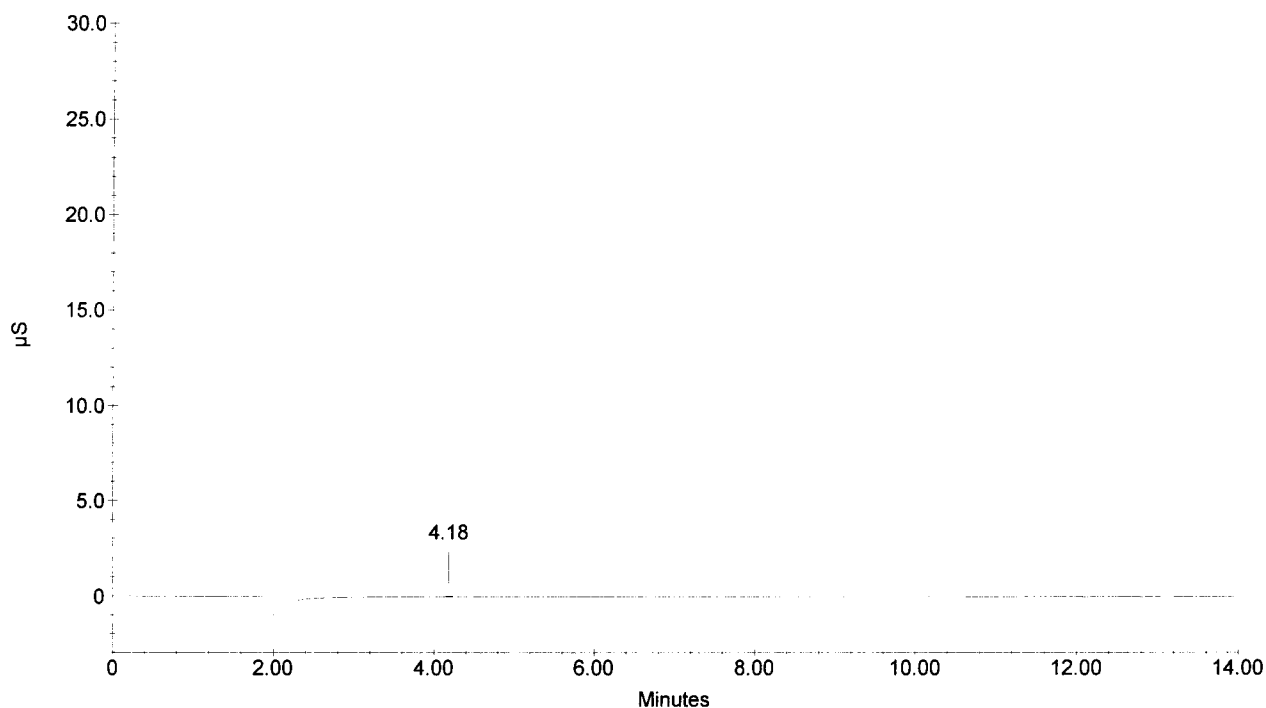
Sample Name : CCB
Dilution Factor : 1.00
Injection Number : 13
Data File Name : c:\peaknet\data\051221\051220_013.DXD
Method File Name : c:\peaknet\method\anions051116.met
Schedule File Name : c:\peaknet\schedule\21dec05.sch

Date Time Collected : 12/21/05 7:00:50 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-SN#018097 AG14-#019940
System Operator : RSPIES

010083

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.18	CHLORIDE	0.035	122	892	1	-1.80
1	4.18	CHLORIDE	0.035	122	892	1	-1.80
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
			---total(s)---				
0.00			0.071		1784		

CCB



Line	Sample	Sample Type	Level	Method	Data File	Dilution
1	ICV	Sample		anions051116.met	051215_001.dxd	20
2	ICB	Sample		anions051116.met	051215_002.dxd	1
3	271245 DF20	Sample		anions051116.met	051215_003.dxd	20
4	271245D DF20	Sample		anions051116.met	051215_004.dxd	20
5	271245S DF20	Sample		anions051116.met	051215_005.dxd	20
6	271246 DF20	Sample		anions051116.met	051215_006.dxd	20
7	271247 DF20	Sample		anions051116.met	051215_007.dxd	20
8	271248 DF20	Sample		anions051116.met	051215_008.dxd	20
9	271249 DF20	Sample		anions051116.met	051215_009.dxd	20
10	PBW-M19E3	Sample		anions051116.met	051215_010.dxd	1
11	271250 DF100	Sample		anions051116.met	051215_011.dxd	100
12	271250D DF100	Sample		anions051116.met	051215_012.dxd	100
13	CCV	Sample		anions051116.met	051215_013.dxd	20
14	CCB	Sample		anions051116.met	051215_014.dxd	1
15	271250S DF100	Sample		anions051116.met	051215_015.dxd	100
16	CCV	Sample		anions051116.met	051215_016.dxd	20
17	CCB	Sample		anions051116.met	051215_017.dxd	1

010084

Default Method Path: C:\PEAKNET\METHOD
Default Data Path: C:\PEAKNET\DATA\051220
Comment:
DIV 20 06002.01.322 TO#051219-5

Y - ELUANT - 17.0 uS
1.0 mM SODIUM BICARBONATE (INORG #2626) & 3.5 mM SODIUM CARBONATE (INORG#3757)

- ICV Sources:
- 1) SPEX LOT#28-164AS (INORG#5467)
 - F = 100 mg/L
 - Cl = 200 mg/L
 - Br = 400 mg/L
 - NO3N = 90.4 mg/L
 - PO4P = 191 mg/L
 - SO4 = 400 mg/L
 - 2) 128-01-IC5
 - NO2N 159 mg/L

R. Spies
12/20/05

Sample Name : ICV
 Dilution Factor : 20.00
 Injection Number : 1
 Data File Name : c:\peaknet\data\051220\051215_001.DXD
 Method File Name : c:\peaknet\method\anions051116.met
 Schedule File Name : c:\peaknet\schedule\20dec05.sch

Date Time Collected : 12/20/05 6:05:45 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-SN#018097 AG14-#019940
 System Operator : RSPIES

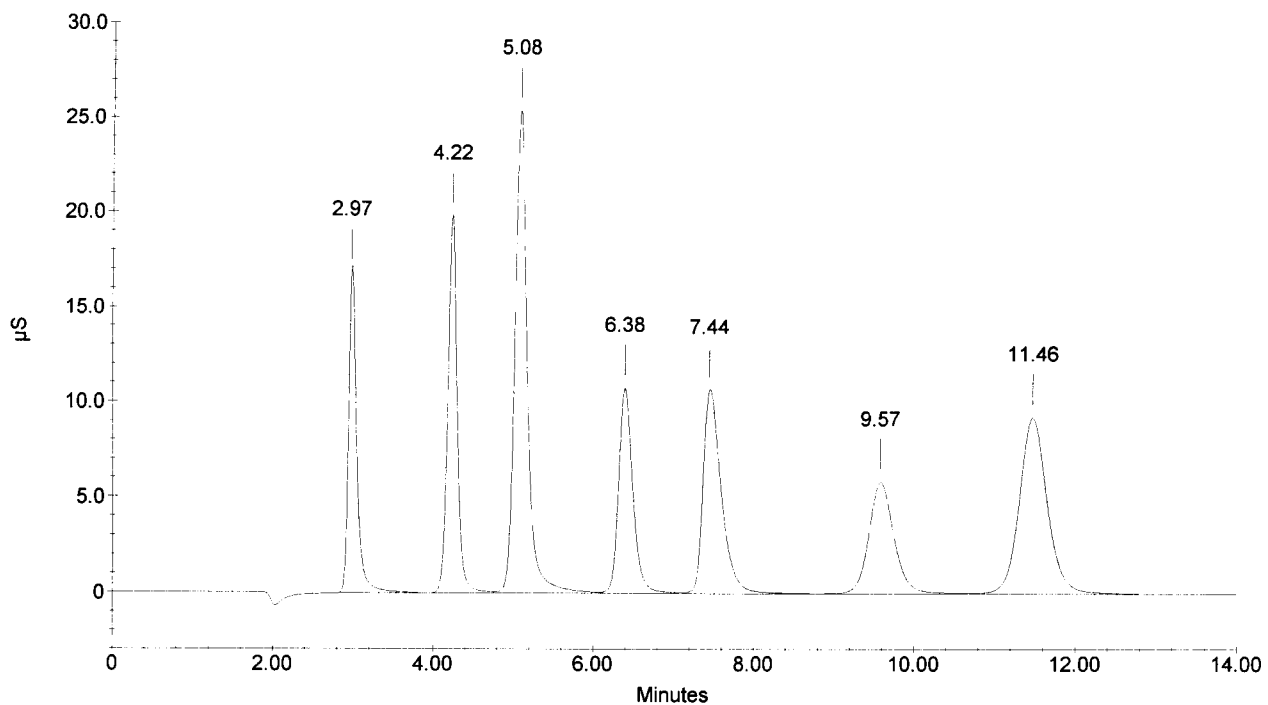
010085

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.97	FLUORIDE	94.985	168166	1209138	2	-1.33
2	4.22	CHLORIDE	199.707	197963	1613594	2	-0.86
3	5.08	NITRITE-N	152.990	253747	2754649	2	-1.23
4	6.38	BROMIDE	390.662	107140	1326554	2	-0.88
5	7.44	NITRATE-N	83.191	105894	1682600	2	0.90
6	9.57	PHOSPHATE-P	187.544	57676	1271206	2	-2.35
7	11.46	SULFATE	388.074	91910	2213583	2	-2.94

0.00	---total(s)---	1497.154	12071325
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ICV



Sample Name : ICB
 Dilution Factor : 1.00
 Injection Number : 2
 Data File Name : c:\peaknet\data\051220\051215_002.DXD
 Method File Name : c:\peaknet\method\anions051116.met
 Schedule File Name : c:\peaknet\schedule\20dec05.sch

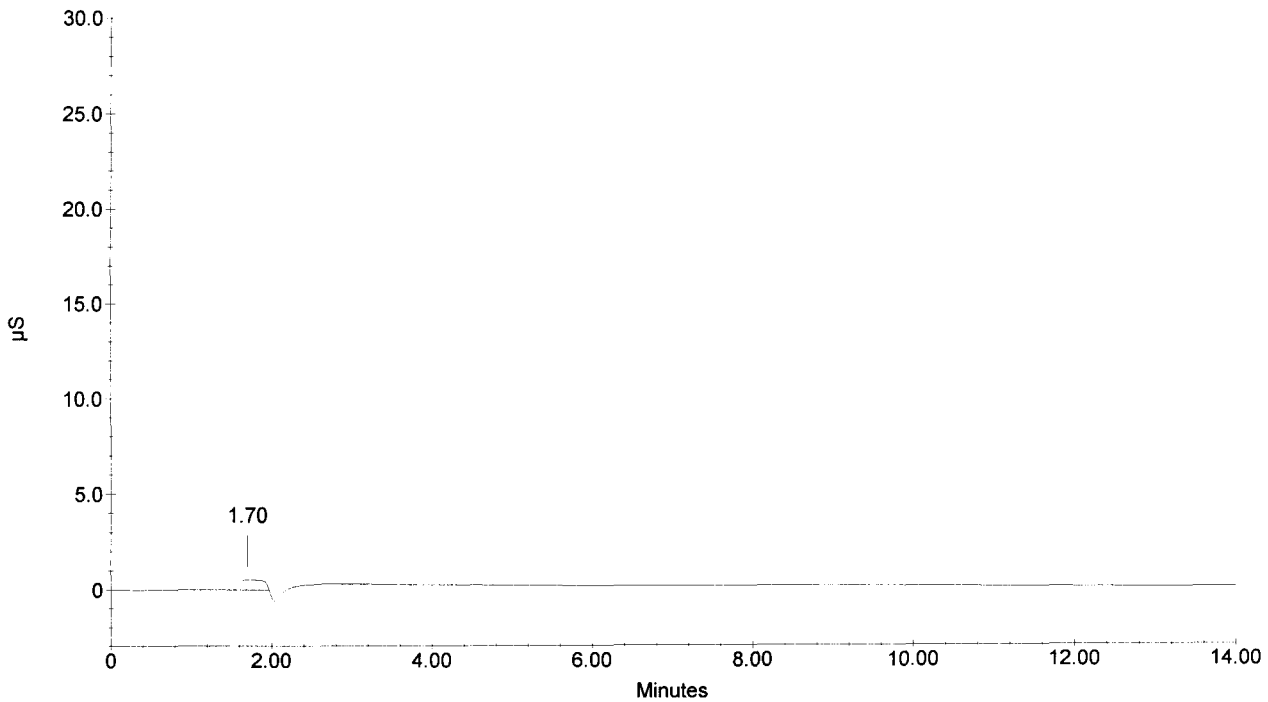
Date Time Collected : 12/20/05 6:22:26 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-SN#018097 AG14-#019940
 System Operator : RSPIES

010086

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	1.70	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P SULFATE	0.000	5359	110250	1	
			---total(s)---				
			0.00		110250		

ICB



Sample Name : 271245 DF20

Dilution Factor : 20.00

Injection Number : 3

Data File Name : c:\peaknet\data\051220\051215_003.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\20dec05.sch

Date Time Collected : 12/20/05 6:39:08 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

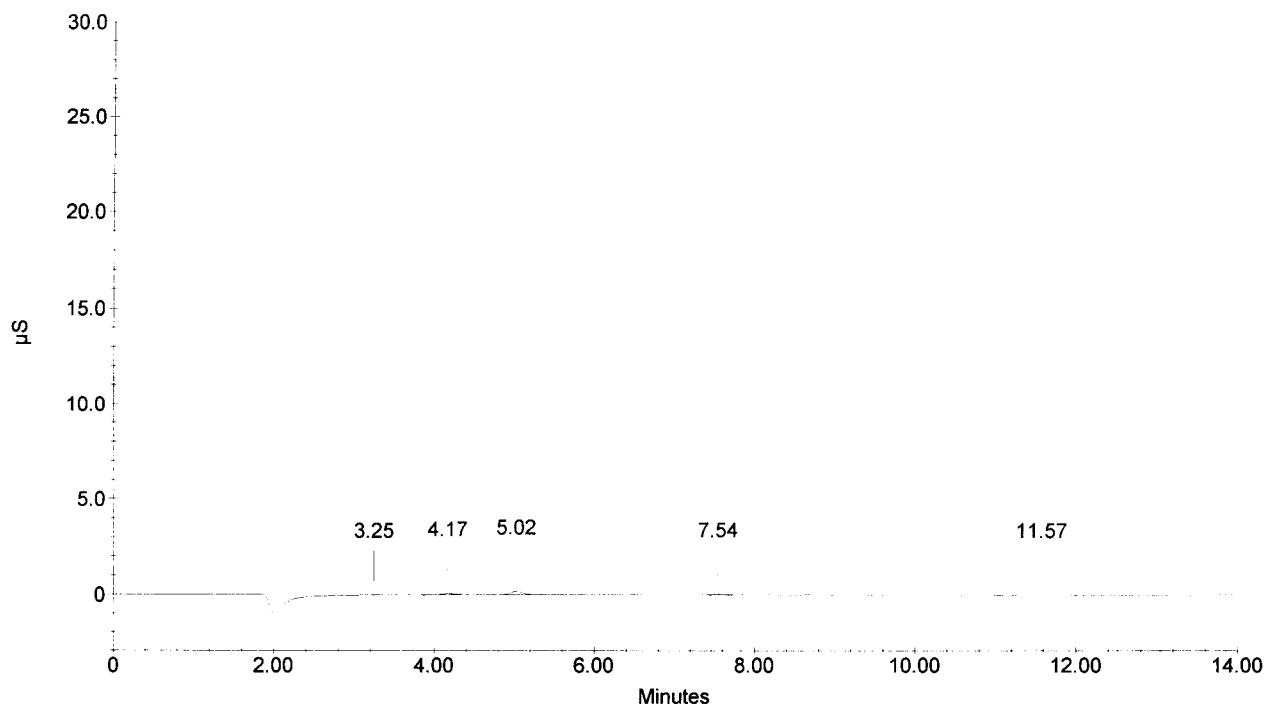
010087

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.25	FLUORIDE	1.911	73	462	1	7.97
2	4.17	CHLORIDE	1.594	741	7609	1	-2.11
3	5.02	NITRITE-N BROMIDE	2.460	1717	18812	1	-2.27
4	7.54	NITRATE-N PHOSPHATE-P	1.879	376	5353	1	2.35
5	11.57	SULFATE	0.729	107	1640	1	-2.03

0.00	---total(s)---	33876
	8.574	

271245 DF20



Sample Name : 271245D DF20

Dilution Factor : 20.00

Injection Number : 4

Data File Name : c:\peaknet\data\051220\051215_004.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\20dec05.sch

Date Time Collected : 12/20/05 6:55:50 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

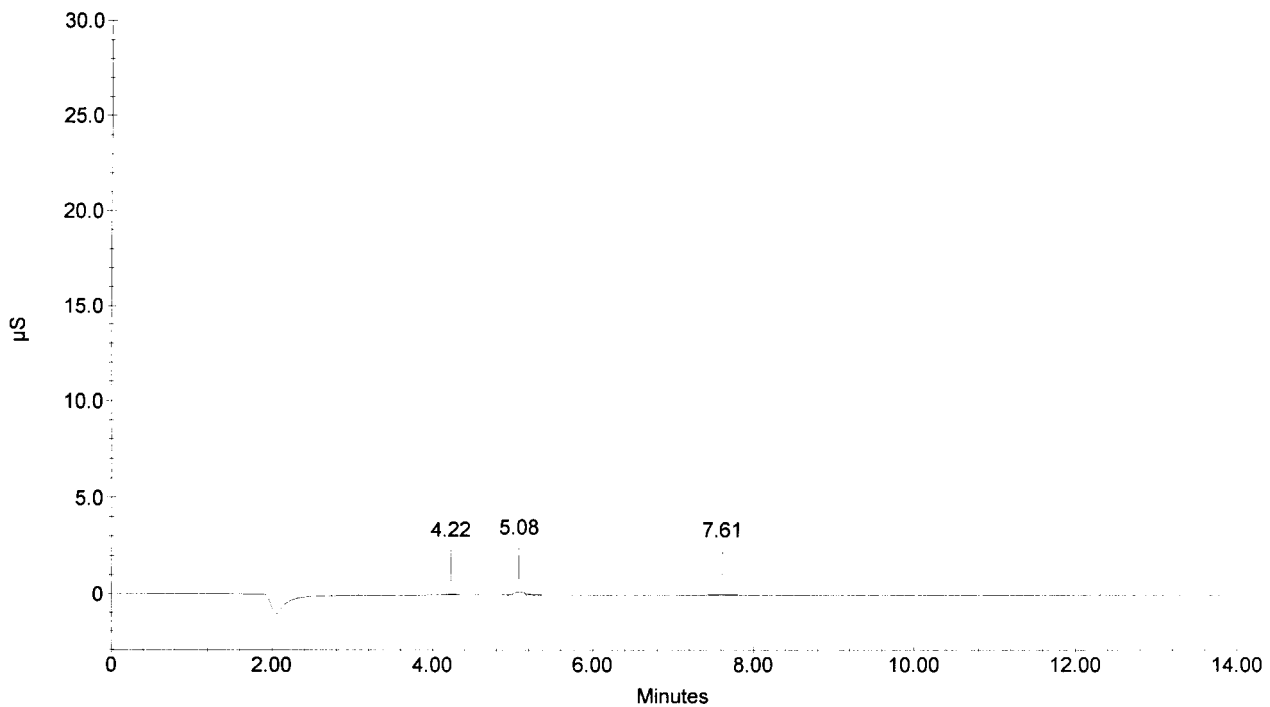
010088

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	4.22	CHLORIDE	1.191	564	4560	1	-0.86
1	4.22	CHLORIDE	1.191	564	4560	1	-0.86
2	5.08	NITRITE-N BROMIDE	2.411	1711	17923	1	-1.23
3	7.61	NITRATE-N PHOSPHATE-P SULFATE	1.872	361	5209	1	3.26

0.00	---total(s)---	32252
	6.665	

271245D DF20



Sample Name : 271245S DF20

Dilution Factor : 20.00

Injection Number : 5

Data File Name : c:\peaknet\data\051220\051215_005.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\20dec05.sch

Date Time Collected : 12/20/05 7:12:32 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

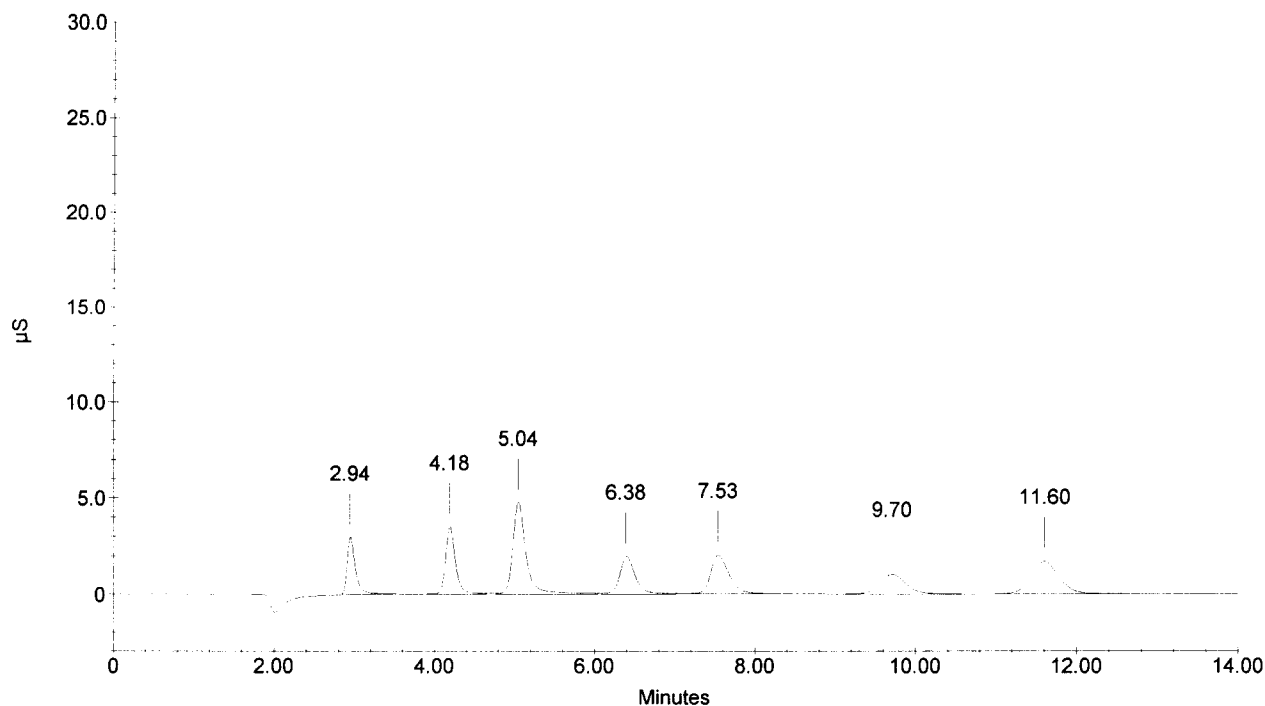
010089

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.94	FLUORIDE	18.015	29215	208300	1	-2.21
2	4.18	CHLORIDE	40.360	34796	304521	2	-1.80
3	5.04	NITRITE-N	32.583	47363	559952	2	-2.01
4	6.38	BROMIDE	86.001	19408	270679	2	-0.88
5	7.53	NITRATE-N	17.990	20117	329965	2	2.17
6	9.70	PHOSPHATE-P	36.938	10287	233320	2	-0.99
7	11.60	SULFATE	78.707	17064	418296	2	-1.81

0.00	---total(s)---	2325033
	310.594	

271245S DF20



Sample Name : 271246 DF20

Dilution Factor : 20.00

Injection Number : 6

Data File Name : c:\peaknet\data\051220\051215_006.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\20dec05.sch

Date Time Collected : 12/20/05 7:29:15 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

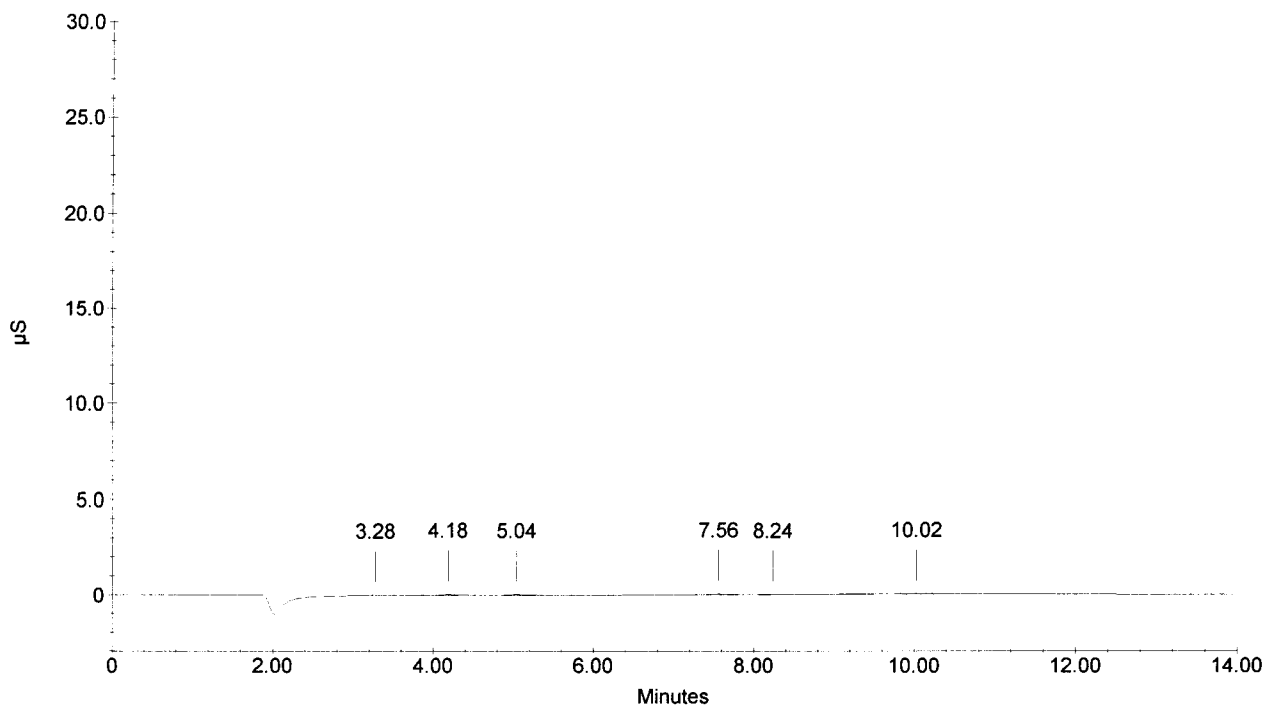
010090

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	3.28	FLUORIDE	1.977	108	1312	1	8.86
2	4.18	CHLORIDE	1.299	484	5372	1	-1.80
3	5.04	NITRITE-N BROMIDE	1.657	429	4421	1	-2.01
4	7.56	NITRATE-N	1.930	430	6388	1	2.53
6	10.02	PHOSPHATE-P SULFATE	2.654	185	11334	2	2.28

0.00	---total(s)---	28827
	9.517	

271246 DF20



Sample Name : 271247 DF20

Dilution Factor : 20.00

Injection Number : 7

Data File Name : c:\peaknet\data\051220\051215_007.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\20dec05.sch

Date Time Collected : 12/20/05 7:46:00 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

010091

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.96	FLUORIDE	1.896	67	267	1	-1.77
3	4.17	CHLORIDE	2.084	1352	11313	1	-2.11
4	5.01	NITRITE-N BROMIDE	2.632	2100	21893	1	-2.53
5	7.46	NITRATE-N	8.747	9100	143290	1	1.27
6	9.70	PHOSPHATE-P SULFATE	1.451	174	3631	1	-0.99

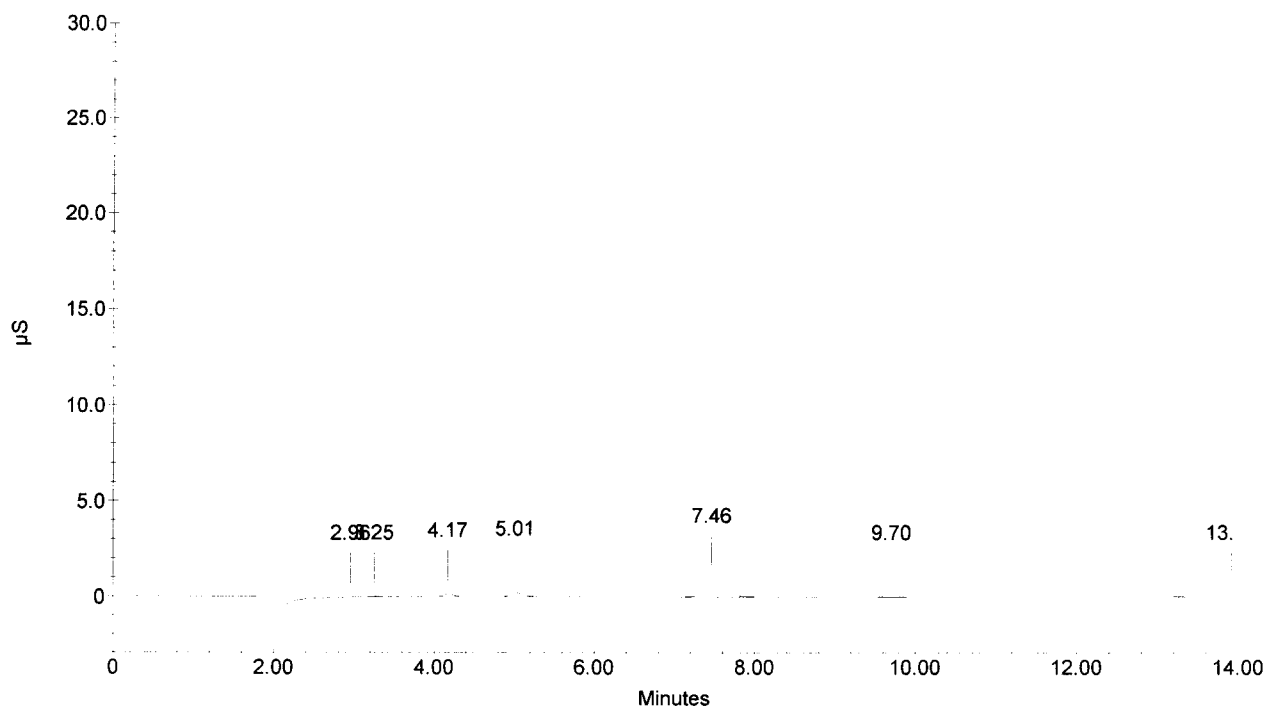
0.00

---total(s)---

16.810

180394

271247 DF20



Sample Name : 271248 DF20

Dilution Factor : 20.00

Injection Number : 8

Data File Name : c:\peaknet\data\051220\051215_008.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\20dec05.sch

Date Time Collected : 12/20/05 8:02:42 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

010092

Peak Information : All Components

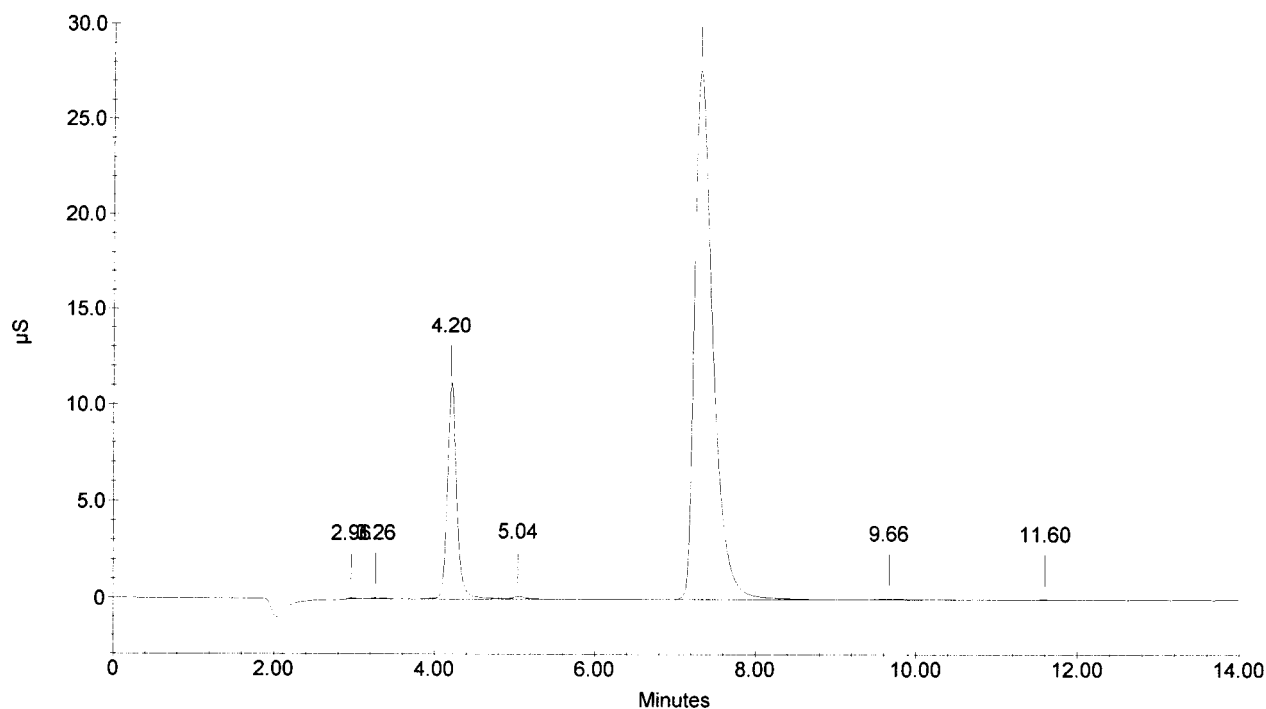
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.96	FLUORIDE	2.187 ✓	662	4019	2	-1.77
3	4.20	CHLORIDE	115.655 ✓	108174	903863	2	-1.49
4	5.04	NITRITE-N	2.372 ✓	1437	17223	2	-2.01
		BROMIDE	✓				
5	7.30	NITRATE-N	203.821 ✓	275863	4377654	1	-0.90
6	9.66	PHOSPHATE-P	2.468 ✓	411	10141	1	-1.39
7	11.60	SULFATE	0.776 ✓	109	1886	1	-1.81

0.00

---total(s)---
327.278

5314785

271248 DF20



Sample Name : 271249 DF20

Dilution Factor : 20.00

Injection Number : 9

Data File Name : c:\peaknet\data\051220\051215_009.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\20dec05.sch

Date Time Collected : 12/20/05 8:19:24 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

010093

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.97	FLUORIDE	2.286 ✓	866	5295	1	-1.33
3	4.28	CHLORIDE	443.557	490844	4021363	3	0.39
4	5.09	NITRITE-N	3.422 ✓	2808	36034	4	-0.97
5	6.45	BROMIDE	13.703 ✓	3247	40512	1	0.16
6	7.36	NITRATE-N	310.009 ✓	428779	7017803	1	-0.18
7	9.76	PHOSPHATE-P SULFATE	3.984 ✓	879	19860	1	-0.44

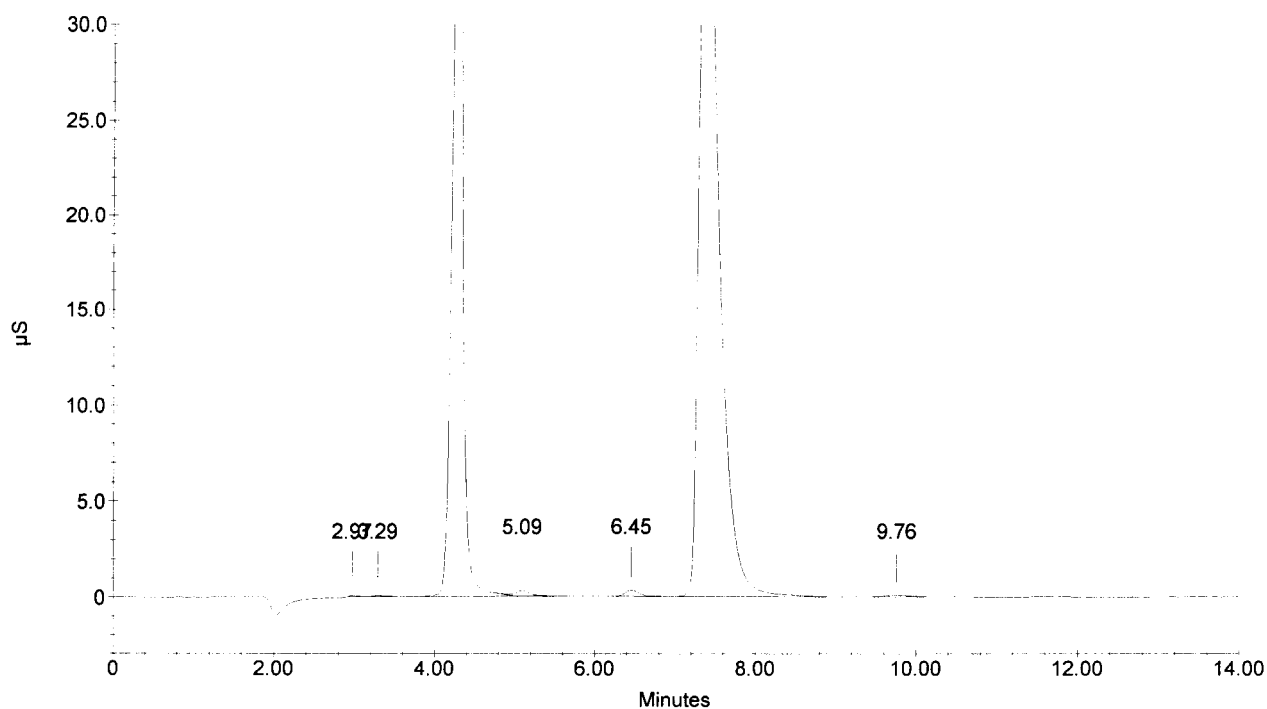
0.00

---total(s)---

776.961

11140867

271249 DF20



Sample Name : PBW-M19E3

Dilution Factor : 1.00

Injection Number : 10

Data File Name : c:\peaknet\data\051220\051215_010.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\20dec05.sch

Date Time Collected : 12/20/05 8:36:08 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

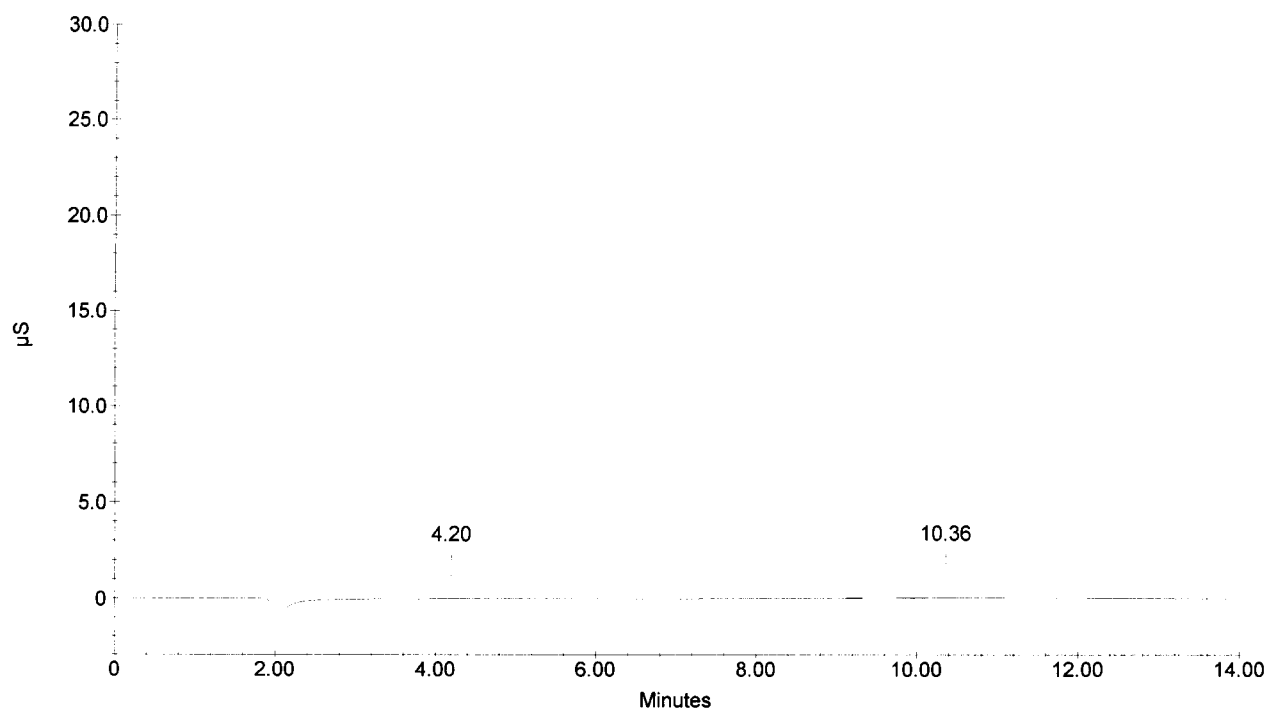
System Operator : RSPIES

010094

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	4.20	CHLORIDE	0.037	157	1148	1	-1.49
1	4.20	CHLORIDE	0.037	157	1148	1	-1.49
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
2	10.36	PHOSPHATE-P	0.092	91	6061	1	5.68
		SULFATE					
0.00			---total(s)---	0.166	8357		

PBW-M19E3



Sample Name : 271250 DF100

Dilution Factor : 100.00

Injection Number : 11

Data File Name : c:\peaknet\data\051220\051215_011.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\20dec05.sch

Date Time Collected : 12/20/05 8:52:50 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

010095

Peak Information : All Components

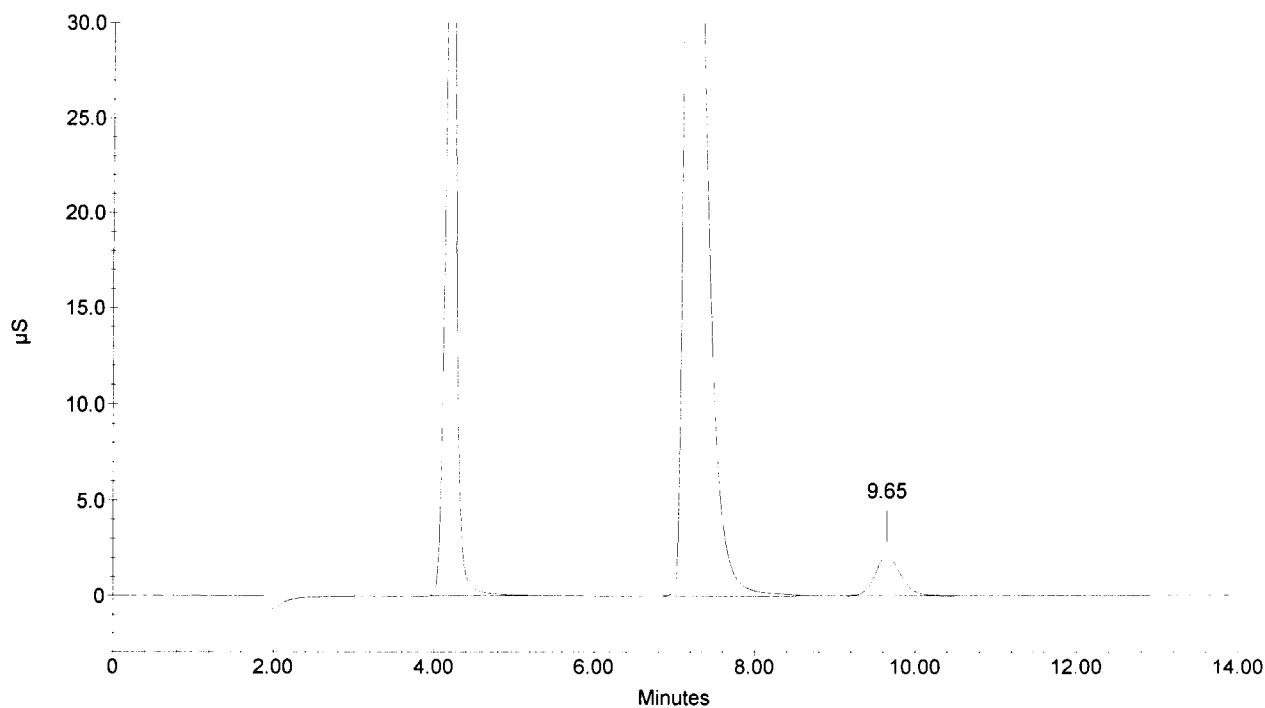
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.20	CHLORIDE	2252.316	491709	4100200	1	-1.49
1	4.20	CHLORIDE	2252.316	491709	4100200	1	-1.49
		NITRITE-N					
		BROMIDE					
2	7.18	NITRATE-N	2125.599	617276	10288814	2	-2.53
3	9.65	PHOSPHATE-P	373.608	21694	483639	2	-1.53
		SULFATE					

0.00

---total(s)---
7003.839

18972853

271250 DF100



Sample Name : 271250D DF100

Dilution Factor : 100.00

Injection Number : 12

Data File Name : c:\peaknet\data\051220\051215_012.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\20dec05.sch

Date Time Collected : 12/20/05 9:09:31 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

010096

Peak Information : All Components

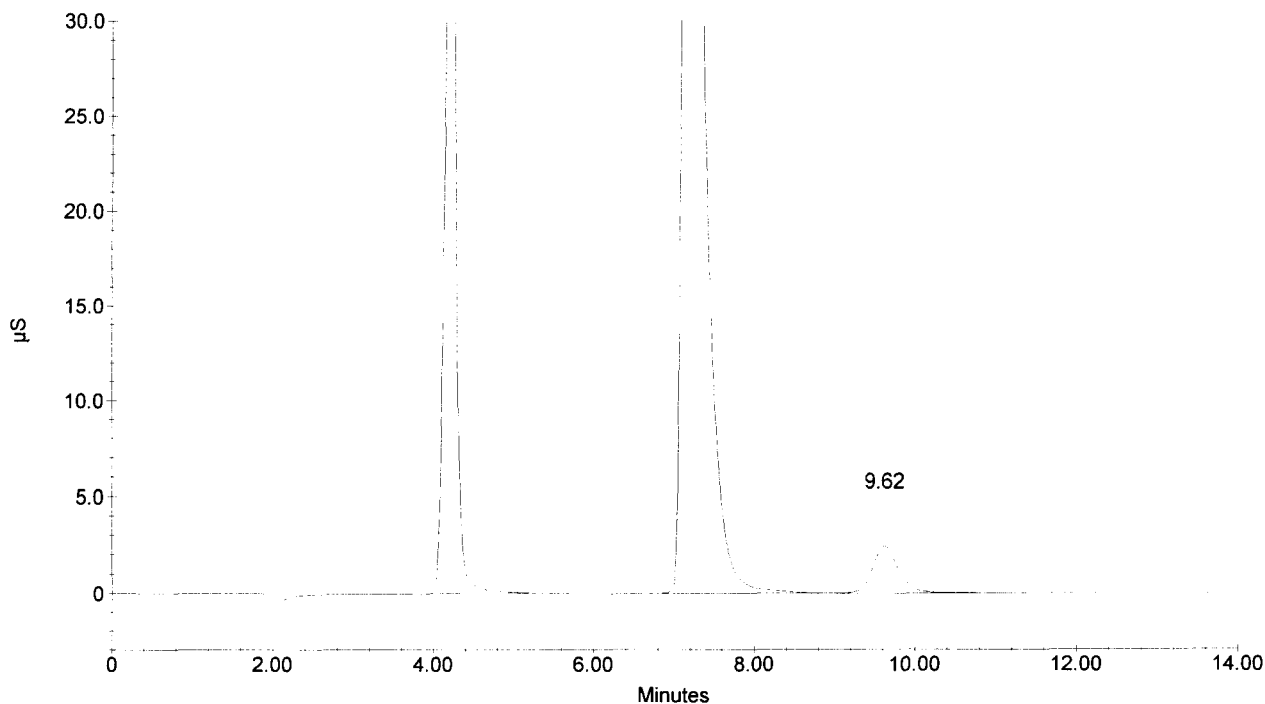
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	4.21	CHLORIDE	2399.753	539098	4446055	1	-1.17
1	4.21	CHLORIDE	2399.753	539098	4446055	1	-1.17
		NITRITE-N					
		BROMIDE					
2	7.17	NITRATE-N	2318.878	682486	11521488	2	-2.71
3	9.62	PHOSPHATE-P	419.901	24248	545932	2	-1.80
		SULFATE					

0.00

---total(s)---
7538.285

20959530

271250D DF100



Sample Name : CCV
Dilution Factor : 20.00
Injection Number : 13
Data File Name : c:\peaknet\data\051220\051215_013.DXD
Method File Name : c:\peaknet\method\anions051116.met
Schedule File Name : c:\peaknet\schedule\20dec05.sch

Date Time Collected : 12/20/05 9:26:15 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-SN#018097 AG14-#019940
System Operator : RSPIES

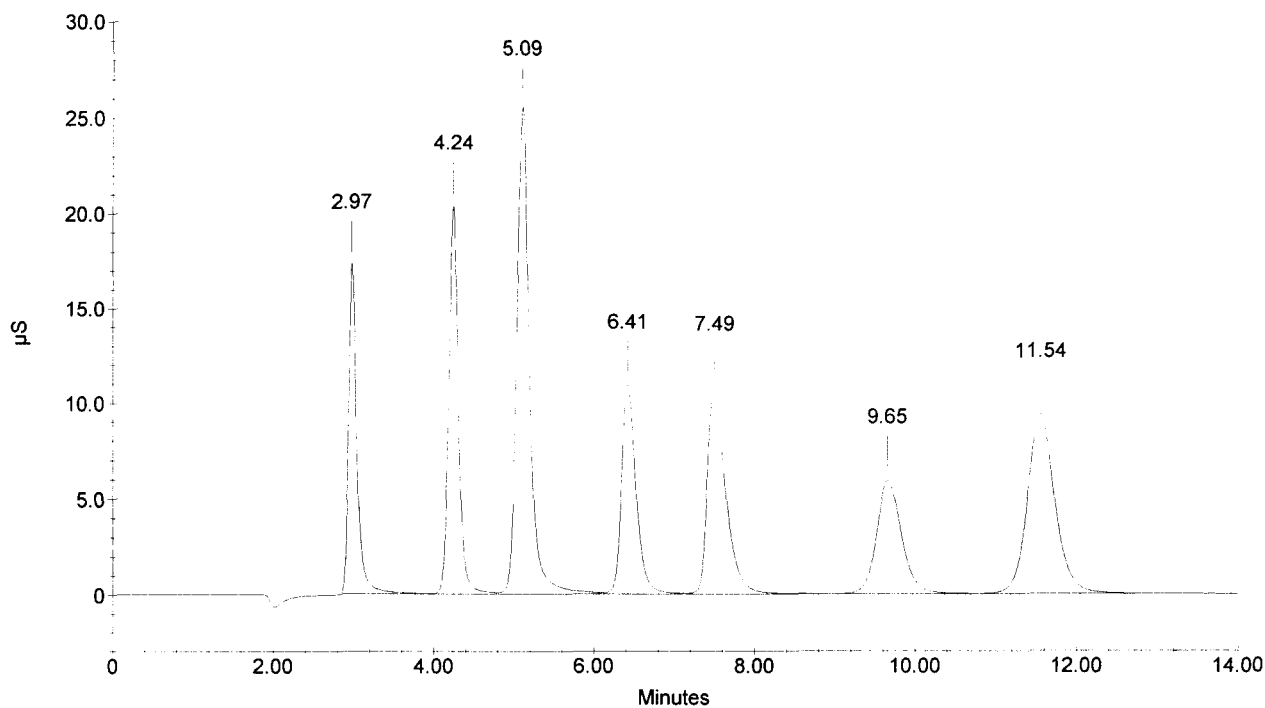
010097

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.97	FLUORIDE	97.883	172241	1247053	2	-1.33
2	4.24	CHLORIDE	210.028	203107	1704110	2	-0.55
3	5.09	NITRITE-N	157.699	252208	2841531	2	-0.97
4	6.41	BROMIDE	401.414	108825	1366864	2	-0.47
5	7.49	NITRATE-N	84.881	107842	1718544	2	1.63
6	9.65	PHOSPHATE-P	189.168	59103	1283032	2	-1.53
7	11.54	SULFATE	390.957	93730	2231583	2	-2.26

0.00	---total(s)---	12392717
	1532.030	

CCV



Sample Name : CCB
 Dilution Factor : 1.00
 Injection Number : 14
 Data File Name : c:\peaknet\data\051220\051215_014.DXD
 Method File Name : c:\peaknet\method\anions051116.met
 Schedule File Name : c:\peaknet\schedule\20dec05.sch

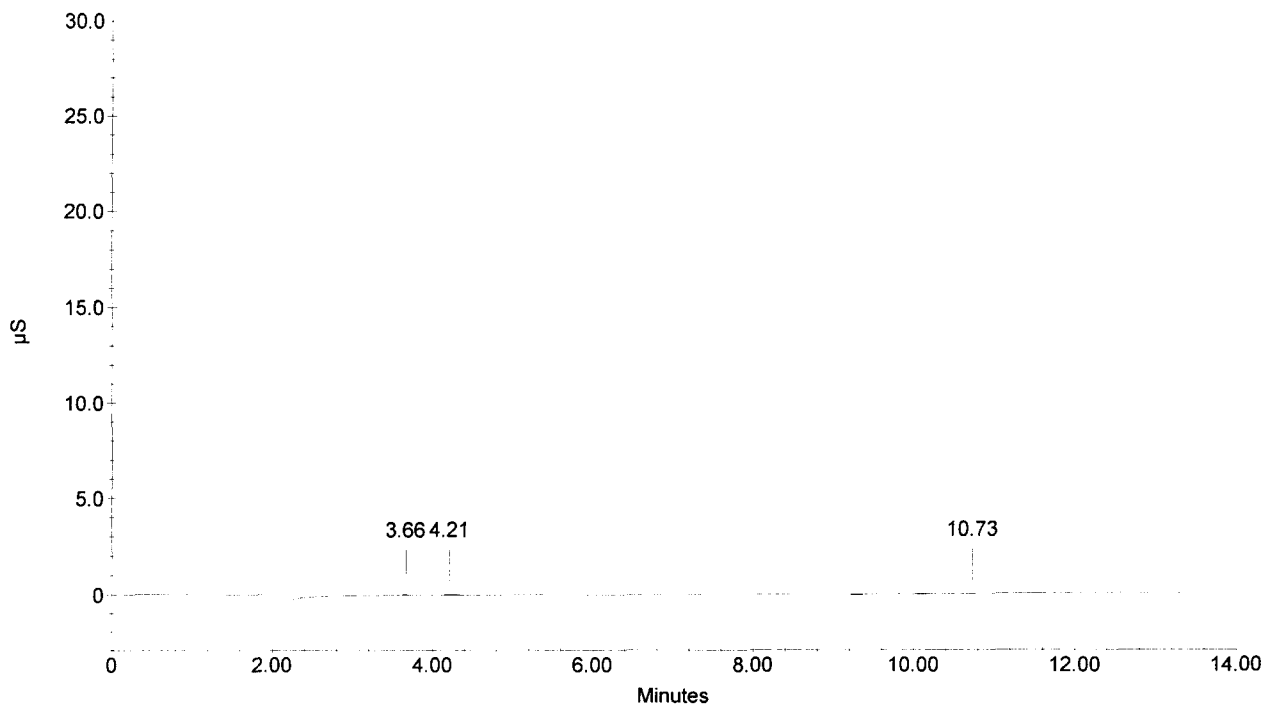
Date Time Collected : 12/20/05 9:42:58 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-SN#018097 AG14-#019940
 System Operator : RSPIES

010098

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	3.66		0.000	76	887	1	
2	4.21	CHLORIDE NITRITE-N BROMIDE NITRATE-N	0.036	148	986	1	-1.17
3	10.73	PHOSPHATE-P SULFATE	0.076	64	4021	1	9.49
			---total(s)---				
			0.00	0.112	5894		

CCB



Sample Name : 271250S DF100

Dilution Factor : 100.00

Injection Number : 15

Data File Name : c:\peaknet\data\051220\051215_015.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\20dec05.sch

Date Time Collected : 12/20/05 9:59:41 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

010099

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.92	FLUORIDE	89.699	27835	207324	1	-3.10
2	4.20	CHLORIDE	2395.482	536230	4435814	2	-1.49
3	4.98	NITRITE-N	154.646	44922	530159	2	-3.05
4	6.30	BROMIDE	406.635	19817	255593	2	-2.12
5	7.17	NITRATE-N	2173.740	632727	10588261	2	-2.71
6	9.62	PHOSPHATE-P	574.656	33450	757057	2	-1.80
7	11.54	SULFATE	396.393	16951	421394	2	-2.26

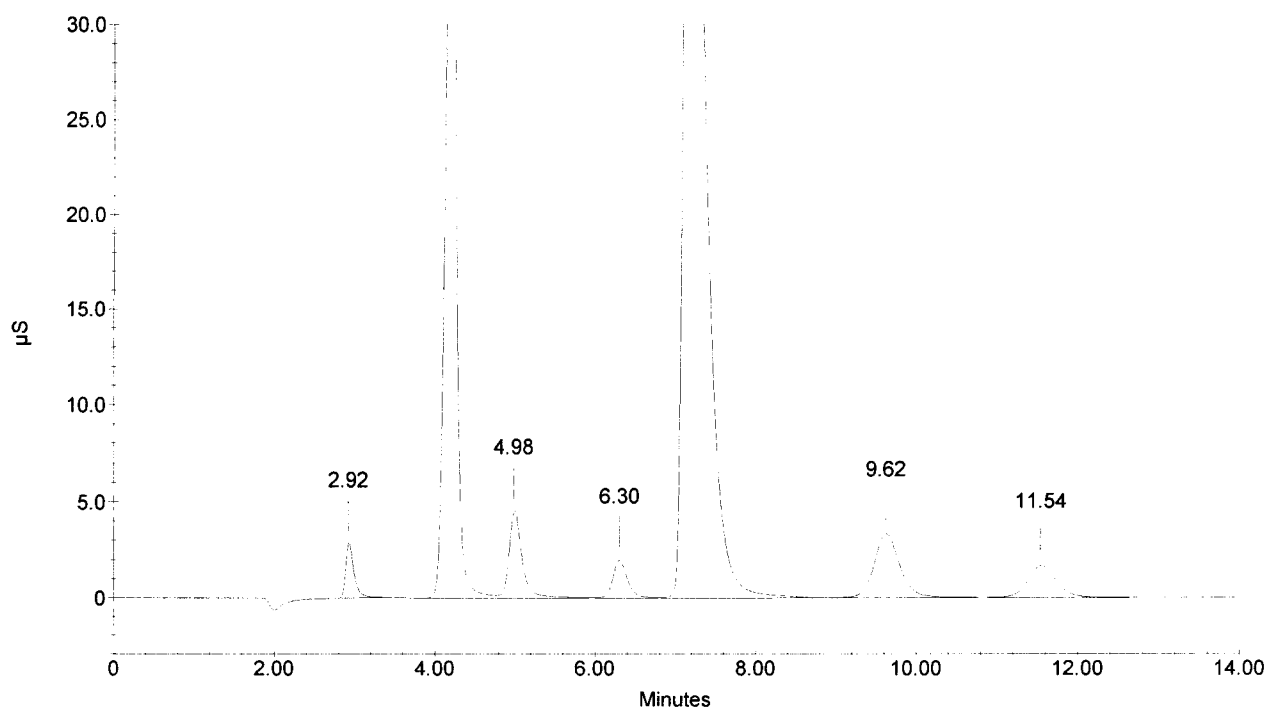
0.00

---total(s)---

6191.251

17195601

271250S DF100



Sample Name : CCV
 Dilution Factor : 20.00
 Injection Number : 16
 Data File Name : c:\peaknet\data\051220\051215_016.DXD
 Method File Name : c:\peaknet\method\anions051116.met
 Schedule File Name : c:\peaknet\schedule\20dec05.sch

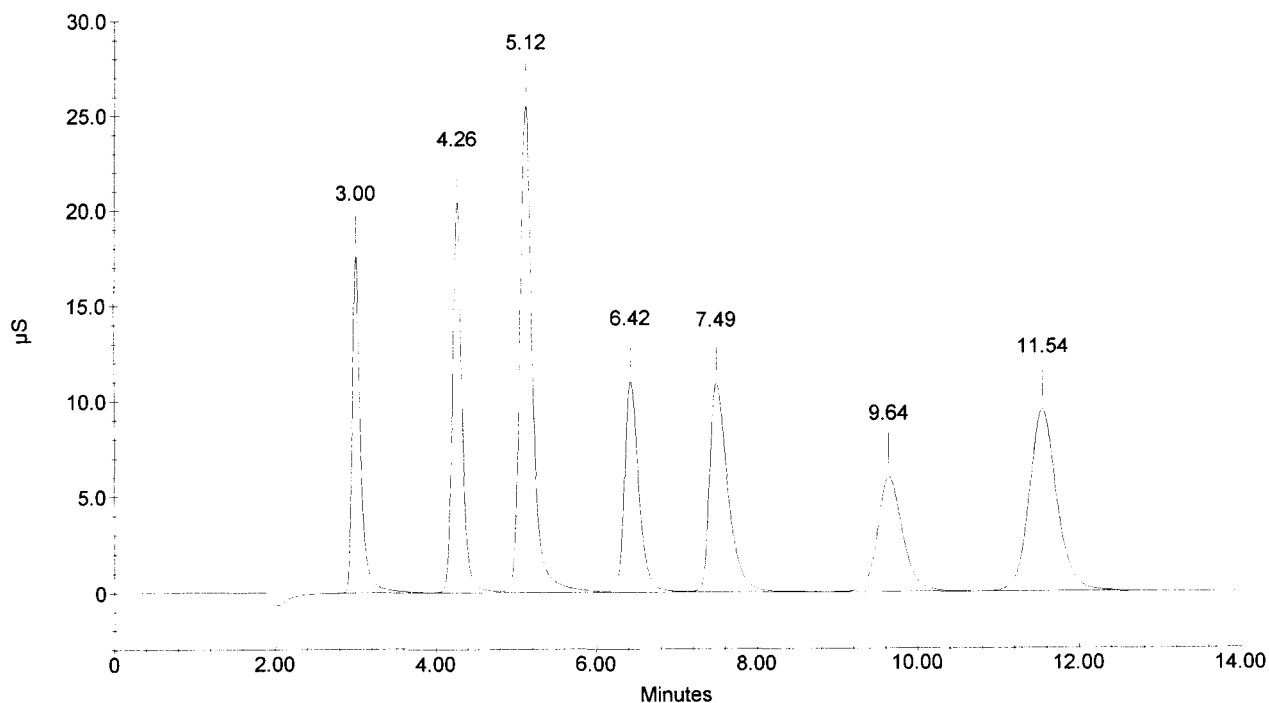
Date Time Collected : 12/20/05 10:16:23 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-SN#018097 AG14-#019940
 System Operator : RSPIES

010100

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	3.00	FLUORIDE	99.628	175052	1269907	2	-0.44
2	4.26	CHLORIDE	207.729	203806	1683881	2	0.08
3	5.12	NITRITE-N	155.013	254772	2791963	2	-0.45
4	6.42	BROMIDE	399.986	109715	1361494	2	-0.26
5	7.49	NITRATE-N	85.118	108775	1723568	2	1.63
6	9.64	PHOSPHATE-P	190.901	59531	1295669	2	-1.67
7	11.54	SULFATE	394.742	94593	2255256	2	-2.26
			---total(s)---				
0.00			1533.117		12381740		

CCV



Sample Name : CCB
 Dilution Factor : 1.00
 Injection Number : 17
 Data File Name : ...051215_017.DXD
 Method File Name : c:\peaknet\method\anions051116.met
 Schedule File Name : c:\peaknet\schedule\20dec05.sch

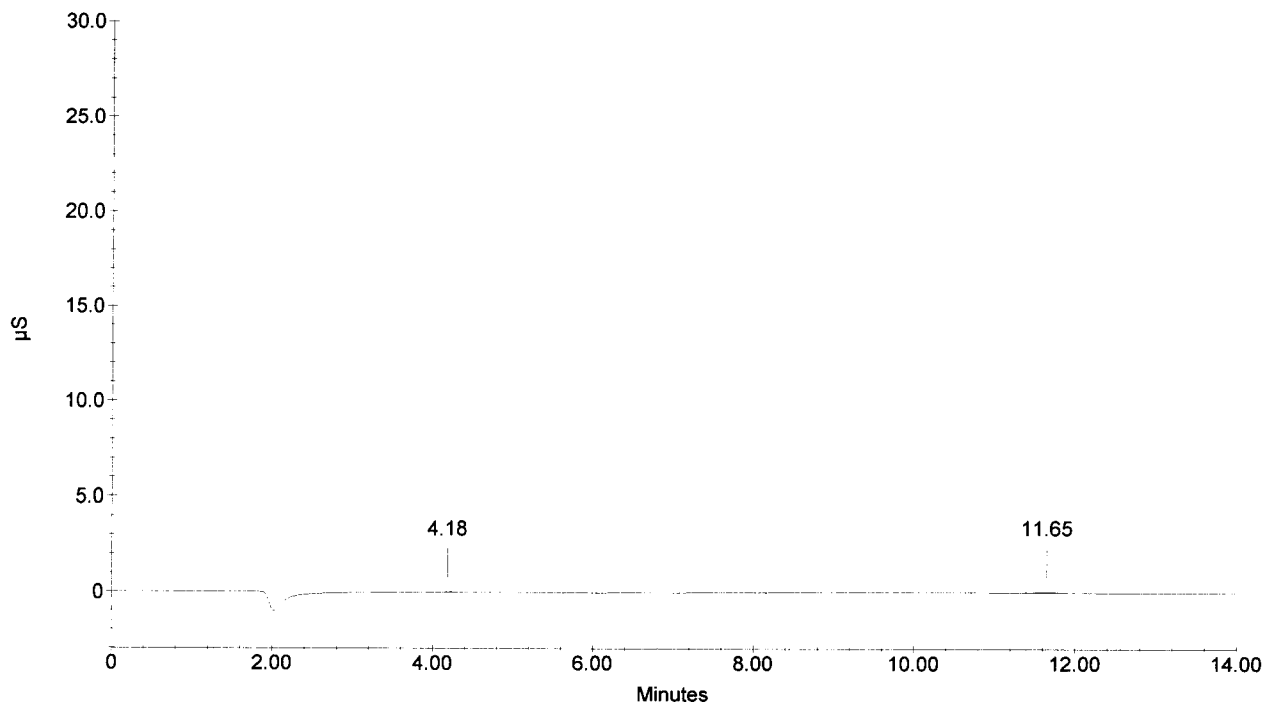
Date Time Collected : 12/20/05 10:33:07 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-SN#018097 AG14-#019940
 System Operator : RSPIES

010101

Peak Information : All Components

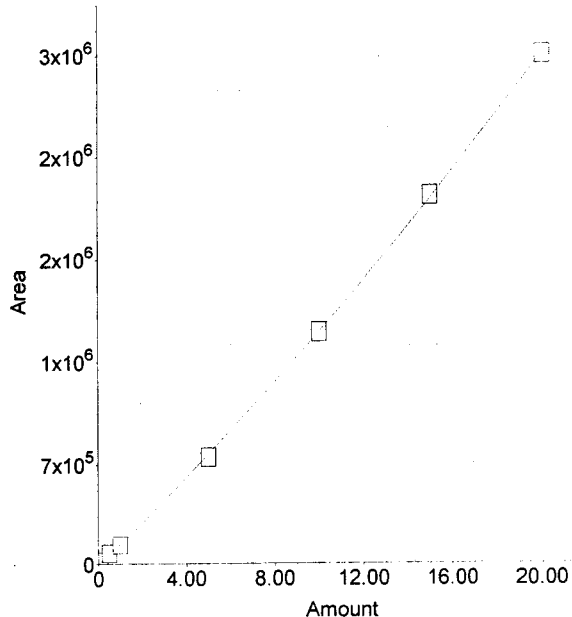
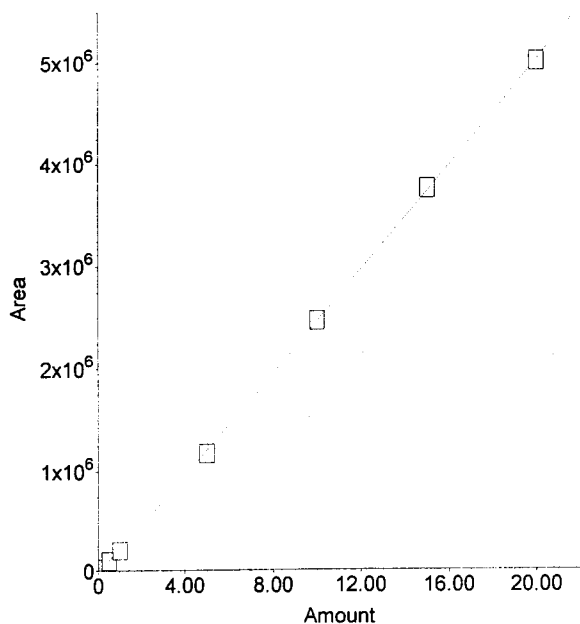
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	4.18	CHLORIDE	0.038	170	1331	1	-1.80
1	4.18	CHLORIDE	0.038	170	1331	1	-1.80
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
2	11.65	SULFATE	0.090	325	7275	1	-1.35
			---total(s)---				
0.00			0.166		9937		

CCB



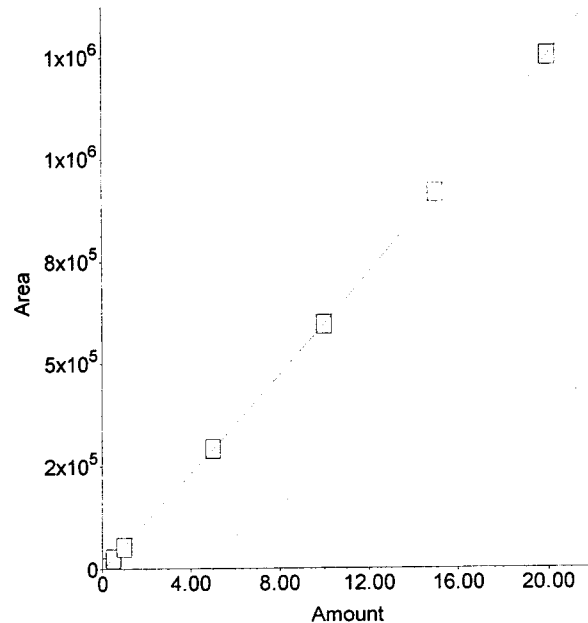
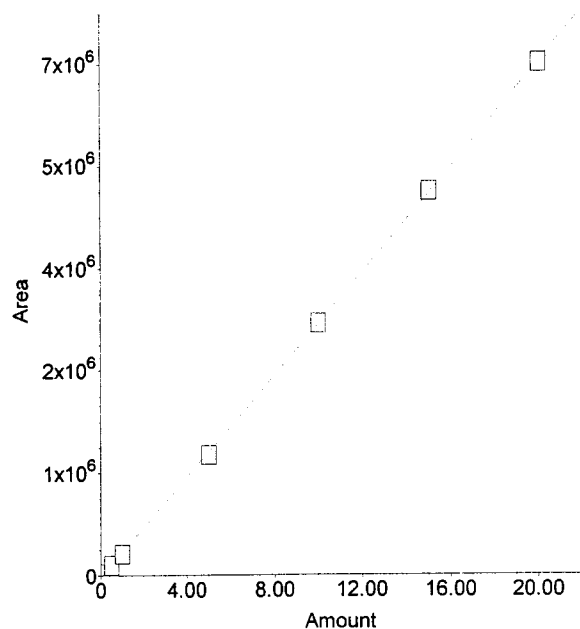
1. Component:FLUORIDE
 Standard:External Fit Type:Quadratic
 Origin:Include Calibration:Area
 $r^2=0.999881$
 $Amt=-2.390323e-014*Resp^2+$
 $3.879166e-006*Resp+0.09377$

2. Component:CHLORIDE
 Standard:External Fit Type:Quadratic
 Origin:Include Calibration:Area
 $r^2=0.999891$
 $Amt=-2.750837e-013*Resp^2+$
 $6.613910e-006*Resp+0.0294$ **010102**



3. Component:NITRITE-N
 Standard:External Fit Type:Quadratic
 Origin:Include Calibration:Area
 $r^2=0.999912$
 $Amt=-1.467710e-014*Resp^2+$
 $2.791785e-006*Resp+0.0705$

4. Component:BROMIDE
 Standard:External Fit Type:Quadratic
 Origin:Include Calibration:Area
 $r^2=0.999989$
 $Amt=-9.942909e-013*Resp^2+$
 $1.601506e-005*Resp+0.03796$



5. Component: NITRATE-N

Standard: External Fit Type: Quadratic

Origin: Include Calibration: Area

$r^2 = 0.999840$

Amt = $-4.254071e-014 * Resp^2 +$

$2.495793e-006 * Resp + 0.08058$

6. Component: PHOSPHATE-P

Standard: External Fit Type: Quadratic

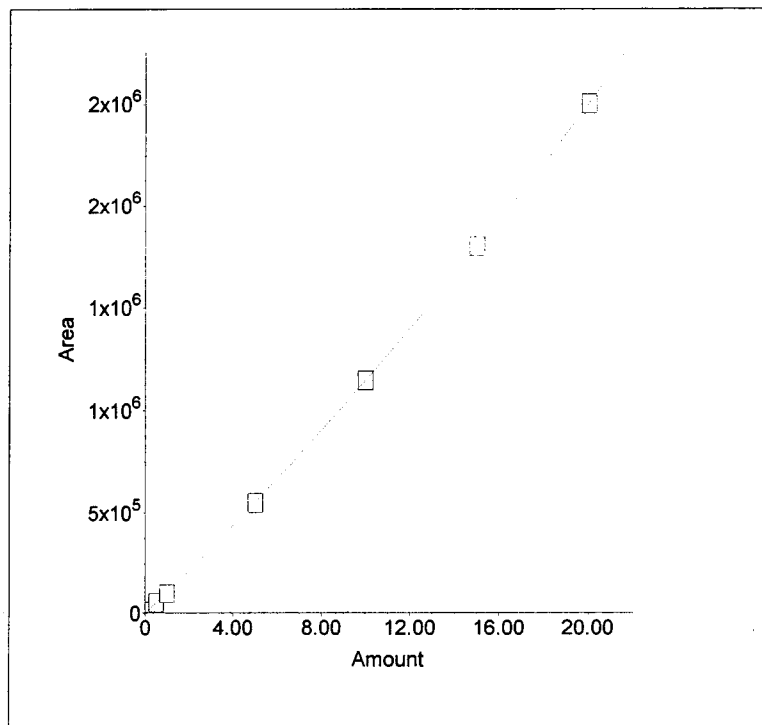
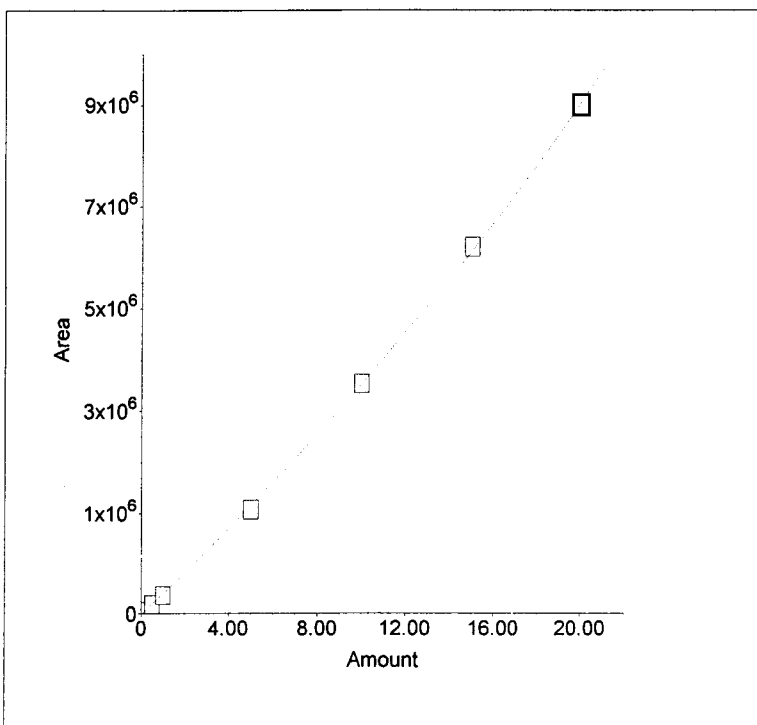
Origin: Include Calibration: Area

$r^2 = 0.999980$

Amt = $-3.703917e-013 * Resp^2 +$

$7.812696e-006 * Resp + 0.0442$

010103



7. Component: SULFATE

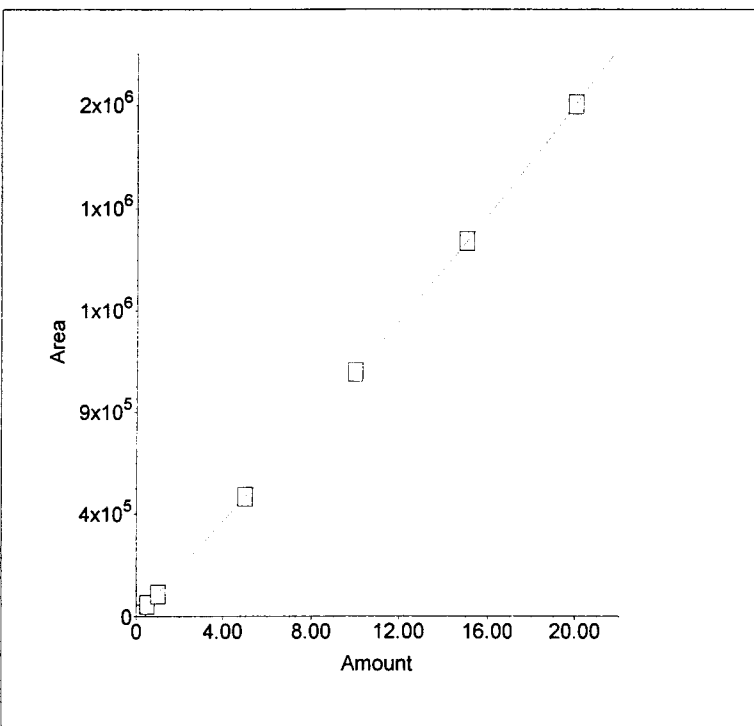
Standard: External Fit Type: Quadratic

Origin: Include Calibration: Area

$r^2 = 0.999987$

Amt = $-3.352536e-013 * Resp^2 +$

$9.498428e-006 * Resp + 0.02088$



Sample Name : 0PPM 115-08-IC5

Dilution Factor : 1.00

Injection Number : 1

Data File Name : c:\peaknet\data\051116\051116_A001.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\051116.sch

Date Time Collected : 11/16/05 6:05:05 PM

Date Time Updated : 11/16/05 6:21:37 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

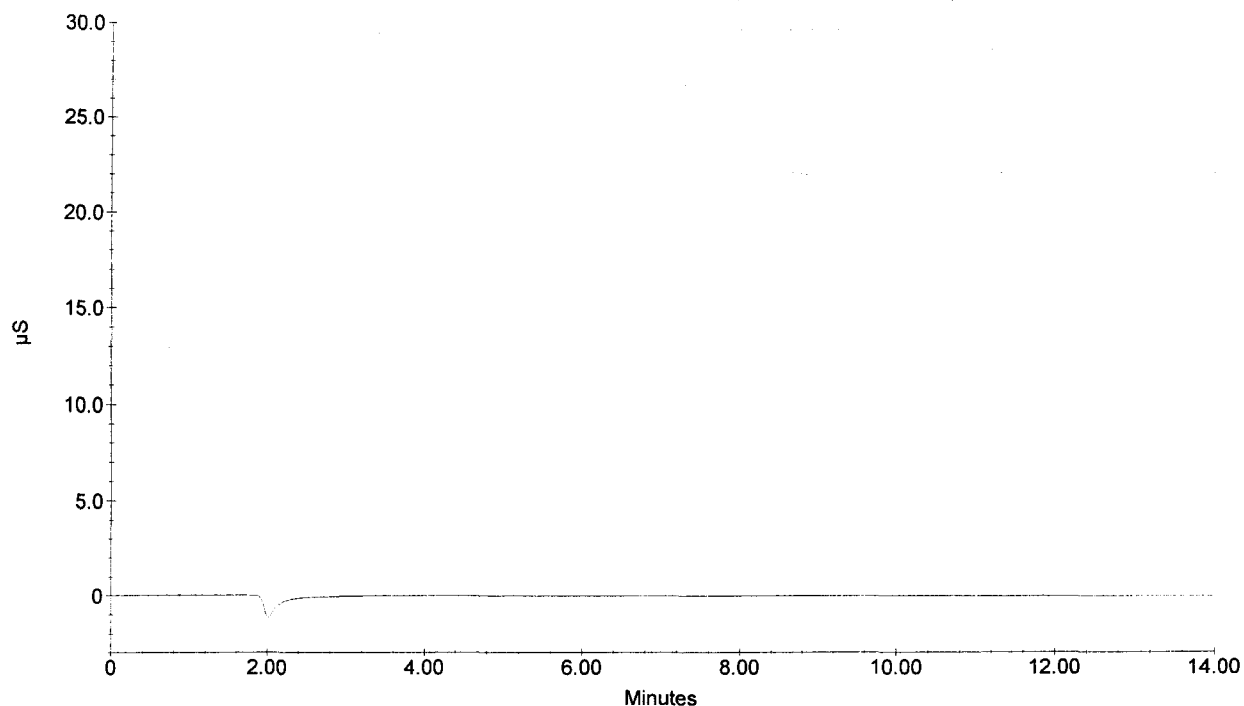
System Operator : RSPIES

010104

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
0	0.00	(null) CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P SULFATE	0.00	0	0

0PPM 115-08-IC5



Sample Name : 0.1PPM 115-07-IC5

Dilution Factor : 1.00

Injection Number : 2

Data File Name : c:\peaknet\data\051116\051116_002.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\051116.sch

Date Time Collected : 11/16/05 6:21:46 PM

Date Time Updated : 11/16/05 6:38:19 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

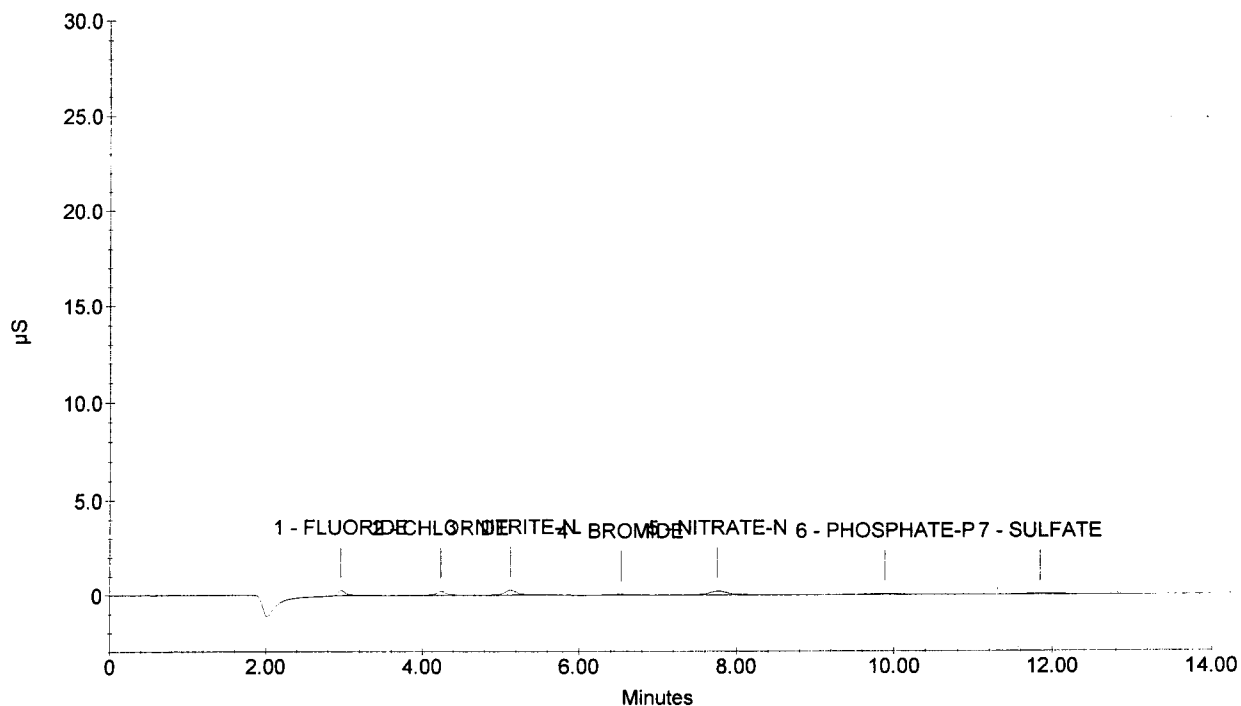
System Operator : RSPIES

010105

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.96	FLUORIDE	0.10	16520	2524
2	4.24	CHLORIDE	0.10	17650	2073
3	5.13	NITRITE-N	0.10	28123	2547
4	6.53	BROMIDE	0.10	4650	389
5	7.76	NITRATE-N	0.10	33559	2009
6	9.89	PHOSPHATE-P	0.10	8257	398
7	11.85	SULFATE	0.10	9941	454

0.1PPM 115-07-IC5



Sample Name : 0.5PPM 115-06-IC5

Dilution Factor : 1.00

Injection Number : 3

Data File Name : c:\peaknet\data\051116\051116_003.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\051116.sch

Date Time Collected : 11/16/05 6:38:30 PM

Date Time Updated : 11/16/05 6:55:02 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

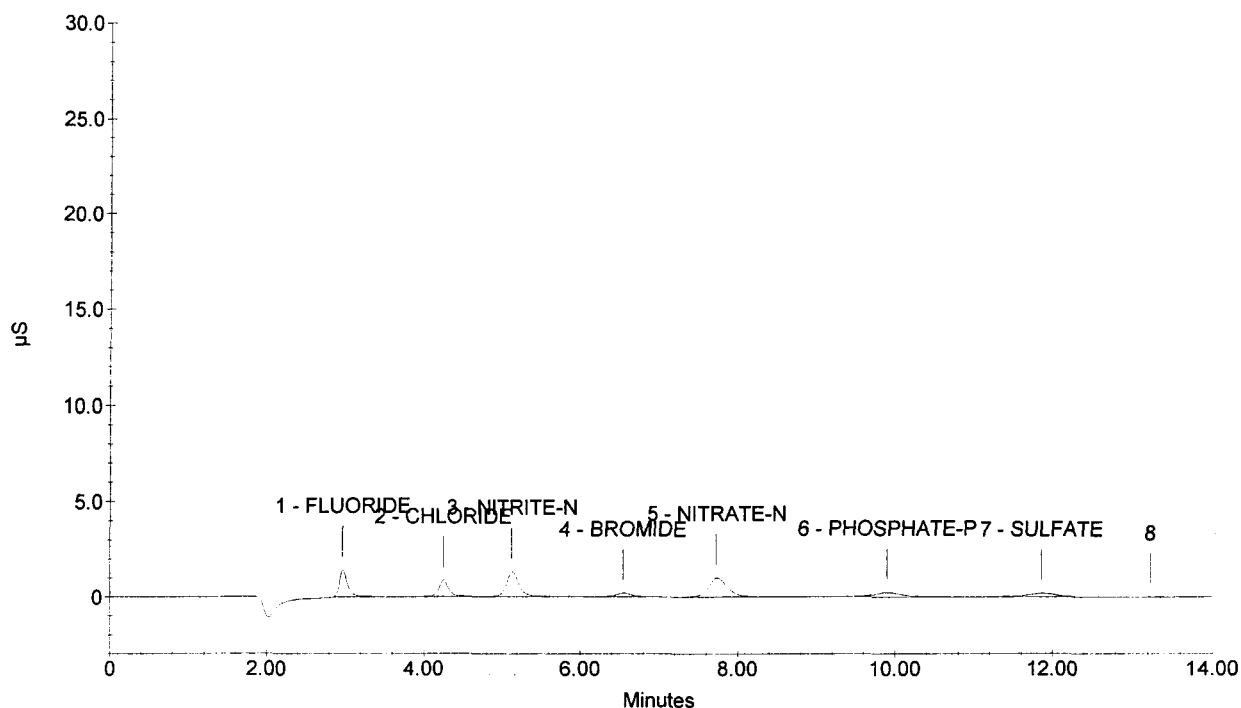
System Operator : RSPIES

010106

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.97	FLUORIDE	0.50	99544	14197
2	4.25	CHLORIDE	0.50	78285	8650
3	5.13	NITRITE-N	0.50	152069	13151
4	6.54	BROMIDE	0.50	27286	2090
5	7.73	NITRATE-N	0.50	171023	10083
6	9.90	PHOSPHATE-P	0.50	60420	2366
7	11.86	SULFATE	0.50	52492	1948

0.5PPM 115-06-IC5



Sample Name : 1PPM 115-05-IC5

Dilution Factor : 1.00

Injection Number : 4

Data File Name : c:\peaknet\data\051116\051116_004.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\051116.sch

Date Time Collected : 11/16/05 6:55:12 PM

Date Time Updated : 11/16/05 7:11:46 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

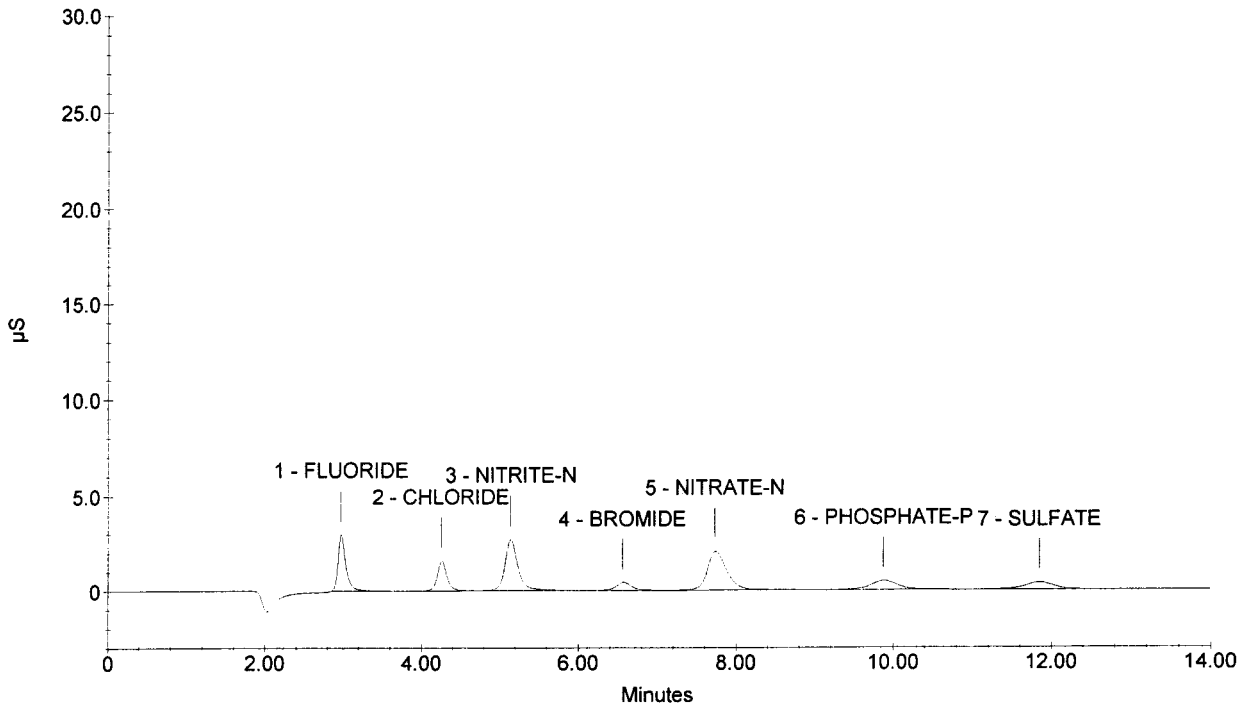
System Operator : RSPIES

010107

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.97	FLUORIDE	1.00	214439	29828
2	4.25	CHLORIDE	1.00	140340	15915
3	5.14	NITRITE-N	1.00	310951	27027
4	6.56	BROMIDE	1.00	57817	4266
5	7.73	NITRATE-N	1.00	346267	20417
6	9.88	PHOSPHATE-P	1.00	115938	4806
7	11.85	SULFATE	1.00	97911	3769

1PPM 115-05-IC5



Sample Name : 5PPM 115-04-IC5

Dilution Factor : 1.00

Injection Number : 5

Data File Name : c:\peaknet\data\051116\051116_005.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\051116.sch

Date Time Collected : 11/16/05 7:12:06 PM

Date Time Updated : 11/16/05 7:28:39 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

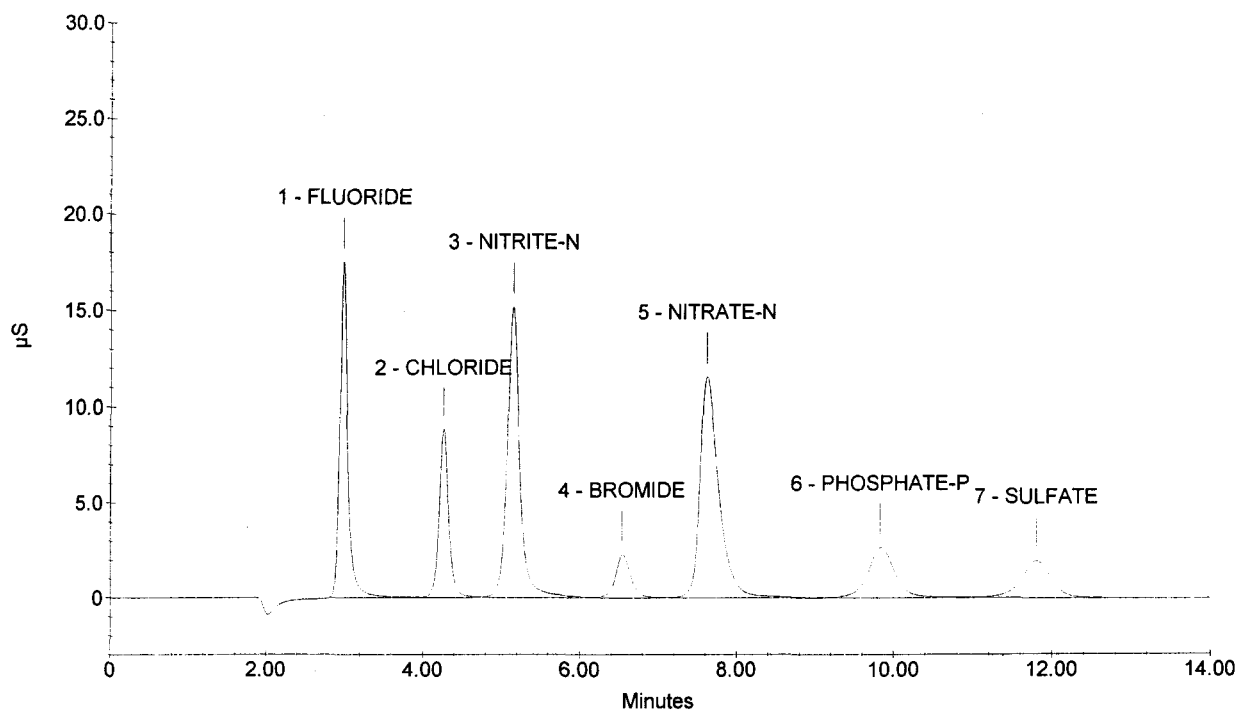
System Operator : RSPIES

010108

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.98	FLUORIDE	5.00	1240719	174788
2	4.25	CHLORIDE	5.00	755822	86741
3	5.14	NITRITE-N	5.00	1739855	151536
4	6.53	BROMIDE	5.00	317492	23072
5	7.61	NITRATE-N	5.00	1968165	115546
6	9.82	PHOSPHATE-P	5.00	650857	26746
7	11.80	SULFATE	5.00	533476	19943

5PPM 115-04-IC5



Sample Name : 10PPM 115-03-IC5

Dilution Factor : 1.00

Injection Number : 6

Data File Name : c:\peaknet\data\051116\051116_006.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\051116.sch

Date Time Collected : 11/16/05 7:28:58 PM

Date Time Updated : 11/16/05 7:45:31 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

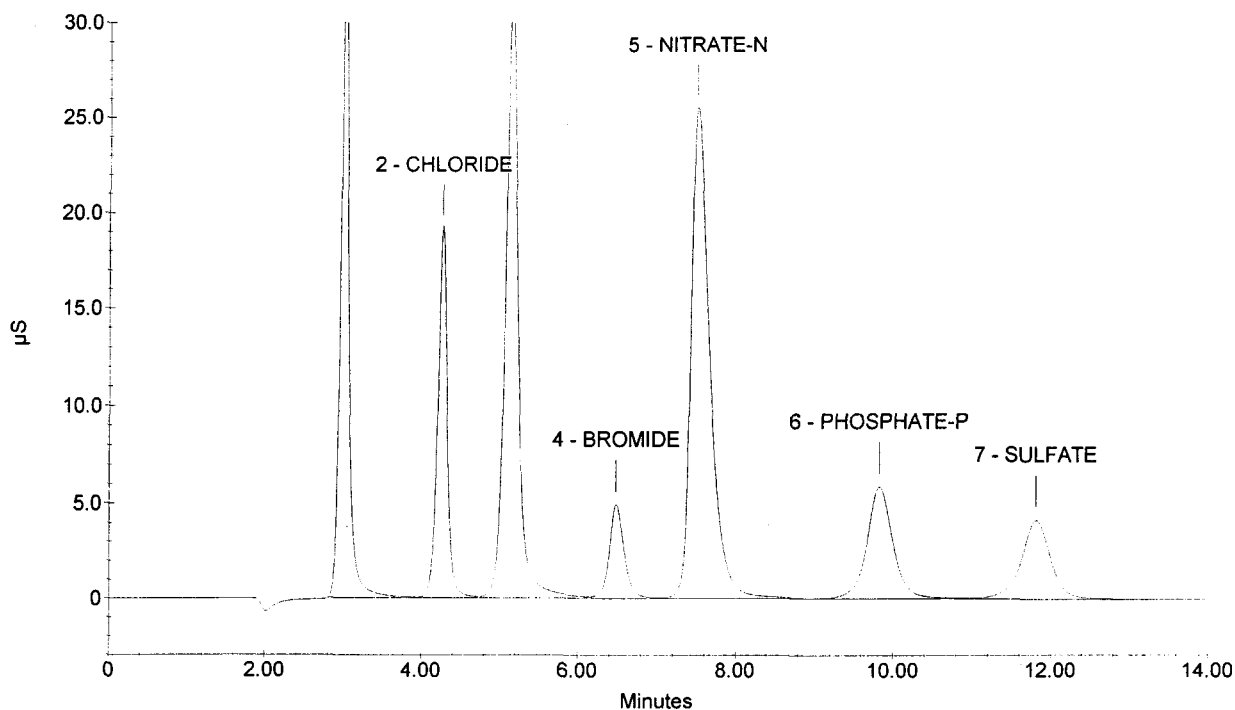
System Operator : RSPIES

010109

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.98	FLUORIDE	10.00	2603044	355519
2	4.25	CHLORIDE	10.00	1613190	191194
3	5.13	NITRITE-N	10.00	3634302	316599
4	6.48	BROMIDE	10.00	647461	49126
5	7.49	NITRATE-N	10.00	4292412	254592
6	9.82	PHOSPHATE-P	10.00	1360845	58433
7	11.81	SULFATE	10.00	1091194	41534

10PPM 115-03-IC5



Sample Name : 15PPM 115-02-IC5

Dilution Factor : 1.00

Injection Number : 7

Data File Name : c:\peaknet\data\051116\051116_007.DXD

Method File Name : c:\peaknet\method\anions051116.met

Schedule File Name : c:\peaknet\schedule\051116.sch

Date Time Collected : 11/16/05 7:45:53 PM

Date Time Updated : 11/16/05 8:02:25 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

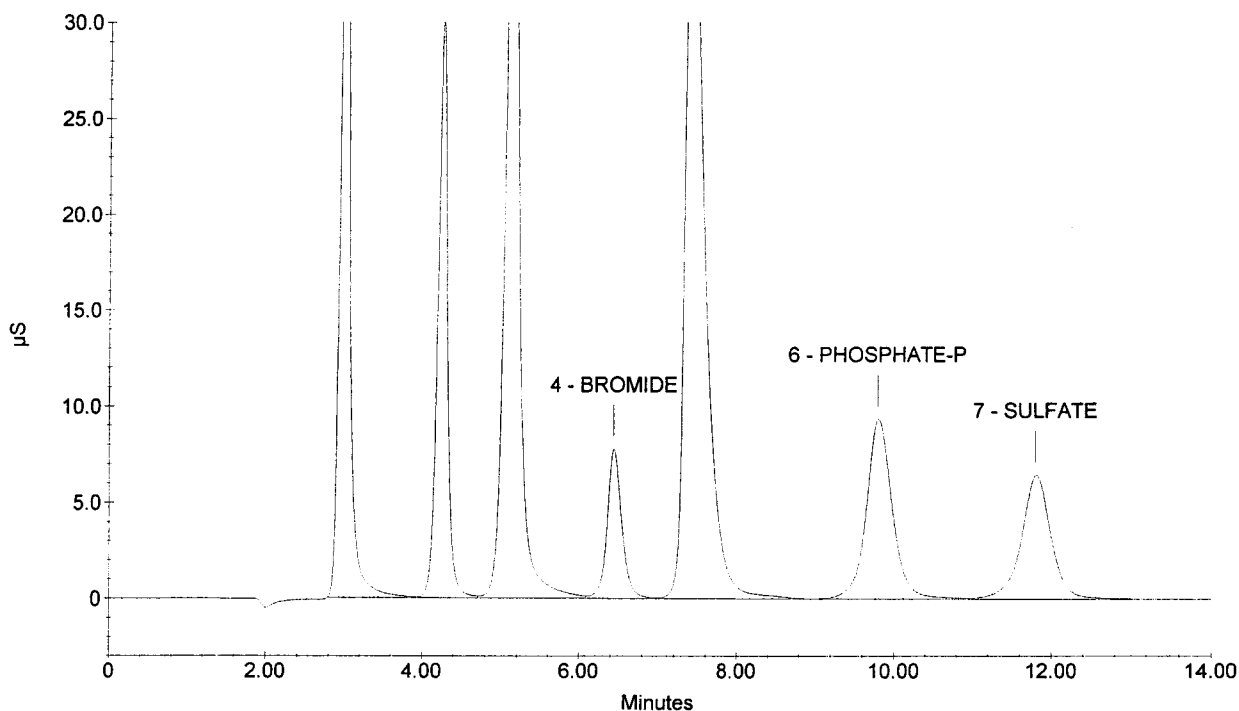
System Operator : RSPIES

010110

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	3.00	FLUORIDE	15.00	3965828	524280
2	4.25	CHLORIDE	15.00	2555092	299420
3	5.13	NITRITE-N	15.00	5542814	470296
4	6.44	BROMIDE	15.00	995994	77442
5	7.41	NITRATE-N	15.00	6827190	402276
6	9.80	PHOSPHATE-P	15.00	2136334	93257
7	11.80	SULFATE	15.00	1680094	64281

15PPM 115-02-IC5



Sample Name : 20PPM 115-01-IC5
Dilution Factor : 1.00
Injection Number : 8
Data File Name : c:\peaknet\data\051116\051116_008.DXD
Method File Name : c:\peaknet\method\anions051116.met
Schedule File Name : c:\peaknet\schedule\051116.sch

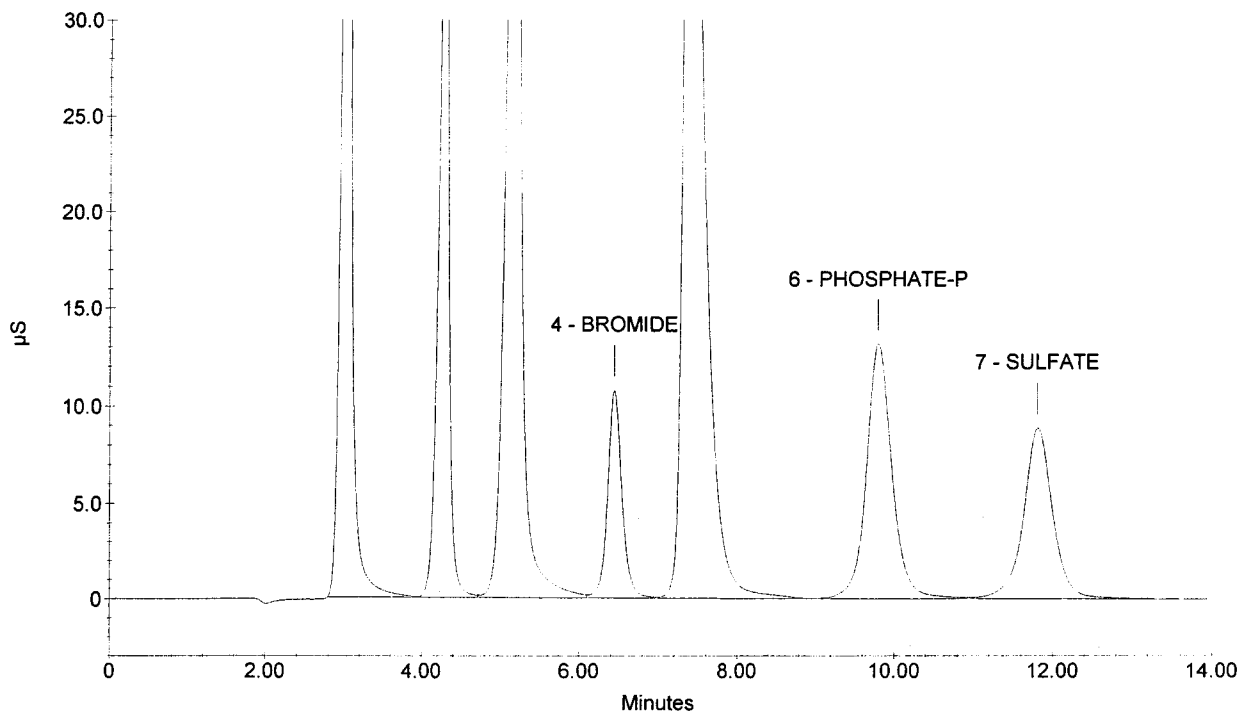
Date Time Collected : 11/16/05 8:02:35 PM
Date Time Updated : 11/16/05 8:19:09 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-SN#018097 AG14-#019940
System Operator : RSPIES

010111

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	3.01	FLUORIDE	20.00	5289226	665312
2	4.26	CHLORIDE	20.00	3528116	402942
3	5.14	NITRITE-N	20.00	7408735	598708
4	6.44	BROMIDE	20.00	1361527	107400
5	7.37	NITRATE-N	20.00	9490085	545948
6	9.80	PHOSPHATE-P	20.00	2969974	131230
7	11.81	SULFATE	20.00	2286449	88474

20PPM 115-01-IC5



Sample Name : ICV
Dilution Factor : 20.00
Injection Number : 9

Data File Name : ...051116_009.DXD

Method File Name : C:\PeakNet\method\ANIONS051116.met

Schedule File Name : c:\peaknet\schedule\051116.sch

Date Time Collected : 11/16/05 8:19:33 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-SN#018097 AG14-#019940

System Operator : RSPIES

010112

Peak Information : All Components

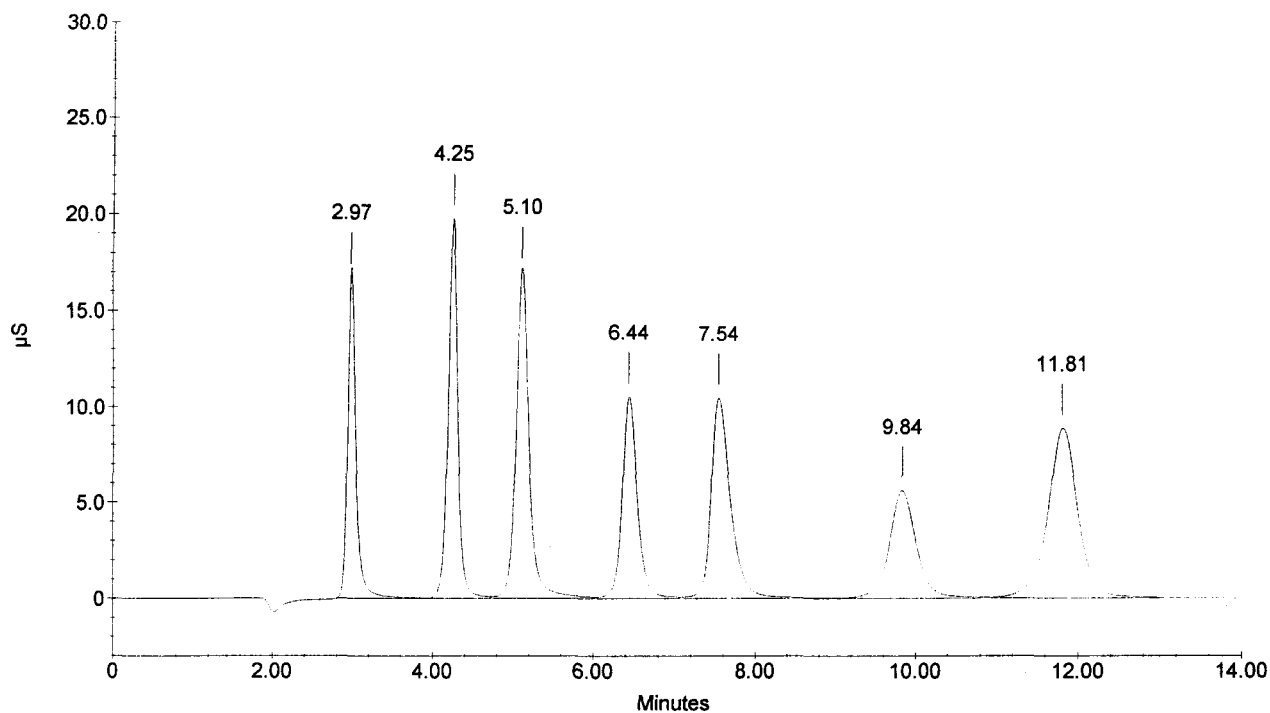
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.97	FLUORIDE	96.141	167051	1224254	2	-1.33
2	4.25	CHLORIDE	204.683	197471	1657137	2	-0.23
3	5.10	NITRITE-N	109.072	169893	1948137	2	-0.71
4	6.44	BROMIDE	402.064	105103	1369309	2	-0.05
5	7.54	NITRATE-N	86.221	104327	1747068	2	2.35
6	9.84	PHOSPHATE-P	192.414	55866	1306716	2	0.37
7	11.81	SULFATE	400.058	88555	2288583	2	0.00

0.00

---total(s)---
1490.653

11541204

ICV



Sample Name : ICB
 Dilution Factor : 1.00
 Injection Number : 10
 Data File Name : c:\peaknet\data\051116\051116_010.DXD
 Method File Name : c:\peaknet\method\anions051116.met
 Schedule File Name : c:\peaknet\schedule\051116.sch

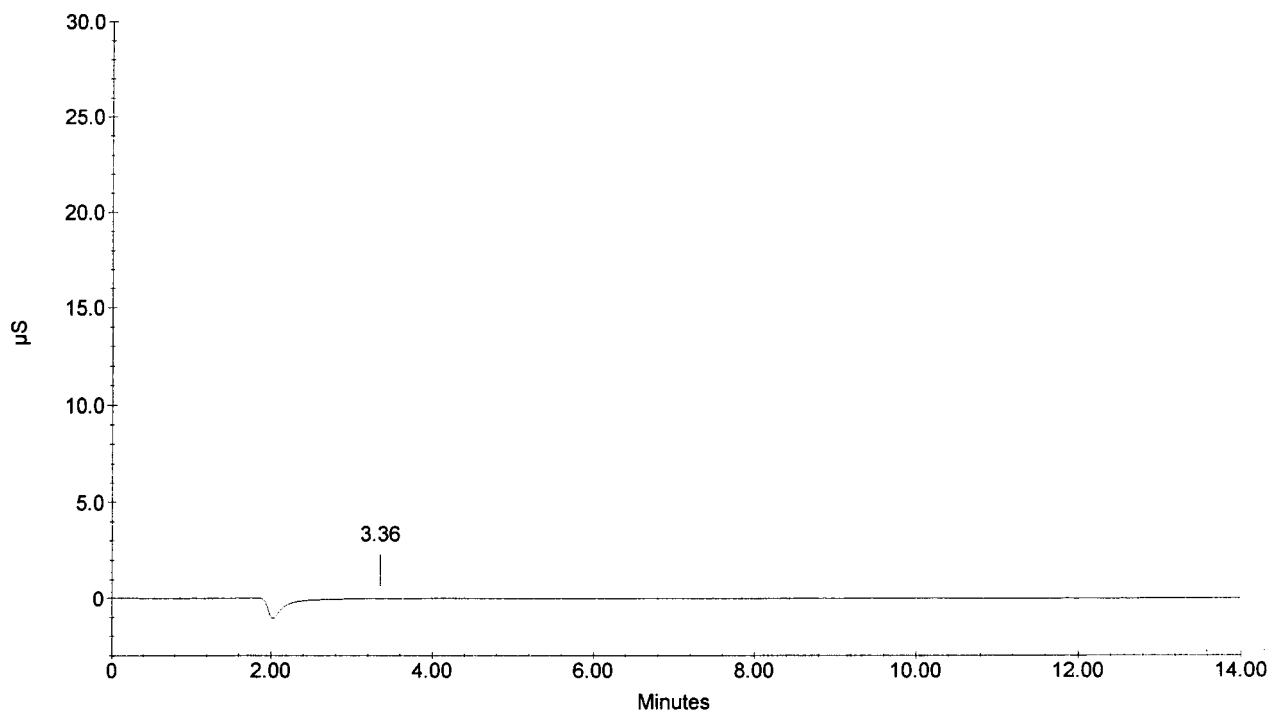
Date Time Collected : 11/16/05 8:36:25 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-SN#018097 AG14-#019940
 System Operator : RSPIES

010113

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.36	CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P SULFATE	0.000	43	429	1	
			---total(s)---				
			0.00	0.000	429		

ICB



TITLE Anion Calibration Curve

PROJECT NO. NA -
BOOK NO. 105

115

Work continued from Page

x incorrect entry

115-01-105 20ppm Anions

010114

Anions	Std vol, mL	Std. Conc; mg/L	Inorg#	Exp.
Fluoride	0.2mL	1000mg/L	4951	1/15/2006
Chloride			4950	1/15/2006
Nitrite N			5076	4/15/30/06
Bromide			5275	6/30/06
Nitrate N			4952	1/15/06
Phosphate P			4953	1/15/06
Sulfate			5305	7/30/06

* Cat A's located in Office 52.

15 Diluted to 10mL DI H₂O.

115-02-105 15ppm
3mL 115-01-105 + 1mL DI H₂O.
115-02-105 incorrect entry

20 115-03-105 10ppm
2mL 115-01-105 + 2mL DI H₂O.

115-04-105 5ppm
2mL 115-03-105 + 2mL DI H₂O.

25 115-05-105 1ppm
1mL 115-04-105 + 4mL DI H₂O.

30 115-06-105 0.5ppm
2mL 115-05-105 + 2mL DI H₂O.

115-07-105 0.1ppm
1mL 115-06-105 + 4mL DI H₂O

35 115-08-105 0ppm
DI H₂O.

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DATE

WITNESS

Work continued to Page

DATE 11/16/05
DATE 12/12/05

Eppendorf's

5000 J

1000 J

200 J

Eppendorf Logbook
located in
Lab 47.

DI water

Logbook located
in Lab 49.

128 PROJECT NO. -

BOOK NO. 105

TITLE

Nitrite-N

Work continued from Page

010115

128-01-105 Nitrite-N, 159 mg/L

0.0470g sodium nitrate (Inorg # 2921)
diluted to 60 mL DI H₂O.
Balance # 12.

R. Spier 12/20/05

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Work continued to Page

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12/20/05

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01/18/06

WITNESS

DATE

010116

SOUTHWEST RESEARCH INSTITUTE

NUCLEAR PROJECT

CLIENT: Division 20

TASK ORDER: 051219-5

SRR: 28420

SDG: 271245

CASE: L. Yang

VTSR: December 16, 2005

PROJECT#: 06002.01.322

Certificates of Analysis

010117



TRACEMETAL GRADE NITRIC ACID CERTIFICATE OF ANALYSIS

B. McKelvey
Dr. B. McKelvey
QA/QC Manager

CATALOG NUMBER: A509
LOT NUMBER: 1105042
RELEASE DATE: July, 2005
EXPIRY DATE: July, 2006

Tests	Maximum Specification	Actual Value	Units
ASSAY (HNO ₃ w/w):	67 - 70%	70%	% by w/w
Color:	10	<10	APHA

Analyte	Maximum Specification	Actual Value (in ppb)	Analyte	Maximum Specification	Actual Value (in ppb)
Aluminum (Al)	1 ppb	<0.5	Neodymium (Nd)	0.5 ppb	<0.1
Antimony (Sb)	1 ppb	<0.1	Nickel (Ni)	1 ppb	<0.1
Arsenic (As)	1 ppb	<0.1	Niobium (Nb)	0.5 ppb	<0.1
Barium (Ba)	1 ppb	<0.1	Palladium (Pd)	0.5 ppb	<0.1
Beryllium (Be)	1 ppb	<0.1	Platinum (Pt)	0.5 ppb	<0.1
Bismuth (Bi)	1 ppb	<0.1	Potassium (K)	1 ppb	<0.2
Boron (B)	1 ppb	<0.5	Praseodymium (Pr)	0.5 ppb	<0.1
Cadmium (Cd)	1 ppb	<0.1	Rhenium (Re)	0.5 ppb	<0.1
Calcium (Ca)	1 ppb	<0.5	Rhodium (Rh)	0.5 ppb	<0.1
Cerium (Ce)	0.5 ppb	<0.1	Rubidium (Rb)	0.5 ppb	<0.1
Cesium (Cs)	0.5 ppb	<0.1	Ruthenium (Ru)	0.5 ppb	<0.1
Chromium (Cr)	1 ppb	<0.5	Samarium (Sm)	0.5 ppb	<0.1
Cobalt (Co)	1 ppb	<0.1	Scandium (Sc)	0.5 ppb	<0.1
Copper (Cu)	1 ppb	<0.1	Selenium (Se)	1 ppb	<0.1
Dysprosium (Dy)	0.5 ppb	<0.1	Silver (Ag)	1 ppb	<0.1
Erbium (Er)	0.5 ppb	<0.1	Sodium (Na)	1 ppb	<0.2
Europium (Eu)	0.5 ppb	<0.1	Strontium (Sr)	1 ppb	<0.1
Gadolinium (Gd)	0.5 ppb	<0.1	Tantalum (Ta)	Information Only	<0.1
Gallium (Ga)	0.5 ppb	<0.1	Tellurium (Te)	0.5 ppb	<0.1
Germanium (Ge)	0.5 ppb	<0.1	Terbium (Tb)	0.5 ppb	<0.1
Gold (Au)	0.5 ppb	<0.1	Thallium (Tl)	0.5 ppb	<0.1
Hafnium (Hf)	0.5 ppb	<0.1	Thorium (Th)	1 ppb	<0.1
Holmium (Ho)	0.5 ppb	<0.1	Thulium (Tm)	0.5 ppb	<0.1
Indium (In)	0.5 ppb	<0.1	Tin (Sn)	1 ppb	<0.1
Iron (Fe)	1 ppb	<0.5	Titanium (Ti)	1 ppb	<0.1
Lanthanum (La)	0.5 ppb	<0.1	Tungsten (W)	0.5 ppb	<0.1
Lead (Pb)	1 ppb	<0.1	Uranium (U)	1 ppb	<0.1
Lithium (Li)	1 ppb	<0.1	Vanadium (V)	1 ppb	<0.1
Lutetium (Lu)	0.5 ppb	<0.1	Ytterbium (Yb)	0.5 ppb	<0.1
Magnesium (Mg)	1 ppb	<0.2	Yttrium (Y)	0.5 ppb	<0.1
Manganese (Mn)	1 ppb	<0.1	Zinc (Zn)	1 ppb	<0.2
Mercury (Hg)	1 ppb	<0.2	Zirconium (Zr)	1 ppb	<0.1
Molybdenum (Mo)	1 ppb	<0.1			

Analyte	Maximum Specification	Actual Value (in ppm)	Analyte	Maximum Specification	Actual Value (in ppm)
Chloride (Cl)	0.2 ppm	<0.2	Total Sulfur (S)	0.3 ppm	<0.3
Total Phosphorus (P)	0.01 ppm	<0.01			

Element concentrations are at the point of bottling. Concentrations of some elements in particular, Ca, Si, K, Na, B, Al, Mg & Mn will increase due to storage in glass bottles.



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010118



TRACEMETAL GRADE NITRIC ACID CERTIFICATE OF ANALYSIS

B. McKelvey
Dr. B. McKelvey
QA/QC Manager

CATALOG NUMBER: A509
LOT NUMBER: 1105040
RELEASE DATE: May, 2005
EXPIRY DATE: May, 2008

Tests	Maximum Specification	Actual Value	Units
ASSAY (HNO ₃ , w/w):	67 - 70%	70%	% by w/w
Color:	10	<10	APHA

Analyte	Maximum Specification	Actual Value (inppb)	Analyte	Maximum Specification	Actual Value (inppb)
Aluminum (Al)	1 ppb	<0.5	Neddyium (Nd)	0.5 ppb	<0.1
Antimony (Sb)	1 ppb	<0.1	Nickel (Ni)	1 ppb	<0.1
Arsenic (As)	1 ppb	<0.1	Niobium (Nb)	0.5 ppb	<0.1
Barium (Ba)	1 ppb	<0.1	Palladium (Pd)	0.5 ppb	<0.1
Beryllium (Be)	1 ppb	<0.1	Platinum (Pt)	0.5 ppb	<0.1
Bismuth (Bi)	1 ppb	<0.1	Potassium (K)	1 ppb	<0.2
Boron (B)	1 ppb	<0.5	Praseodymium (Pr)	0.5 ppb	<0.1
Cadmium (Cd)	1 ppb	<0.1	Rhenium (Re)	0.5 ppb	<0.1
Calcium (Ca)	1 ppb	<0.5	Rhodium (Rh)	0.5 ppb	<0.1
Cerium (Ce)	0.5 ppb	<0.1	Rubidium (Rb)	0.5 ppb	<0.1
Cesium (Cs)	0.5 ppb	<0.1	Ruthenium (Ru)	0.5 ppb	<0.1
Chromium (Cr)	1 ppb	<0.5	Samarium (Sm)	0.5 ppb	<0.1
Cobalt (Co)	1 ppb	<0.1	Scandium (Sc)	0.5 ppb	<0.1
Copper (Cu)	1 ppb	<0.1	Selenium (Se)	1 ppb	<0.1
Dysprosium (Dy)	0.5 ppb	<0.1	Silver (Ag)	1 ppb	<0.1
Erbium (Er)	0.5 ppb	<0.1	Sodium (Na)	1 ppb	<0.2
Europium (Eu)	0.5 ppb	<0.1	Strontium (Sr)	1 ppb	<0.1
Gadolinium (Gd)	0.5 ppb	<0.1	Tantalum (Ta)	Information Only	<0.1
Gallium (Ga)	0.5 ppb	<0.1	Tellurium (Te)	0.5 ppb	<0.1
Germanium (Ge)	0.5 ppb	<0.1	Terbium (Tb)	0.5 ppb	<0.1
Gold (Au)	0.5 ppb	<0.1	Thallium (Tl)	0.5 ppb	<0.1
Hafnium (Hf)	0.5 ppb	<0.1	Thorium (Th)	1 ppb	<0.1
Holmium (Ho)	0.5 ppb	<0.1	Thulium (Tm)	0.5 ppb	<0.1
Indium (In)	0.5 ppb	<0.1	Tin (Sn)	1 ppb	<0.1
Iron (Fe)	1 ppb	<0.5	Titanium (Ti)	1 ppb	<0.1
Lanthanum (La)	0.5 ppb	<0.1	Tungsten (W)	0.5 ppb	<0.1
Lead (Pb)	1 ppb	<0.1	Uranium (U)	1 ppb	<0.1
Lithium (Li)	1 ppb	<0.1	Vanadium (V)	1 ppb	<0.1
Lutetium (Lu)	0.5 ppb	<0.1	Ytterbium (Yb)	0.5 ppb	<0.1
Magnesium (Mg)	1 ppb	<0.2	Yttrium (Y)	0.5 ppb	<0.1
Manganese (Mn)	1 ppb	<0.1	Zinc (Zn)	1 ppb	<0.2
Mercury (Hg)	1 ppb	<0.2	Zirconium (Zr)	1 ppb	<0.1
Molybdenum (Mo)	1 ppb	<0.1			

Element concentrations are at the point of bottling. Concentrations of some elements in particular, Ca, Si, K, Na, B, Al, Mg & Mn will increase due to storage in glass bottles.



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010119

**Fisher Scientific**

TRACEMETAL GRADE HYDROCHLORIC ACID CERTIFICATE OF ANALYSIS

B. McKelvey

Dr. B. McKelvey
QA/QC Manager

CATALOG NUMBER: A508

LOT NUMBER: 4105050

RELEASE DATE: July, 2005

EXPIRY DATE: July, 2008

Tests	Maximum Specification	Actual Value	Units
ASSAY (HCl, w/w):	34 - 37%	36%	% by w/w
Color:	10	<10	APHA

Analyte	Maximum Specification	Actual Value (in ppb)	Analyte	Maximum Specification	Actual Value (in ppb)
Aluminum (Al)	1 ppb	<0.5	Neodymium (Nd)	0.5 ppb	<0.1
Antimony (Sb)	1 ppb	<0.1	Nickel (Ni)	1 ppb	<0.1
Arsenic (As)	1 ppb	<0.1	Niobium (Nb)	0.5 ppb	<0.1
Barium (Ba)	1 ppb	<0.1	Palladium (Pd)	Information Only	<0.5
Beryllium (Be)	1 ppb	<0.1	Platinum (Pt)	Information Only	<0.5
Bismuth (Bi)	1 ppb	<0.1	Potassium (K)	1 ppb	<0.1
Boron (B)	1 ppb	<0.5	Praseodymium (Pr)	0.5 ppb	<0.1
Cadmium (Cd)	1 ppb	<0.1	Rhenium (Re)	0.5 ppb	<0.1
Calcium (Ca)	1 ppb	<0.5	Rhodium (Rh)	0.5 ppb	<0.1
Cerium (Ce)	0.5 ppb	<0.1	Rubidium (Rb)	0.5 ppb	<0.1
Cesium (Cs)	0.5 ppb	<0.1	Ruthenium (Ru)	0.5 ppb	<0.1
Chromium (Cr)	1 ppb	<0.1	Samarium (Sm)	0.5 ppb	<0.1
Cobalt (Co)	1 ppb	<0.1	Scandium (Sc)	0.5 ppb	<0.1
Copper (Cu)	1 ppb	<0.1	Selenium (Se)	1 ppb	<0.1
Dysprosium (Dy)	0.5 ppb	<0.1	Silver (Ag)	1 ppb	<0.1
Erbium (Er)	0.5 ppb	<0.1	Sodium (Na)	1 ppb	<0.5
Europium (Eu)	0.5 ppb	<0.1	Strontium (Sr)	1 ppb	<0.1
Gadolinium (Gd)	0.5 ppb	<0.1	Tantalum (Ta)	Information Only	<1
Gallium (Ga)	0.5 ppb	<0.1	Tellurium (Te)	0.5 ppb	<0.1
Gold (Au)	0.5 ppb	<0.1	Terbium (Tb)	0.5 ppb	<0.1
Hafnium (Hf)	0.5 ppb	<0.1	Thallium (Tl)	0.5 ppb	<0.1
Holmium (Ho)	0.5 ppb	<0.1	Thorium (Th)	1 ppb	<0.1
Indium (In)	0.5 ppb	<0.1	Thulium (Tm)	0.5 ppb	<0.1
Iron (Fe)	1 ppb	<0.5	Tin (Sn)	1 ppb	<0.1
Lanthanum (La)	0.5 ppb	<0.1	Titanium (Ti)	1 ppb	<0.1
Lead (Pb)	1 ppb	<0.1	Tungsten (W)	0.5 ppb	<0.1
Lithium (Li)	1 ppb	<0.1	Uranium (U)	1 ppb	<0.1
Lutetium (Lu)	0.5 ppb	<0.1	Vanadium (V)	1 ppb	<0.1
Magnesium (Mg)	1 ppb	<0.5	Ytterbium (Yb)	0.5 ppb	<0.1
Manganese (Mn)	1 ppb	<0.1	Yttrium (Y)	0.5 ppb	<0.1
Mercury (Hg)	1 ppb	<0.2	Zinc (Zn)	1 ppb	<0.5
Molybdenum (Mo)	1 ppb	<0.1	Zirconium (Zr)	1 ppb	<0.1

Analyte	Maximum Specification	Actual Value (in ppm)	Analyte	Maximum Specification	Actual Value (in ppm)
Bromide (Br)	10 ppm	<10	Total Sulphur (S)	0.3 ppm	<0.3
Total Phosphorus (P)	0.01 ppm	<0.01	Free Chlorine (Cl ₂)	0.5 ppm	<0.5

Element concentrations are at the point of bottling. Concentrations of some elements in particular, Ca, Si, K, Na, B, Al, Mg & Mn will increase due to storage in glass bottles.

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INORG: 5475-75480 PO: F56664

010120



TRACEMETAL GRADE HYDROCHLORIC ACID CERTIFICATE OF ANALYSIS

B. McKelvey
Dr. B. McKelvey
QA/QC Manager

CATALOG NUMBER: A508

LOT NUMBER: 4105031
RELEASE DATE: July, 2005
EXPIRY DATE: July, 2008

Tests	Maximum Specification	Actual Value	Units
ASSAY (HCl, w/w):	34 - 37%	36%	% by w/w
Color:	10	<10	APHA

Analyte	Maximum Specification	Actual Value (in ppb)	Analyte	Maximum Specification	Actual Value (in ppb)
Aluminum (Al)	1 ppb	<0.5	Neodymium (Nd)	0.5 ppb	<0.1
Antimony (Sb)	1 ppb	<0.1	Nickel (Ni)	1 ppb	<0.1
Arsenic (As)	1 ppb	<0.1	Niobium (Nb)	0.5 ppb	<0.1
Barium (Ba)	1 ppb	<0.1	Palladium (Pd)	Information Only	<0.5
Beryllium (Be)	1 ppb	<0.1	Platinum (Pt)	Information Only	<0.5
Bismuth (Bi)	1 ppb	<0.1	Potassium (K)	1 ppb	<0.1
Boron (B)	1 ppb	<0.5	Praseodymium (Pr)	0.5 ppb	<0.1
Cadmium (Cd)	1 ppb	<0.1	Rhenium (Re)	0.5 ppb	<0.1
Calcium (Ca)	1 ppb	<0.5	Rhodium (Rh)	0.5 ppb	<0.1
Cerium (Ce)	0.5 ppb	<0.1	Rubidium (Rb)	0.5 ppb	<0.1
Cesium (Cs)	0.5 ppb	<0.1	Ruthenium (Ru)	0.5 ppb	<0.1
Chromium (Cr)	1 ppb	<0.1	Samarium (Sm)	0.5 ppb	<0.1
Cobalt (Co)	1 ppb	<0.1	Scandium (Sc)	0.5 ppb	<0.1
Copper (Cu)	1 ppb	<0.1	Selenium (Se)	1 ppb	<0.1
Dysprosium (Dy)	0.5 ppb	<0.1	Silver (Ag)	1 ppb	<0.1
Erbium (Er)	0.5 ppb	<0.1	Sodium (Na)	1 ppb	<0.5
Europium (Eu)	0.5 ppb	<0.1	Strontium (Sr)	1 ppb	<0.1
Gadolinium (Gd)	0.5 ppb	<0.1	Tantalum (Ta)	Information Only	<1
Gallium (Ga)	0.5 ppb	<0.1	Tellurium (Te)	0.5 ppb	<0.1
Gold (Au)	0.5 ppb	<0.1	Terbium (Tb)	0.5 ppb	<0.1
Hafnium (Hf)	0.5 ppb	<0.1	Thallium (Tl)	0.5 ppb	<0.1
Holmium (Ho)	0.5 ppb	<0.1	Thorium (Th)	1 ppb	<0.1
Indium (In)	0.5 ppb	<0.1	Thulium (Tm)	0.5 ppb	<0.1
Iron (Fe)	1 ppb	<0.5	Tin (Sn)	1 ppb	<0.1
Lanthanum (La)	0.5 ppb	<0.1	Titanium (Ti)	1 ppb	<0.1
Lead (Pb)	1 ppb	<0.1	Tungsten (W)	0.5 ppb	<0.1
Lithium (Li)	1 ppb	<0.1	Uranium (U)	1 ppb	<0.1
Lutetium (Lu)	0.5 ppb	<0.1	Vanadium (V)	1 ppb	<0.1
Magnesium (Mg)	1 ppb	<0.5	Ytterbium (Yb)	0.5 ppb	<0.1
Manganese (Mn)	1 ppb	<0.1	Yttrium (Y)	0.5 ppb	<0.1
Mercury (Hg)	1 ppb	<0.2	Zinc (Zn)	1 ppb	<0.5
Molybdenum (Mo)	1 ppb	<0.1	Zirconium (Zr)	1 ppb	<0.1

Analyte	Maximum Specification	Actual Value (in ppm)	Analyte	Maximum Specification	Actual Value (in ppm)
Bromide (Br)	10 ppm	<10	Total Sulphur (S)	0.3 ppm	<0.3
Total Phosphorus (P)	0.01 ppm	<0.01	Free Chlorine (Cl ₂)	0.5 ppm	<0.5

Element concentrations are at the point of bottling. Concentrations of some elements in particular, Ca, Si, K, Na, B, Al, Mg & Mn will increase due to storage in glass bottles.



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DATE RECEIVED: 10/6/05
DATE EXPIRED: 10/4/2015
DATE OPENED: 10/14/05
INORG: 5418-5423 PO: 652702

SPE Certificate™

010121

Certificate of Reference Material

Catalog Number: SPIKE-1 Lot No.: 28-176AS
Description: Spike Sample Standard 1
Matrix: 5% Nitric Acid/tr Tartaric Acid - HF

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single element concentrates of individual elements using Class A laboratory ware to give precise concentration.

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM	Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
Al	200	198.56	3101a	Pb	50	50.06	3128
As	200	197.01	3103a	Sb	50	48.62	3102a
Ba	200	199.49	3104a	V	50	49.87	3165
Se	200	198.51	3149	Zn	50	49.70	3168a
TL	200	199.25	3158	Cu	25	25.15	3114
Fe	100	98.90	3126a	Cr	20	19.81	3112a
Co	50	50.04	3113	Ag	5	4.96	3151
Mn	50	49.90	3132	Be	5	4.92	3105a
Ni	50	50.16	3136	Cd	5	4.96	3108

Spex Reference Multi: Lot #4-24BD, 2-61BD, 17-55AS, 16-68AS

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable and accurate to +/- 0.5% on the average of all the certified concentrations with no single component exceeding +/- 2%. This guarantee is valid for a period of one year from the date of certification only when the material is kept tightly capped and transported and stored under laboratory conditions.

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 4/18/05

DATE EXPIRED: 4/30/06

DATE OPENED: 4/18/05

INORG: 5197 FO: 55168

1 of 2
5197

Date of Certification: APR. -- 2005 Certifying Officer: N. Kocherakota

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s \cdot m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



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5197



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SPEXertificate™

Certificate of Reference Material

Catalog Number: ICAL-1 **Lot No.:** 28-64AS
Description: Instrument Calibration Standard 1
Matrix: 5% Nitric Acid

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single element concentrates of individual elements using Class A laboratory ware to give precise concentration.

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
Ca	5,000	5011.87	3109a
K	5,000	5011.80	3141a
Mg	5,000	5020.86	3131a
Na	5,000	4995.13	3152a

Spex Reference Multi: Lot #6-28VY, 6-104VY, 25-178AS-REF

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable and accurate to +/- 0.5% on the average of all the certified concentrations with no single element exceeding +/-2%. This includes uncertainty of measurements and other effects, such as transpiration losses. This guarantee is valid for a period of one year from the date of certification only when the material is kept tightly capped and transported and stored under laboratory conditions.

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 6/30/05

DATE EXPIRED: 6/30/06

DATE OPENED: 6/30/05

INORG: 5258 PD: 55205

Date of Certification: _____ Certifying Officer: N. Kocherakota

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

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Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

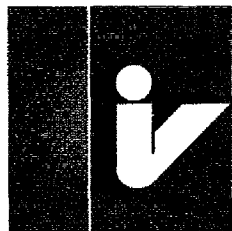
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certificate of analysis

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s)), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Scandium in 5% (abs) HNO₃

Catalog Number: CGSC1-1, CGSC1-2, and CGSC1-5
Lot Number: X-SC02063
Starting Material: Sc₂O₃
Starting Material Purity (%): 99.996919
Starting Material Lot No: BSC-632-1-5736
Matrix: 5% (abs) HNO₃

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1007 ± 2 µg/mL

Certified Density: 1.037 g/mL (measured at 22° C)

The Certified Value is the ICP value. The following equations are used in the calculations of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

(\bar{x}) = mean
 x_i = individual results
 n = number of measurements

$$\text{Uncertainty } (\pm) = 2 \left[\frac{\sum s_i^2}{n} \right]^{1/2}$$

$\sum s_i$ = The summation of all significant estimated errors.
(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

- ☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
- ☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 Assay Method #1 1007 ± 2 µg/mL
ICP Assay NIST SRM 3148a Lot Number: 792111

Assay Method #2 1006 ± 2 µg/mL
EDTA NIST SRM 928 Lot Number: 392110

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 9/23/05
DATE EXPIRED: 10/1/06
DATE OPENED: 9/27/05
INORG: 5404 PO: DEQA6435

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5/10/04

- 4.2 BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 4.3 THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.
- 4.4 GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions 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.

<u>Q</u> Al < 0.00100	<u>M</u> Dy < 0.00598	<u>M</u> Li < 0.00997	<u>M</u> Pr < 0.00030	<u>M</u> Te < 0.02990
<u>M</u> Sb < 0.00050	<u>M</u> Er < 0.00498	<u>M</u> Lu < 0.00040	<u>M</u> Re < 0.00100	<u>M</u> Tb < 0.00030
<u>M</u> As < 0.00997	<u>M</u> Eu < 0.00299	<u>Q</u> Mg 0.00010	<u>M</u> Rh < 0.00100	<u>M</u> Tl < 0.00100
<u>M</u> Ba < 0.00997	<u>M</u> Gd < 0.00100	<u>M</u> Mn < 0.00399	<u>M</u> Rb < 0.00100	<u>M</u> Th 0.01175
<u>M</u> Be < 0.00050	<u>M</u> Ga < 0.00100	<u>Q</u> Hg < 0.01000	<u>M</u> Ru < 0.00199	<u>M</u> Tm < 0.00040
<u>M</u> Bi < 0.00040	<u>M</u> Ge < 0.00598	<u>M</u> Mo < 0.00199	<u>M</u> Sm < 0.00100	<u>M</u> Sn < 0.00498
<u>M</u> B < 0.06976	<u>M</u> Au < 0.00299	<u>M</u> Nd < 0.00199	<u>s</u> Sc	<u>Q</u> Ti < 0.00100
<u>M</u> Cd < 0.00299	<u>M</u> Hf < 0.00199	<u>Q</u> Ni < 0.00090	<u>M</u> Se < 0.00797	<u>M</u> W < 0.00997
<u>Q</u> Ca 0.01149	<u>M</u> Ho < 0.00050	<u>M</u> Nb < 0.00050	<u>Q</u> Si 0.00200	<u>M</u> U < 0.00199
<u>M</u> Ce < 0.00498	<u>M</u> In < 0.00997	<u>n</u> Os	<u>M</u> Ag < 0.00199	<u>M</u> V < 0.00199
<u>M</u> Cs < 0.00030	<u>M</u> Ir < 0.00498	<u>M</u> Pd < 0.00498	<u>Q</u> Na < 0.09000	<u>M</u> Yb < 0.00100
<u>Q</u> Cr 0.00047	<u>Q</u> Fe 0.00037	<u>n</u> P	<u>M</u> Sr < 0.00050	<u>Q</u> Y < 0.00100
<u>M</u> Co < 0.00299	<u>M</u> La < 0.00050	<u>M</u> Pt < 0.00199	<u>Q</u> S < 0.02500	<u>Q</u> Zn 0.00060
<u>Q</u> Cu < 0.00140	<u>M</u> Pb < 0.00299	<u>Q</u> K < 0.10000	<u>M</u> Ta < 0.00698	<u>Q</u> Zr 0.02298

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 including but not limited to the following:

ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 44.95591; +3; 6; $\text{Sc}(\text{H}_2\text{O})_6^{+3}$

Chemical Compatibility - Soluble in HCl , H_2SO_4 and HNO_3 . Avoid HF , H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride. Avoid mixing with elements / solutions containing moderate amounts of fluoride. The fluoride is soluble in excess HF forming ScF_6^- (not recommended for standard preparations).

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 5-10% HNO_3 / LDPE container. Small atomic radius increases hydrolysis requiring higher acid levels than other Rare Earths.

Sc Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolve by heating in H_2O / HNO_3); Ores (Carbonate fusion in Pb followed by HCl dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H_2O / HCl or HNO_3), (Aqua Regia or nitric / perchloric / sulfuric acid digestions can be used. **Exercise caution when using perchloric acid.**)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES 335.373 nm	0.004 / 0.00002 $\mu\text{g/mL}$	1	ion	
ICP-OES 337.215 nm	0.004 / 0.00002 $\mu\text{g/mL}$	1	ion	Ti, U, Ni, Rh
ICP-OES 424.683 nm	0.003 / 0.00002 $\mu\text{g/mL}$	1	ion	Ce^{+2}
ICP-MS 45 amu	2.3 ppt	n/a	M ⁺	$^{16}\text{O}^{12}\text{CH}$, $^{29}\text{Si}^{16}\text{O}$, $^{90}\text{Zr}^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditación, a.c.(EMA)

Members of IQ Net International Certification Network:

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10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

3 of 4
9/10/01

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: December 14, 2004

Expiration Date: **EXPIRES**
12/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Nicholas Maida
Katalin Le
Paul Gaines

4084
5404


inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
 phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
 e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade 10000 µg/mL Scandium in 5% (abs) HNO₃

Catalog Number: CGSC10-1, CGSC10-2, and CGSC10-5
 Lot Number: X-SC02061
 Starting Material: Sc₂O₃
 Starting Material Purity (%): 99.996918
 Starting Material Lot No BSC-632-1-5736
 Matrix: 5% (abs) HNO₃

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,007 ± 21 µg/mL

Certified Density: 1.071 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2(\sum s_i)^2}{(n)^{1/2}}$$

$\sum s_i$ = The summation of all significant estimated errors

(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM-certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

• "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

• This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** 10,005 ± 26 µg/mL
 ICP Assay NIST SRM 3148a Lot Number: 792111

Assay Method #2 10,007 ± 21 µg/mL
 EDTA NIST SRM 928 Lot Number: 880710

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 3/31/05
 DATE EXPIRED: 3/31/06
 DATE OPENED: 3/31/05
 INORG: 5175 PD: 221106

1064
 5175

- 4.2 BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 4.3 THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.
- 4.4 GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions 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.

<u>Q</u> Al < 0.00100	<u>M</u> Dy < 0.00598	<u>M</u> Li < 0.00997	<u>M</u> Pr < 0.00030	<u>M</u> Te < 0.02990
<u>M</u> Sb < 0.00050	<u>M</u> Er < 0.00498	<u>M</u> Lu < 0.00040	<u>M</u> Re < 0.00100	<u>M</u> Tb < 0.00030
<u>M</u> As < 0.00997	<u>M</u> Eu < 0.00299	<u>Q</u> Mg 0.00100	<u>M</u> Rh < 0.00100	<u>M</u> Tl < 0.00100
<u>M</u> Ba < 0.00997	<u>M</u> Gd < 0.00100	<u>M</u> Mn < 0.00399	<u>M</u> Rb < 0.00100	<u>M</u> Th 0.11759
<u>M</u> Be < 0.00050	<u>M</u> Ga < 0.00100	<u>Q</u> Hg < 0.01000	<u>M</u> Ru < 0.00199	<u>M</u> Tm < 0.00040
<u>M</u> Bi < 0.00040	<u>M</u> Ge < 0.00598	<u>M</u> Mo < 0.00199	<u>M</u> Sm < 0.00100	<u>M</u> Sn < 0.00498
<u>M</u> B < 0.06976	<u>M</u> Au < 0.00299	<u>M</u> Nd < 0.00199	<u>s</u> Sc	<u>Q</u> Ti < 0.00100
<u>M</u> Cd < 0.00299	<u>M</u> Hf < 0.00199	<u>Q</u> Ni < 0.00090	<u>M</u> Se < 0.00797	<u>M</u> W < 0.00997
<u>Q</u> Ca 0.11500	<u>M</u> Ho < 0.00050	<u>M</u> Nb < 0.00050	<u>Q</u> Si 0.02000	<u>M</u> U < 0.00199
<u>M</u> Ce < 0.00498	<u>M</u> In < 0.00997	<u>n</u> Os	<u>M</u> Ag < 0.00199	<u>M</u> V < 0.00199
<u>M</u> Cs < 0.00030	<u>M</u> Ir < 0.00498	<u>M</u> Pd < 0.00498	<u>Q</u> Na < 0.09000	<u>M</u> Yb < 0.00100
<u>Q</u> Cr 0.00470	<u>Q</u> Fe 0.00370	<u>n</u> P	<u>M</u> Sr < 0.00050	<u>Q</u> Y < 0.00100
<u>M</u> Co < 0.00299	<u>M</u> La < 0.00050	<u>M</u> Pt < 0.00199	<u>Q</u> S < 0.02500	<u>Q</u> Zn 0.00600
<u>Q</u> Cu < 0.00140	<u>M</u> Pb < 0.00299	<u>Q</u> K < 0.10000	<u>M</u> Ta < 0.00698	<u>Q</u> Zr 0.23000

M - Checked by ICP-MS Q - 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 including but not limited to the following:
 ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
 For the validation of analytical methods
 For the preparation of "working reference samples"
 For interference studies and the determination of correction coefficients
 For detection limit and linearity studies
 For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 44.95591; +3, 6; $\text{Sc}(\text{H}_2\text{O})_9^{3+}$

Chemical Compatibility - Soluble in HCl , H_2SO_4 and HNO_3 . Avoid HF , H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride. Avoid mixing with elements / solutions containing moderate amounts of fluoride. The fluoride is soluble in excess HF forming ScF_4 (not recommended for standard preparations)

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 5-10% HNO_3 / LDPE container. Small atomic radius increases hydrolysis requiring higher acid levels than other Rare Earths.

Sc Containing Sample Preparation and Solution - Metal (Soluble in acids); Oxide (Dissolve by heating in H_2O / HNO_3); Ores (Carbonate fusion in Pt followed by HCl dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H_2O / HCl or HNO_3); (Aqua

Regia or nitric / perchloric / sulfuric acid digestions can be used. Exercise caution when using perchloric acid.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at = concs.)
ICP-OES 335.373 nm	0.004 / 0.00002 $\mu\text{g/mL}$	1	ion	
ICP-OES 337.215 nm	0.004 / 0.00002 $\mu\text{g/mL}$	1	ion	Ti, U, Ni, Rh
ICP-OES 424.683 nm	0.003 / 0.00002 $\mu\text{g/mL}$	1	ion	Ce
ICP-MS 45 amu	2.3 ppt	n/a	M	$^{10}\text{O}_2^{16}\text{CH}$, $^{28}\text{Si}^{16}\text{O}$, $^{90}\text{Zr}^{16}\text{O}$

8.0 **HAZARDOUS INFORMATION** - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditacion, a.c.(EMA)



Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 01, 2004

Expiration Date:

EXPIRES
01/1/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Malda, QA Administrator

Nicholas Malda
known as

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Paul Gaines

SPEXcertificate™

Certificate of Reference Material

Catalog Number: PLB9-2X/2Y/2T

Lot No. 10-119B

Description: 1000 mg/L Boron

Matrix: H2O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1001 mg/L

Uncertainty Associated with Measurement: ± 3.0 mg/L

Certified Value is Traceable to: NIST SRM 3107

The CRM is prepared gravimetrically using high purity (NH₄)₂B₄O₇·4H₂O Lot# 08001E. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1001 mg/L

Method: Titration with Sodium Hydroxide using Phenolphthalein as indicator. Sodium Hydroxide standardized against Potassium Biphthalate NIST SRM #84k

Instrumental Analysis by ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.001 @ 22.3 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.06	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.001	Re	<0.001
Ag	0.002	Ga	<0.001	Rb	<0.001
Ba	<0.001	In	<0.001	Sr	<0.001
Bc	<0.001	K	<0.06	Sb	<0.001
Bi	0.03	Li	<0.001	Si	0.01
Cd	<0.001	Mn	<0.001	Ti	<0.001
Co	<0.001	Mo	<0.001	Tl	<0.001
Ca	0.001	Mg	<0.001	V	0.003
Cr	<0.001	Na	0.01	Zr	<0.001
		Ni	0.001	Zn	0.004

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to $\pm 0.5\%$ of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN 05

Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 01/17/05
 DATE EXPIRED: 01/15/06
 DATE OPENED: 01/19/05
 INORG: 4966 PD: F55130

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



SPEXcertificate™

Certificate of Reference Material

Catalog Number: PLLI2-2X/2Y

Lot No. 11-120LI

Description: 1000 mg/L Lithium

Matrix: 2% HNO₃

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1002 mg/L

Uncertainty Associated with Measurement: ± 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3129a

The CRM is prepared gravimetrically using high purity Lithium Carbonate Lot# 03021A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1003 mg/L

Method: Evaporate to dryness Fume with Sulfuric Acid. Ignite and weigh as Li₂SO₄

Instrumental Analysis by ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.013 @ 24.6 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	<0.001	Cu	0.02	Pb	0.008
Ag	<0.001	Fe	0.04	Rb	<0.001
As	0.06	Ga	<0.001	Re	<0.001
Bi	<0.001	In	<0.001	Sr	0.004
Be	<0.001	K	<0.20	Sb	0.004
B	<0.001	Li	<0.001	Si	<0.100
Ba	0.004	Mg	0.004	Tl	<0.001
Cr	<0.001	Mo	0.007	Ti	<0.001
Co	<0.001	Mn	0.004	V	0.006
Ca	0.012	Ni	<0.001	Zn	0.03
Cd	<0.001	Na	0.100	Zr	<0.001

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to $\pm 0.5\%$ of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: AUG - 2005

Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 8/1/05

DATE EXPIRED: 8/1/06

DATE OPENED: 8/6/05

INORG: 5327 PO: F52483

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



203 Norcross Avenue • Metuchen, NJ 08840 USA

732-549-7144 • 1-800-IAR-SPEX • Fax: 732-603-9647 • CRM_Sales@spexcorp.com • www.spexcorp.com

SPEXTM Certificate

Certificate of Reference Material

Catalog Number: PLMO9-2X/2Y/2T **Lot No.** 11-51MO
Description: 1000 mg/L Molybdenum
Matrix: H₂O

This ASSURANCE[®] certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1000 mg/L
Uncertainty Associated with Measurement: +/-3.0 mg/L
Certified Value is Traceable to: NIST SRM #3134

The CRM is prepared gravimetrically using high purity (NH₄)₆(Mo)₇(O)₂₄·4H₂O Lot# 03011C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

Method: Precipitation using 8-Hydroxy Quinoline. Filter, dry, and weigh as MoO₂(C₉H₆NO)₂.

Instrumental Analysis by ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 09989 @23.7 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
As	0.03	Cu	0.003	Pb	<0.001
Ag	<0.002	Fe	0.110	Rb	<0.001
Al	<0.002	Ga	<0.001	Re	0.030
Ba	<0.001	In	<0.001	Sr	<0.001
Be	<0.002	K	0.060	Sb	<0.001
B	<0.007	Li	<0.003	Si	<0.200
Bi	<0.001	Mn	0.002	Ti	0.003
Cd	<0.100	Mg	<0.001	Tl	<0.001
Ca	0.010	Ni	<0.001	V	0.004
Cr	<0.003	Na	<0.002	Zr	<0.001
Co	<0.001			Zn	0.006

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 8/4/05

DATE EXPIRED: 8/15/06

DATE OPENED: 8/15/05

INORG: 5326 PO: 152683

Date of Certification: AUG - 2005 **Certifying Officer:** N. Kocherakota

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2/m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



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SPEXcertificate™

Certificate of Reference Material

Catalog Number: PLP9-2X/2Y/2T**Lot No.** 11-90P**Description:** 1000 mg/L Phosphorus**Matrix:** H₂O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1000 mg/L**Uncertainty Associated with Measurement:** +/- 3.0 mg/L**Certified Value is Traceable to:** NIST SRM #3139a

The CRM is prepared gravimetrically using high purity (NH₄)H₂(PO₄) Lot# 049411. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis. Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 999 mg/L**Method:** Precipitation using Magnesia Mixture. Filter, ignite and weigh as Mg₂P₂O₇.**Instrumental Analysis by ICP spectrometer:** 1000 mg/L**Uncertified Properties:****Density:** 1.000 @ 24.3 Degrees Celsius**Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:**

Element	mg/L	Element	mg/L	Element	mg/L
As	<0.001	Cu	<0.001	Pb	<0.001
Ag	<0.009	Fe	0.02	Re	<0.001
Al	0.02	Ga	<0.001	Rb	<0.001
B	<0.002	In	<0.001	Si	0.01
Be	<0.001	K	<0.20	Sb	0.02
Ba	<0.001	Li	<0.001	Sr	<0.001
Bi	<0.001	Mo	0.002	Ti	0.006
Cr	<0.001	Mn	<0.001	Tl	0.003
Ca	0.025	Mg	0.002	V	<0.001
Cd	<0.001	Ni	<0.001	Zn	0.60
Co	<0.001	Na	0.009	Zr	<0.001

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: _____ **Certifying Officer:** N. Kocherlakota

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 6/30/05

DATE EXPIRED: 6/30/06

DATE OPENED: 6/30/05

INORG: 5280 PO: 155205

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



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SPEXTM Certificate

Certificate of Reference Material

Catalog Number: PLSI9-2X/2Y/2T

Lot No. 11-33SI

Description: 1000 mg/L Silicon

Matrix: H₂O / 0.4% F-

This ASSURANCE[®] certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1001.5 mg/L

Uncertainty Associated with Measurement: ± 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3150

The CRM is prepared gravimetrically using high purity (NH₄)₂SiF₆ Lot# 02021D. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis. Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1004 mg/L

Method: Precipitation using Ammonium Molybdate and 8-Hydroxy Quinoline. Filter, dry, and weigh as (C₉H₇ON)₄[Si(Mo₁₂O₄₀)]

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.001 @ 23.7 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.003	Cu	<0.001	Pb	<0.001
Ag	<0.001	Fe	0.02	Rb	<0.001
As	<0.06	Ga	<0.001	Re	<0.001
Ba	<0.001	In	<0.001	Sr	<0.001
Be	<0.001	K	0.14	Sb	<0.001
B	<0.004	Li	0.008	Ti	<0.001
Bi	<0.001	Mo	<0.001	Tl	<0.001
Cd	<0.001	Mg	<0.001	V	<0.001
Ca	0.016	Mn	<0.001	Zn	0.002
Cr	<0.001	Na	0.003	Zr	0.002
Co	<0.001	Ni	<0.004		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to $\pm 0.5\%$ of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

FEB '05

Date of Certification: _____ Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 2/28/05
 DATE EXPIRED: 2/28/06
 DATE OPENED: 2/28/05
 INORG: 5038
 PO: F-35148

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



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SPEXcertificate™

Certificate of Reference Material

Catalog Number: PLTI9-2X/2Y/2T

Lot No. 10-172TI

Description: 1000 mg/L Titanium

Matrix: H₂O/ 0.24% F-

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 998 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3162a

The CRM is prepared gravimetrically using high purity (NH₄)TiF₆ Lot# 02021E. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis. Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 999 mg/L

Method: Precipitation using Ammonium Hydroxide. Filter, ignite and weigh as TiO₂.

Instrumental Analysis by ICP spectrometer: 997 mg/L

Uncertified Properties:

Density: 1.000 @ 23.7 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.004	Cu	0.04	Pb	<0.001
As	<0.001	Fe	0.002	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.004	In	<0.001	Si	3.0
Ba	<0.001	K	<0.10	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	<0.003	Tl	<0.001
Ca	0.012	Mn	<0.001	V	<0.001
Cr	<0.07	Mo	<0.001	Zr	0.004
Cd	<0.001	Na	0.02	Zn	0.004
Co	0.002	Ni	<0.001		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: FEB '05

Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 3/26/05
 DATE EXPIRED: 3/26/06
 DATE OPENED: 3/28/05
 INORG: 5040 PO: F35248

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

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ISO 9001

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SPEXcertificate™

Certificate of Reference Material

Catalog Number: PLSR2-2X/2Y/2T **Lot No.** 10-130SR

Description: 1000 mg/L Strontium in 2% HNO₃

Matrix: 2% HNO₃

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1000 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3153a

The CRM is prepared gravimetrically using high purity Strontium Carbonate Lot# 09031B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis. Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

Method: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against Pb(NO₃)₂ NIST SRM #928.

Instrumental Analysis by ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.010 @ 23.5 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.002	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.006	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.001	In	<0.001	Si	0.012
Ba	0.02	K	0.20	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	<0.001	Ti	<0.001
Ca	0.016	Mn	<0.001	Tl	<0.001
Cr	0.003	Mo	<0.001	V	0.003
Cd	<0.001	Na	0.004	Zr	
Co	<0.001	Ni	<0.001	Zn	<0.001

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: MAY - 2005

Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 5/24/05
DATE EXPIRED: 5/30/06
DATE OPENED: 5/24/05
INORG: 5249 PO: 155189

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

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Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s \cdot m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



5246
2 of 2



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SPEXTM Certificate

Certificate of Reference Material

Catalog Number: PLSR2-2X/2Y/2T **Lot No.** 10-130SR

Description: 1000 mg/L Strontium in 2% HNO₃

Matrix: 2% HNO₃

This ASSURANCE[®] certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1000 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3153a

The CRM is prepared gravimetrically using high purity Strontium Carbonate Lot# 09031B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis. Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

Method: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against Pb(NO₃)₂ NIST SRM #928.

Instrumental Analysis by ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.010 @ 23.5 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.002	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.006	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.001	In	<0.001	Si	0.012
Ba	0.02	K	0.20	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	<0.001	Ti	<0.001
Ca	0.016	Mn	<0.001	Tl	<0.001
Cr	0.003	Mo	<0.001	V	0.003
Cd	<0.001	Na	0.004	Zr	
Co	<0.001	Ni	<0.001	Zn	<0.001

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: MAY - 2005

Certifying Officer: *N. Kocherakota*

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 5/24/05

DATE EXPIRED: 5/20/06

DATE OPENED: 5/24/05

INORG: 5246 PO: 15030

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



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SPEXTM Certificate

Certificate of Reference Material

Catalog Number: PLBI4-2X/2Y

Lot No. 11-136BI

Description: 1000 mg/L Bismuth

Matrix: 10% HNO₃

This ASSURANCE[®] certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1003 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3106

The CRM is prepared gravimetrically using high purity Bismuth Metal Lot# 07931E. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1003 mg/L

Method: EDTA titration using Xylenol Orange as indicator. EDTA standardized against Pb(NO₃)₂ NIST SRM #928.

Instrumental Analysis by ICP spectrometer: 1002 mg/L

Uncertified Properties:

Density: 1.052 @ 25.1 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
As	<0.001	Cu	<0.001	Pb	0.002
Al	0.002	Fe	0.01	Rb	<0.001
Ag	<0.04	Ga	<0.001	Re	<0.001
B	<0.03	In	<0.001	Sb	<0.001
Ba	<0.001	K	0.01	Si	0.027
Be	<0.002	Li	<0.001	Sr	<0.001
Cr	<0.001	Mo	<0.001	Tl	<0.001
Co	<0.001	Mn	<0.001	Ti	<0.001
Cd	<0.001	Mg	<0.001	V	<0.001
Ca	0.04	Ni	0.002	Zr	<0.001
		Na	0.003	Zn	0.05

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: OCT - 2005

Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 10/17/05

DATE EXPIRED: 10/15/06

DATE OPENED: 10/17/05

INORG: 3132 PO: 12070630

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



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SPEXTM Certificate

Certificate of Reference Material

Catalog Number: PLLA2-2X/2Y

Lot No. 11-32LA

Description: 1000 mg/L Lanthanum

Matrix: 2% HNO₃

This ASSURANCE[®] certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1000 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3127a

The CRM is prepared gravimetrically using high purity Lanthanum Oxide Lot# 11901J. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1001 mg/L

Method: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against Pb(NO₃)₂ NIST SRM #928.

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.011 @ 21.8 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Ce	0.007	Lu	<0.001	Tm	<0.001
Ca	12.00	Mn	<0.003	Ti	0.01
Dy	<0.001	Mo	<0.001	Tl	0.02
Er	<0.001	Nd	<0.001	Ta	<0.001
Eu	<0.001	Ni	<0.003	Tb	<0.001
Fe	0.02	Na	0.08	Th	<0.001
Ga	<0.001	Pr	<0.001	V	<0.001
Gd	<0.10	Rb	<0.001	W	<0.001
Hf	<0.001	Sc	0.003	Yb	<0.001
Ho	<0.001	Sm	<0.001	Y	0.003
In	<0.001			Zr	<0.001

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: AUG - 2005

Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 8/4/05

DATE EXPIRED: 8/5/06

DATE OPENED: 8/5/05

INORG: 5325 PO: F22423

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2/m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

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SPEXTM Certificate

Certificate of Reference Material

Catalog Number: PLY2-2X/2Y/2T

Lot No. 11-84Y

Description: 1,000 mg/L Yttrium

Matrix: 2% HNO₃

This ASSURANCE[®] certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 999 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3167

The CRM is prepared gravimetrically using high purity Yttrium Oxide Lot# 04041A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

Method: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against Pb(NO₃)₂ NIST SRM #928.

Instrumental Analysis by ICP spectrometer: 997 mg/L

Uncertified Properties:

Density: 1.011 @ 24.0 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Ca	0.02	Lu	<0.001	Tm	<0.001
Ce	<0.001	La	<0.001	Ti	<0.001
Dy	<0.001	Mn	<0.001	Tl	<0.001
Er	<0.001	Mo	<0.001	Tb	<0.001
Bu	<0.001	Nd	<0.001	Th	<0.001
Fe	0.005	Na	0.001	Ta	<0.001
Ga	<0.001	Ni	<0.001	V	<0.001
Gd	<0.001	Pr	<0.001	W	<0.001
Ho	<0.001	Rb	<0.001	Yb	<0.001
Hf	<0.001	Sm	<0.001	Zr	<0.001
In	<0.001	Sc	<0.001		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 10/17/05

DATE EXPIRED: 10/15/06

DATE OPENED: 10/17/05

INORG: 5431 PO: 200020

Date of Certification: OCT - 2005

Certifying Officer: N. Kocherakota

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



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732-549-7144 • 1-800-1AR-SPEX • Fax: 732-603-9647 • CRM_Sales@spexcorp.com • www.spexcorp.com

SPEX Certificate TM*Certificate of Reference Material***Catalog Number:** PLPD3-2X/2Y**Lot No.** 9-99PD**Description:** 1000 mg/L Palladium.**Matrix:** 10% HCl

This ASSURANCE[®] certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 999 mg/L**Uncertainty Associated with Measurement:** +/-3.0 mg/L**Certified Value is Traceable to:** NIST SRM #3138

The CRM is prepared gravimetrically using high purity Palladium Metal Lot# 06021C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 999 mg/L**Method:** Precipitation using Dimethyl Glyoxime. Filter, dry, and weigh as Pd(C₄H₇O₂N₂)₂.**Instrumental Analysis by ICP spectrometer:** 1000 mg/L**Uncertified Properties:****Density:** 1.017 @ 24.2 Degrees Celsius**Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:**

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.002	Fe	0.033	Re	<0.001
Au	0.002	Ga	<0.001	Rh	<0.001
Ag	<0.001	Ir	<0.001	Rb	<0.001
B	<0.001	In	<0.001	Ru	<0.001
Be	<0.001	Mg	0.001	Sn	<0.001
Bi	<0.001	Mn	<0.001	Te	<0.001
Ca	0.006	Na	0.005	Ti	<0.001
Cd	<0.001	Ni	0.001	W	<0.001
Co	<0.001	Pb	0.002	Zr	<0.001
Cr	<0.002	Pt	0.008	Zn	0.06
Cu	0.002				

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN '05**Certifying Officer:** N. Kocherakota

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 01/17/05
 DATE EXPIRED: 01/15/2006
 DATE OPENED: 01/19/05
 INORG: 4967
 PO: F56130

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

S = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_{\text{rel}} = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



010157

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 7/2/05
 DATE EXPIRED: 7/2/06
 DATE OPENED: 7/2/05
 INORG: 5896 PO: F55207

SPEXTM Certificate

Certificate of Reference Material

Catalog Number: PLS9-2X/2Y/2T

Lot No. 11-63S

Description: 1000 mg/L Sulfur

Matrix: H₂O

This ASSURANCE[®] certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1001.5 mg/L

Uncertainty Associated with Measurement: ± 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3154

The CRM is prepared gravimetrically using high purity Ammonium Sulfate Lot# 05891M. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1003 mg/L

Method: Precipitation using Barium Chloride. Filter, ignite and weigh as BaSO₄.

Instrumental Analysis by ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1000 @ 23.2 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Ag	<0.001	Cu	<0.001	Pb	<0.001
Al	<0.001	Fe	0.01	Re	<0.001
As	<0.001	Ga	<0.001	Rb	<0.001
Be	<0.002	In	<0.001	Si	0.033
Ba	<0.001	K	0.009	Sb	<0.001
B	<0.001	Li	<0.001	Sr	<0.001
Bi	<0.001	Mg	0.004	Ti	<0.001
Cd	<0.001	Mn	<0.001	Tl	0.02
Co	<0.001	Mo	<0.001	V	<0.002
Ca	0.015	Na	0.01	Zn	0.03
Cr	<0.005	Ni	<0.001	Zr	<0.001

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to $\pm 0.5\%$ of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JUL - 2005

Certifying Officer: N. Kocherakota

SPEXTM Certificate

Certificate of Reference Material

Catalog Number: PLTH2-2X/2Y

Lot No. 11-82TH

Description: 1000 mg/L Thorium

Matrix: 2% HNO₃

This ASSURANCE[®] certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1000 mg/L

Uncertainty Associated with Measurement: ± 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3159

The CRM is prepared gravimetrically using high purity Th(NO₃)₄·4H₂O Lot# 01851R. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1001 mg/L

Method: EDTA titration using Xylenol Orange as indicator. EDTA standardized against Pb(NO₃)₂ NIST SRM #928.

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.010 @ 24.1 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Ca	<0.02	Lu	<0.001	Th	<0.001
Ce	0.01	La	0.003	Tb	<0.001
Dy	<0.001	Mo	<0.001	Tm	<0.001
Er	<0.001	Mn	<0.001	Ta	<0.001
Eu	<0.001	Na	0.04	Tl	<0.001
Fe	<0.01	Nd	0.003	Ti	<0.001
Gd	<0.001	Ni	<0.001	V	<0.001
Ga	<0.001	Pr	<0.001	W	<0.001
Hf	<0.001	Rb	<0.001	Y	0.002
Ho	<0.0001	Sm	<0.001	Yb	<0.001
In	<0.001	Sc	<0.001	Zr	0.001

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to $\pm 0.5\%$ of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: AUG - 2005

Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 8/31/05

DATE EXPIRED: 8/30/06

DATE OPENED: 8/31/05

INORG: 5352 PO: 00004005

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
CERTIFIED



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SPEXcertificate™

Certificate of Reference Material

Catalog Number: PLU2-2X/2Y

Lot No. 11-124U

Description: 1000 mg/L Uranium

Matrix: 2% HNO₃

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1000 mg/L

Uncertainty Associated with Measurement: ± 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3164

The CRM is prepared gravimetrically using high purity Triuranium Octaoxide Lot# 04001D. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis. Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1001 mg/L

Method: Evaporate to dryness. Ignite and weigh as U₃O₈.

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.009 @ 23.9 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.01	Cu	0.01	Pb	0.04
Ag	<0.005	Fe	0.20	Re	<0.001
As	0.05	Ga	<0.001	Rb	<0.001
Bi	<0.001	In	<0.001	Si	<0.01
Ba	0.005	K	0.03	Sb	0.004
Be	<0.001	Li	<0.001	Sr	0.003
B	<0.001	Mg	0.003	Tl	0.001
Ca	0.05	Mn	0.004	Ti	0.006
Cd	<0.001	Mo	0.006	V	0.005
Co	0.001	Ni	<0.001	Zr	<0.003
Cr	<0.002	Na	0.10	Zn	0.007

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to $\pm 0.5\%$ of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: _____ Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 6/30/05
 DATE EXPIRED: 6/30/06
 DATE OPENED: 6/30/05
 INORG: 5279 PO: 153205

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

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SPEXcertificate™

Certificate of Reference Material

Catalog Number: PLW9-2X/2Y

Lot No. 11-83W

Description: 1000 mg/L Tungsten

Matrix: H₂O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1003 mg/L

Uncertainty Associated with Measurement: ± 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3163

The CRM is prepared gravimetrically using high purity Ammonium Tungstate Lot# M0600W. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1002 mg/L

Method: Fume with Sulfuric Acid to dryness. Ignite and weigh as WO₃.

Instrumental Analysis by ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 1.000 @ 19.6 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Ag	<0.005	Cu	<0.001	Pb	<0.001
Al	0.006	Fe	0.001	Rb	<0.001
As	0.003	Ga	<0.001	Re	0.006
B	<0.003	In	<0.001	Sr	<0.001
Be	<0.001	K	<0.10	Sb	<0.001
Bi	<0.001	Li	<0.001	Si	0.52
Ba	<0.001	Mo	<0.001	Tl	<0.001
Ca	0.005	Mn	<0.001	Ti	<0.001
Cr	<0.001	Mg	<0.001	V	<0.001
Cd	<0.001	Ni	<0.001	Zr	<0.001
Co	<0.001	Na	0.09	Zn	0.005

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to $\pm 0.5\%$ of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JUL - 2005

Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 7/26/05

DATE EXPIRED: 7/30/06

DATE OPENED: 7/26/05

INORG: 534 PD: 155213

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

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SPX Certificate TM

Certificate of Reference Material

Catalog Number: PLZR2-2X/2Y/2T

Lot No. 11-69ZR

Description: 1000 mg/L Zirconium

Matrix: 2% HNO₃

This ASSURANCE[®] certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1004 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM #3169

The CRM is prepared gravimetrically using high purity Zirconyl Nitrate Lot# 02041A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1004 mg/L

Method: Fume with Sulfuric Acid to dryness. Ignite and weigh as ZrO₂.

Instrumental Analysis by ICP spectrometer: 1004 mg/L

Uncertified Properties:

Density: 1.011 @ 22.6 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
As	<0.001	Cu	<0.001	Pb	<0.001
Ag	0.03	Fe	0.02	Re	<0.001
Al	0.004	Ga	<0.001	Rb	<0.001
Ba	<0.002	In	<0.001	Sb	<0.001
Be	<0.001	K	<0.20	Sr	<0.001
Bi	0.15	Li	<0.001	Si	<0.10
B	<0.004	Mn	<0.001	Tl	<0.001
Cr	<0.001	Mg	<0.001	Ti	<0.003
Cd	<0.001	Mo	<0.001	V	<0.001
Co	<0.002	Ni	<0.001	Zn	0.001
Ca	<0.001	Na	0.004		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: FEB '05

Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 2/28/05
 DATE EXPIRED: 2/28/06
 DATE OPENED: 2/28/05
 INORG: 5039
 PO: F55148

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

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Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



010166

SPExertificate™

Certificate of Reference Material

Catalog Number: PLNA2-3X/3Y

Lot No. V9-56NA

Description: 10,000 mg/L Sodium

Matrix: 5% HNO₃

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 9984 mg/L

Uncertainty Associated with Measurements: +/- 30.0 mg/L

Certified Value is Traceable to: NIST SRM # 3152a

The CRM is prepared gravimetrically using high purity Sodium Carbonate Lot# 05031C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 9983 mg/L

Method: Evaporate to dryness. Fume with Sulfuric Acid. Ignite and weigh as Na₂SO₄.

Instrumental Analysis by ICP spectrometer: 9985 mg/L

Uncertified Properties:

Density: 1.048 @ 23.1 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	<0.001	Cu	0.01	Pb	0.009
As	<0.01	Fe	0.02	Re	<0.001
Ag	<0.02	Ga	<0.001	Rb	<0.001
B	<0.05	In	<0.001	Sr	<0.002
Ba	0.01	K	2.50	Sb	<0.001
Be	<0.009	Li	<0.002	Si	0.14
Bi	0.001	Mg	0.20	Ti	<0.02
Ca	0.75	Mn	0.001	Tl	<0.001
Cr	<0.02	Mo	<0.001	V	0.002
Cd	<0.001	Ni	<0.006	Zr	<0.01
Co	<0.001			Zn	0.02

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN -- 2005

Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 1/31/05
 DATE EXPIRED: 1/30/2006
 DATE OPENED: 1/31/05
 INORG: 4998
 PO: F55139

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



SPEXertificate™*Certificate of Reference Material*

Catalog Number: ICV-2A **Lot No.:** 29-175AS
Description: Initial Calibration Verification Standard II
Matrix: 5% Nitric Acid

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single element concentrates of individual elements using Class A laboratory ware to give precise concentration.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM	Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
Ca	2,000	1,995.81	3109a	Ni	500	499.54	3136
K	2,000	1,995.56	3141a	V	500	499.79	3165
Mg	2,000	1,995.61	3131a	Cr	200	199.97	3112a
Na	2,000	1,995.63	3152a	Cu	200	199.98	3114
Al	1,000	989.06	3101a	Ag	100	99.44	3151
Ba	1,000	999.68	3104a	Be	100	99.16	3105a
Fe	1,000	995.89	3126a	Mn	100	100.03	3132
Co	500	500.41	3113	Zn	100	100.06	3168a

Spex Reference Multi: Lot # 1-58GM, 15-37AS, 11-171AS REF

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable and accurate to +/- 0.5% on the average of all the certified concentrations with no single component exceeding +/- 2%. This guarantee is valid for a period of one year from the date of certification only when the material is kept tightly capped and transported and stored under laboratory conditions.

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 10/14/05

DATE EXPIRED: 10/15/06

DATE OPENED: 10/14/05

INORG: 5429 PO: D-070003

Date of Certification: OCT. -- 2005

Certifying Officer: N. Kocherakota

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



203 Norcross Avenue • Metuchen, NJ 08840 USA

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SPEXTM Certificate

Certificate of Reference Material

Catalog Number: PLSB7-2X/2Y/2T **Lot No.** 11-02SB
Description: 1000 mg/L Antimony
Matrix: H₂O / 0.6% Tart. Acid/tr. HNO₃

This ASSURANCE[®] certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 997 mg/L
Uncertainty Associated with Measurement: +/- 3.0 mg/L
Certified Value is Traceable to: NIST SRM #3102a

The CRM is prepared gravimetrically using high purity Antimony Metal Lot# 01041A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis. Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

Method: Evaporate to dryness. Fume with nitric acid. Ignite and weigh as Sb₂O₄.

Instrumental Analysis by ICP spectrometer: 997 mg/L

Uncertified Properties:

Density: 1.003 @ 31.6 Degrees Celsius

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.02	Cu	0.002	Pb	0.002
Ag	<0.001	Fe	35.00	Rb	<0.001
As	0.03	Ga	<0.001	Re	<0.001
Ba	0.005	In	<0.001	Sr	0.001
B	<0.50	K	0.90	Si	0.08
Bi	0.003	Li	<0.004	Ti	0.004
Be	<0.001	Mo	<0.001	Tl	0.01
Cr	<0.01	Mg	0.07	V	<0.004
Ca	4.00	Mn	<0.003	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	2.00
Cd	<0.001	Na	0.03		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: Oct. -- 2005 **Certifying Officer:** N. Kocherakota

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 01/14/05

DATE EXPIRED: 01/15/06

DATE OPENED: 01/14/05

INDRG: 5430 PO: 00000664

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

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ISO 9001
CERTIFIED



203 Norcross Avenue • Metuchen, NJ 08840 USA

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SPE Certificate™

Certificate of Reference Material

Catalog Number: ICV-2C **Lot No.:** 29-176AS
Description: Initial Calibration Verification Standard II
Matrix: 5% Nitric Acid

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single element concentrates of individual elements using Class A laboratory ware to give precise concentration.

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
As	500	499.69	3103a
Pb	500	499.61	3128
Se	500	499.91	3149
TL	500	499.92	3158
Cd	100	99.90	3108

Spex Reference Multi: Lot #11-34AS, 1-57MG, 15-39AS Reff

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable and accurate to +/- 0.5% on the average of all the certified concentrations with no single element exceeding +/- 2%. This includes uncertainty of measurements and other effects, such as transpiration losses. This guarantee is valid for a period of one year from the date of certification only when the material is kept tightly capped and transported and stored under laboratory conditions.

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 10/14/05

DATE EXPIRED: 10/15/06

DATE OPENED: 10/14/05

INORG: 5428 PO: 12070203

Date of Certification: OCT. -- 2005 Certifying Officer: N. Kocherakota

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

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Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

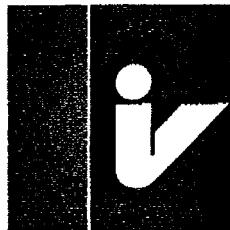
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732-549-7144 • 1-800-1AR-SPEX • Fax: 732-603-9647 • CRMSales@spexcorp.com • www.spexcorp.com



inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
 phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
 e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s)), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

- 2.0 DESCRIPTION OF CRM Custom-Grade 10000 µg/mL Aluminum in 5% (abs) HNO₃

Catalog Number: CGAL10-1, CGAL10-2, and CGAL10-5
 Lot Number: X-AL04021
 Starting Material: Al metal
 Starting Material Purity (%): 99.997990
 Starting Material Lot No: 607116
 Matrix: 5% (abs) HNO₃

- 3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10,030 ± 19 µg/mL

Certified Density: 1.071 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

(\bar{x}) = mean
 x_i = individual results
 n = number of measurements

$$\text{Uncertainty } (\pm) = 2\left[\left(\frac{\sum s_i^2}{n}\right)^{1/2}\right]$$

$\sum s_i^2$ = The summation of all significant estimated errors.
 (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

- 4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

□ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

□ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 Assay Method #1 10,030 ± 19 µg/mL
 ICP Assay NIST SRM 3101a Lot Number: 010808
 Assay Method #2 10,022 ± 21 µg/mL
 EDTA NIST SRM 928 Lot Number: 392110

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 9/23/05
 DATE EXPIRED: 10/1/06
 DATE OPENED: 9/27/05
 INORG: 5405 PO: D200616435

pg. 1 of 4
 5405

- 4.2 BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 4.3 THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.
- 4.4 GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions 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.

<u>s</u> Al	<u>M</u> Dy < 0.03378	<u>O</u> Li < 0.00020	<u>M</u> Pr < 0.00169	<u>M</u> Te < 0.16892
<u>M</u> Sb < 0.00282	<u>M</u> Er < 0.02815	<u>M</u> Lu < 0.00225	<u>M</u> Re < 0.00563	<u>M</u> Tb < 0.00169
<u>M</u> As < 0.05631	<u>M</u> Eu < 0.01689	<u>O</u> Mg 0.00498	<u>M</u> Rh < 0.00563	<u>M</u> Tl < 0.00563
<u>M</u> Ba < 0.05631	<u>M</u> Gd < 0.00563	<u>M</u> Mn < 0.02252	<u>M</u> Rb < 0.00563	<u>M</u> Th < 0.00563
<u>O</u> Be < 0.00017	<u>M</u> Ga < 0.00563	<u>O</u> Hg < 0.00700	<u>M</u> Ru < 0.01126	<u>M</u> Tm < 0.00225
<u>M</u> Bi < 0.00225	<u>M</u> Ge < 0.03378	<u>M</u> Mo < 0.01126	<u>M</u> Sm < 0.00563	<u>M</u> Sn < 0.02815
<u>O</u> B 0.01173	<u>M</u> Au < 0.01689	<u>M</u> Nd < 0.01126	<u>M</u> Sc < 0.05631	<u>O</u> Ti 0.00213
<u>M</u> Cd < 0.01689	<u>M</u> Hf < 0.01126	<u>O</u> Ni < 0.00600	<u>M</u> Se < 0.04505	<u>M</u> W < 0.05631
<u>O</u> Ca 0.01013	<u>M</u> Ho < 0.00282	<u>M</u> Nb < 0.00282	<u>O</u> Si 0.07462	<u>M</u> U < 0.01126
<u>M</u> Ce < 0.02815	<u>M</u> In < 0.05631	<u>n</u> Os	<u>M</u> Ag < 0.01126	<u>M</u> V < 0.01126
<u>M</u> Cs < 0.00169	<u>M</u> Ir < 0.02815	<u>M</u> Pd < 0.02815	<u>O</u> Na 0.06396	<u>M</u> Yb < 0.00563
<u>O</u> Cr 0.00533	<u>O</u> Fe 0.00586	<u>O</u> P < 0.03000	<u>M</u> Sr < 0.00282	<u>M</u> Y < 0.22523
<u>M</u> Co < 0.01689	<u>M</u> La < 0.00282	<u>M</u> Pt < 0.01126	<u>O</u> S < 0.10000	<u>M</u> Zn 0.00450
<u>M</u> Cu < 0.03378	<u>M</u> Pb < 0.01689	<u>O</u> K 0.01208	<u>M</u> Ta < 0.03942	<u>M</u> Zr < 0.02815

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 including but not limited to the following:

ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 26.98154; +3;

$6; \text{Al}(\text{H}_2\text{O})_6^{3+}$

Chemical Compatibility - Soluble in HCl , HNO_3 , HF and H_2SO_4 . Avoid neutral media. Soluble in strongly basic NaOH forming the $\text{Al}(\text{OH})_4^-(\text{H}_2\text{O})_2^-$ species. Stable with most metals and inorganic anions. The phosphate is insoluble in water and only slightly soluble in acid.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

Al Containing Samples (Preparation and Solution) - Metal (Best dissolved in HCl / HNO_3); α - Al_2O_3 (Na_2CO_3 fusion in Pt);

γ - Al_2O_3 (Soluble in acids such as HCl); Ores (Carbonate fusion in Pt 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	Type	Interferences (underlined indicates severe)
ICP-OES 394.401 nm	0.05 / 0.006 $\mu\text{g/mL}$	1	atom	U, Ce
ICP-OES 396.152 nm	0.03 / 0.006 $\mu\text{g/mL}$	1	atom	Mn, Zr, Ce
ICP-OES 167.078 nm	0.1 / 0.009 $\mu\text{g/mL}$	1	ion	Fe
ICP-MS 27 amu	30 ppt	n/a	M ⁺	$^{12}\text{C}^{15}\text{N}$, $^{12}\text{C}^{14}\text{N}$, $^1\text{H}^{12}\text{C}^{14}\text{N}$, $^1\text{B}^{16}\text{O}$, $^{54}\text{Cr}^{2+}$, $^{56}\text{Fe}^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditación, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (OQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JOA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)



10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

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11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: December 28, 2004

Expiration Date: **EXPIRES**

12/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Nick Maida

Certificate Approved By: Katalin Le, QC Manager

Katalin Le

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Paul Gaines

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
 phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
 e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s)), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade 10000 µg/mL Calcium in 1.4% (abs) HNO₃

Catalog Number: CGCA10-1, CGCA10-2, and CGCA10-5

Lot Number: X-CA03030

Starting Material: CaO

Starting Material Purity (%): 99.999155

Starting Material Lot No C27L01

Matrix: 1.4% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 1/27/05

DATE EXPIRED: 3/1/06

DATE OPENED: 1/28/05

INORG: 4988 PO: F55L33

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10,035 ± 24 µg/mL

Certified Density: 1.037 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$\sum S$ = The summation of all significant estimated errors

(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

$$\text{Uncertainty } (\pm) = \frac{2(\sum S_i)^{1/2}}{(n)^{1/2}}$$

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 Assay Method #1 10,035 ± 24 µg/mL

EDTA NIST SRM 928 Lot Number: 392110

Assay Method #2 10,046 ± 65 µg/mL

ICP Assay NIST SRM 3109a Lot Number: 000622

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- 4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 789543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.
- 4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions 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.

Q Al 0.00069	M Dy < 0.04098	Q Li < 0.00002	M Pr < 0.00205	M Te < 0.20492
M Sb < 0.00342	M Er < 0.03415	M Lu < 0.00273	M Re < 0.00683	M Tb < 0.00205
M As < 0.06831	M Eu < 0.02049	Q Mg 0.05295	M Rh < 0.00683	M Tl < 0.00683
Q Ba 0.00065	M Gd < 0.00683	Q Mn 0.00038	M Rb < 0.00683	M Th < 0.00683
Q Be < 0.00009	M Ga < 0.00683	Q Hg < 0.01100	M Ru < 0.01366	M Tm < 0.00273
M Bi < 0.00273	M Ge < 0.04098	M Mo < 0.01366	M Sm < 0.00683	M Sn < 0.03415
Q B < 0.00054	M Au < 0.02049	M Nd < 0.01366	Q Sc < 0.00002	M Ti < 0.34153
Q Cd < 0.00450	M Hf < 0.01366	Q Ni < 0.00230	Q Se < 0.00620	M W < 0.06831
s Ca	M Ho < 0.00342	M Nb < 0.00342	Q Si 0.00132	M U < 0.01366
M Ce < 0.03415	Q In < 0.00200	n Os	M Ag < 0.01366	Q V < 0.00090
M Cs < 0.00205	M Ir < 0.03415	M Pd < 0.03415	Q Na 0.01000	M Yb < 0.00683
Q Cr 0.00103	Q Fe < 0.00110	Q P < 0.00480	Q Sr 0.03530	M Y < 0.27323
Q Co < 0.00120	M La < 0.00342	M Pt < 0.01366	Q S 0.00412	Q Zn 0.02353
Q Cu < 0.00400	M Pb < 0.02049	Q K < 0.00170	M Ta < 0.04782	M Zr < 0.03415

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 including but not limited to the following:
 ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
 For the validation of analytical methods
 For the preparation of "working reference samples"
 For interference studies and the determination of correction coefficients
 For detection limit and linearity studies
 For additional intended uses, contact IV Technical Staff

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 40.078; +2; 6; $\text{Ca}(\text{H}_2\text{O})_6^{2+}$

Chemical Compatibility - Soluble in HCl and HNO_3 . Avoid H_2SO_4 , HF, H_3PO_4 , 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% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO_3 / LDPE container.

Ca Containing Samples (Preparation and Solution) - Metal (best dissolved in diluted HNO_3), Ores (Carbonate fusion in P^{1+} followed by HCl dissolution); Organic Matrices (dry ash and dissolution in dilute HCl. Do not heat when dissolving to avoid precipitation of SiO_2). The oxide, hydroxide, carbonate, phosphate, and fluoride of calcium are soluble in % levels of HCl or HNO_3 . The sulfates (gypsum, anhydrite, etc.), certain silicates and complex compounds require fusion with Na_2CO_3 followed by HCl / water dissolution. 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	Type	Interferences (underlined indicates severe at concs.)
ICP-OES 393.366 nm	0.0002 / 0.00004 $\mu\text{g/mL}$	1	ion	U, Ce
ICP-OES 396.847 nm	0.0005 / 0.00006 $\mu\text{g/mL}$	1	ion	Th
ICP-OES 422.673 nm	0.01 / 0.001 $\mu\text{g/mL}$	1	atom	Ge
ICP-MS 44 amu	1200 ppt	n/a	M	^{16}O , ^{12}C , ^{28}Si , ^{16}O , ^{88}Sr

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditación, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

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11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: September 20, 2004

Expiration Date: **EXPIRES**
11/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Malda, QA Administrator

Nicholas Malda
known as

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Paul Gaines

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
 phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
 e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

- 1.0 Inorganic Ventures / IV Labs Is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s)), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade 10000 µg/mL Iron in 4.8% (abs) HNO₃

Catalog Number: CGFE10-1, CGFE10-2, and CGFE10-5

Lot Number: X-FE03041

Starting Material: Fe metal

Starting Material Purity (%): 99.998667

Starting Material Lot No: 23387

Matrix: 4.8% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 2/28/05

DATE EXPIRED: 3/11/2006

DATE OPENED: 2/28/05

INORG: 5048 PO: F55148

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10,041 ± 21 µg/mL

Certified Density: 1.061 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$$\text{Uncertainty } (s) = \frac{2(\sum s_i^2)^{1/2}}{(n)^{1/2}}$$

$\sum s$ = The summation of all significant estimated errors

(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM-certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

• "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

• This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 Assay Method #1 10,041 ± 21 µg/mL

EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 10,017 ± 40 µg/mL

ICP Assay NIST SRM 3126a Lot Number: 000606

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- 4.2 BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 4.3 THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.
- 4.4 GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions 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.

<u>Q</u> Al < 0.00270	<u>M</u> Dy < 0.02528	<u>Q</u> Li < 0.00003	<u>M</u> Pr < 0.00126	<u>M</u> Te < 0.12640
<u>M</u> Sb < 0.00211	<u>M</u> Er < 0.02107	<u>M</u> Lu < 0.00169	<u>M</u> Re < 0.00421	<u>M</u> Tb < 0.00126
<u>M</u> As < 0.04213	<u>M</u> Eu < 0.01264	<u>Q</u> Mg < 0.00006	<u>M</u> Rh < 0.00421	<u>M</u> Tl < 0.00421
<u>M</u> Ba < 0.04213	<u>M</u> Gd < 0.00421	<u>Q</u> Mn < 0.05000	<u>M</u> Rb < 0.00421	<u>M</u> Th < 0.00421
<u>Q</u> Be < 0.00005	<u>M</u> Ga < 0.00421	<u>Q</u> Hg < 0.01100	<u>M</u> Ru < 0.00843	<u>M</u> Tm < 0.00169
<u>M</u> Bi < 0.00169	<u>I</u> Ge	<u>M</u> Mo < 0.00843	<u>M</u> Sm < 0.00421	<u>M</u> Sn < 0.02107
<u>Q</u> B < 0.00090	<u>M</u> Au < 0.01264	<u>M</u> Nd < 0.00843	<u>M</u> Sc < 0.04213	<u>M</u> Ti < 0.21066
<u>M</u> Cd < 0.01264	<u>M</u> Hf < 0.00843	<u>Q</u> Ni < 0.00230	<u>M</u> Se < 0.03371	<u>M</u> W < 0.04213
<u>Q</u> Ca 0.03107	<u>M</u> Ho < 0.00211	<u>M</u> Nb < 0.00211	<u>Q</u> Si 0.01673	<u>M</u> U < 0.00843
<u>M</u> Ce < 0.02107	<u>M</u> In < 0.04213	<u>n</u> Os	<u>M</u> Ag < 0.00843	<u>M</u> V < 0.00843
<u>M</u> Cs < 0.00126	<u>M</u> Ir < 0.02107	<u>M</u> Pd < 0.02107	<u>Q</u> Na 0.00956	<u>M</u> Yb < 0.00421
<u>M</u> Cr < 0.02107	<u>s</u> Fe	<u>I</u> P	<u>M</u> Sr < 0.00211	<u>M</u> Y < 0.16853
<u>Q</u> Co 0.01195	<u>M</u> La < 0.00211	<u>M</u> Pt < 0.00843	<u>Q</u> S < 0.07200	<u>M</u> Zn 0.08761
<u>M</u> Cu < 0.02528	<u>M</u> Pb < 0.01264	<u>Q</u> K 0.00239	<u>M</u> Ta < 0.02949	<u>M</u> Zr < 0.02107

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 including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 55.847, +3, 6; $\text{Fe}(\text{H}_2\text{O})_6^{3+}$

Chemical Compatibility - Stable in HCl , HNO_3 , H_2SO_4 , HF and H_3PO_4 . Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Fe Containing Samples (Preparation and Solution) - Metal (Soluble in HCl); Oxides (If the oxide has been at a high temperature then Na_2CO_3 fusion in Pt followed by HCl dissolution otherwise dissolve in dilute HCl); Ores (See Oxides above using only the fusion approach).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at = concs.)
ICP-OES 238.204 nm	0.005 / 0.001 $\mu\text{g/mL}$	1	ion	Ru, Co
ICP-OES 238.562 nm	0.005 / 0.001 $\mu\text{g/mL}$	1	ion	Co, W, Cr
ICP-OES 258.940 nm	0.005 / 0.001 $\mu\text{g/mL}$	1	ion	Hf, Nb
ICP-MS 56 amu	970 ppt	n/a	M'	$^{44}\text{Ar}^{14}\text{N}^+\text{H}$, $^{40}\text{Ar}^{16}\text{O}$, $^{40}\text{Ar}^{16}\text{O}^+\text{H}$, $^{36}\text{Ar}^{16}\text{O}$, $^{35}\text{Cl}^{16}\text{O}^+\text{H}$, $^{40}\text{Ca}^{16}\text{O}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of **IQ Net International Certification Network:**

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

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11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 22, 2004

Expiration Date: **EXPIRES**
12 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Malda, QA Administrator

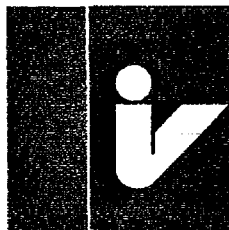
Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Nick Malda
Katalin Le
Paul Gaines

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**inorganic ventures / iv labs**

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
 phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
 e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

- 1.0** Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: **Certificate #883-02**. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade 10000 µg/mL Potassium in 1.4% (abs) HNO₃

Catalog Number:	CGK10-1, CGK10-2, and CGK10-5	
Lot Number:	Y-K02129	
Starting Material:	KNO ₃	INORGANIC LABS/RADCHEM LABS
Starting Material Purity (%):	99.998112	DATE RECEIVED: 11/28/05
Starting Material Lot No:	B19P01	DATE EXPIRED: 12/01/06 (5)
Matrix:	1.4% (abs) HNO ₃	DATE OPENED: 11/29/05
		INORG: 5471 PO: D20224720

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 9983 ± 5 µg/mL 9759 ± 5 µg/g

Certified Density: 1.023 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

(\bar{x}) = mean
 x_i = individual results
 n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2(\sum s_i^2)^{1/2}}{(n)^{1/2}}$$

$\sum s_i$ = The summation of all significant estimated errors.
 (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

"Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

This IV product is Traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 Assay Method #1 9926 ± 36 µg/mL 9703 ± 35 µg/g
 ICP Assay NIST SRM 3141a Lot Number: 891312

Assay Method #2 9983 ± 5 µg/mL 9759 ± 5 µg/g
 Gravimetric NIST SRM Lot Number: See Sec. 4.2

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4.2 BALANCE CALIBRATION- All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 THERMOMETER CALIBRATION- The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION- In-house procedure 3-QC-002 is used to calibrate all Class A glassware used in the manufacture and quality control of CRM's.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

CRM's solutions 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.

<u>Q</u> Al 0.00072	<u>M</u> Dy < 0.00597	<u>Q</u> Li < 0.00001	<u>M</u> Pr < 0.00030	<u>M</u> Te < 0.02986
<u>M</u> Sb < 0.00050	<u>M</u> Er < 0.00498	<u>M</u> Lu < 0.00040	<u>M</u> Re < 0.00100	<u>M</u> Tb < 0.00030
<u>M</u> As < 0.00995	<u>M</u> Eu < 0.00299	<u>Q</u> Mg 0.00068	<u>M</u> Rh < 0.00100	<u>M</u> Tl < 0.00100
<u>M</u> Ba < 0.00995	<u>M</u> Gd < 0.00100	<u>Q</u> Mn 0.00020	<u>M</u> Rb 0.55238	<u>M</u> Th < 0.00100
<u>Q</u> Be < 0.00003	<u>M</u> Ga < 0.00100	<u>Q</u> Hg < 0.00255	<u>M</u> Ru < 0.00199	<u>M</u> Tm < 0.00040
<u>M</u> Bi < 0.00040	<u>Q</u> Ge < 0.00026	<u>M</u> Mo < 0.00199	<u>M</u> Sm < 0.00100	<u>M</u> Sn < 0.00498
<u>Q</u> B < 0.00010	<u>Q</u> Au < 0.00051	<u>M</u> Nd < 0.00199	<u>Q</u> Sc < 0.00002	<u>Q</u> Ti < 0.00012
<u>M</u> Cd < 0.00299	<u>M</u> Hf < 0.00199	<u>Q</u> Ni < 0.00039	<u>Q</u> Se < 0.00851	<u>M</u> W < 0.00995
<u>Q</u> Ca 0.00357	<u>M</u> Ho < 0.00050	<u>M</u> Nb < 0.00050	<u>Q</u> Si < 0.00058	<u>M</u> U < 0.00199
<u>M</u> Ce < 0.00498	<u>M</u> In < 0.00995	<u>n</u> Os	<u>M</u> Ag < 0.00199	<u>Q</u> V < 0.00015
<u>M</u> Cs < 0.00030	<u>M</u> Ir < 0.00498	<u>M</u> Pd < 0.00498	<u>Q</u> Na 0.15315	<u>M</u> Yb < 0.00100
<u>M</u> Cr < 0.00498	<u>Q</u> Fe 0.00048	<u>Q</u> P < 0.00043	<u>M</u> Sr < 0.00050	<u>M</u> Y < 0.03981
<u>M</u> Co < 0.00299	<u>M</u> La < 0.00050	<u>M</u> Pt < 0.00199	<u>Q</u> S < 0.01225	<u>Q</u> Zn 0.00068
<u>M</u> Cu < 0.00597	<u>M</u> Pb 0.08559	<u>s</u> K	<u>M</u> Ta < 0.00697	<u>M</u> Zr < 0.00498

M - Checked by ICP-MS Q - 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 including but not limited to the following:

ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 29.0983; +1; (6); $\text{K}^+(\text{aq})$
(Coordination Number in parentheses is assumed, not certain.)

Chemical Compatibility - Soluble in HCl , HNO_3 , H_2SO_4 and HF aqueous matrices. Avoid use of HClO_4 due to insolubility of the perchlorate. Stable with all metals and inorganic anions except ClO_4^- .

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

K Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Sodium carbonate fusion in Pt^0 followed by HCl dissolution-blank levels of K in sodium carbonate critical); Organic Matrices (Sulfuric/peroxide digestion)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

<u>Technique/Line</u>	<u>Estimated D.L.</u>	<u>Order</u>	<u>Type</u>	<u>Interferences</u> (underlined indicates severe)
ICP-OES 766.490 nm	0.4 / 0.001 $\mu\text{g/mL}$	1	atom	2 nd order radiation from R.E.s on some optical designs
ICP-OES 771.531 nm	1.0 / 0.03 $\mu\text{g/mL}$	1	atom	2 nd order radiation from R.E.s on some optical designs
ICP-OES 404.721 nm	1.1 / 0.05 $\mu\text{g/mL}$	1	atom	<u>U</u> , <u>Ce</u>
ICP-MS 39 amu	10 ppt	n/a	M ⁺	³⁶ ArH, ²³ Na ¹⁶ O, ⁷⁸ Se

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of **IQ Net International Certification Network**:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)



10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

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11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: October 17, 2005

Expiration Date:

EXPIRES
01/12/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Nicholas Maida

Certificate Approved By: Katalin Le, QC Manager

Katalin Le

Certifying Officer: Paul Gaines, PhD., Technical Director

Paul R. Gaines

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
 phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
 e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s)), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

- 2.0 DESCRIPTION OF CRM Custom-Grade 10000 µg/mL Magnesium In 1.4% (abs) HNO₃

Catalog Number: CGMG10-1, CGMG10-2, and CGMG10-5
 Lot Number: X-MG03018
 Starting Material: Mg metal
 Starting Material Purity (%): 99.994984
 Starting Material Lot No 91191
 Matrix: 1.4% (abs) HNO₃

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10,039 ± 31 µg/mL

Certified Density: 1.051 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

$$\text{Uncertainty } (\pm) = \frac{2(\sum s_i^2)^{1/2}}{(n)^{1/2}}$$

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$\sum s_i^2$ = The summation of all significant estimated errors.

(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

- ☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
- ☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 Assay Method #1 10,039 ± 31 µg/mL
 ICP Assay NIST SRM 3131a Lot Number: 991107

Assay Method #2 10,079 ± 21 µg/mL
 EDTA NIST SRM 928 Lot Number: 880710

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 7/22/05
 DATE EXPIRED: 8/1/06
 DATE OPENED: 7/22/05
 INORG: 5312 PD: F55213

Pg. 1 of 4
 5312

- 4.2 BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 4.3 THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.
- 4.4 GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions 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.

<u>Q</u> Al 0.04714	<u>M</u> Dy < 0.03601	<u>Q</u> Li 0.00623	<u>M</u> Pr < 0.00180	<u>M</u> Te < 0.18002
<u>M</u> Sb < 0.00300	<u>M</u> Er < 0.03000	<u>M</u> Lu < 0.00240	<u>M</u> Re < 0.00600	<u>M</u> Tb < 0.00180
<u>M</u> As < 0.06001	<u>M</u> Eu < 0.01800	<u>s</u> Mg	<u>M</u> Rh < 0.00600	<u>M</u> Tl < 0.00600
<u>M</u> Ba < 0.06001	<u>M</u> Gd < 0.00600	<u>Q</u> Mn 0.07408	<u>M</u> Rb < 0.00600	<u>M</u> Th < 0.00600
<u>Q</u> Be < 0.00017	<u>M</u> Ga < 0.00600	<u>Q</u> Hg < 0.00900	<u>M</u> Ru < 0.01200	<u>M</u> Tm < 0.00240
<u>M</u> Bi < 0.00240	<u>M</u> Ge < 0.03601	<u>M</u> Mo < 0.01200	<u>M</u> Sm < 0.00600	<u>M</u> Sn < 0.03000
<u>Q</u> B 0.00303	<u>M</u> Au < 0.01800	<u>M</u> Nd < 0.01200	<u>M</u> Sc < 0.06001	<u>Q</u> Ti 0.09765
<u>M</u> Cd < 0.01800	<u>M</u> Hf < 0.01200	<u>Q</u> Ni 0.01229	<u>M</u> Se < 0.04801	<u>M</u> W < 0.06001
<u>Q</u> Ca 0.14984	<u>M</u> Ho < 0.00300	<u>M</u> Nb < 0.00300	<u>Q</u> Si 0.02357	<u>M</u> U < 0.01200
<u>M</u> Ce < 0.03000	<u>M</u> In < 0.06001	<u>n</u> Os	<u>M</u> Ag < 0.01200	<u>M</u> V < 0.01200
<u>M</u> Cs < 0.00180	<u>M</u> Ir < 0.03000	<u>M</u> Pd < 0.03000	<u>Q</u> Na 0.02189	<u>M</u> Yb < 0.00600
<u>Q</u> Cr 0.02189	<u>Q</u> Fe 0.03704	<u>Q</u> P < 0.01600	<u>M</u> Sr < 0.00300	<u>M</u> Y 0.02021
<u>M</u> Co < 0.01800	<u>M</u> La < 0.00300	<u>M</u> Pt < 0.01200	<u>n</u> S	<u>Q</u> Zn 0.00572
<u>Q</u> Cu 0.00674	<u>Q</u> Pb 0.02694	<u>Q</u> K < 0.05000	<u>M</u> Ta < 0.04201	<u>M</u> Zr < 0.03000

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 including but not limited to the following:
 ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
 For the validation of analytical methods
 For the preparation of "working reference samples"
 For interference studies and the determination of correction coefficients
 For detection limit and linearity studies
 For additional intended uses, contact IV Technical Staff

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 24.305; +2; 6; $\text{Mg}(\text{H}_2\text{O})_6^{+2}$

Chemical Compatibility - Soluble in HCl , HNO_3 , and H_2SO_4 ; avoid HF , H_3PO_4 , 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% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO_3 / LDPE container.

Mg Containing Samples (Preparation and Solution) - Metal (Best dissolved in diluted HNO_3); Oxide (Readily soluble in above compatible aqueous acidic solutions); Ores (Carbonate fusion in Pt^2 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	Type	Interferences (underlined indicates severe at $\mu\text{g/L}$ concs.)
ICP-OES 279.553 nm	0.0002 / 0.00003 $\mu\text{g/mL}$	1	ion	Th
ICP-OES 280.270 nm	0.0003 / 0.00005 $\mu\text{g/mL}$	1	ion	U, V
ICP-OES 285.213 nm	0.002 / 0.00003 $\mu\text{g/mL}$	1	atom	U, Hf, Cr, Zr
ICP-MS 24 amu	42 ppt	n/a	M	⁶ Li ¹⁰ B, ⁴⁷ Ti ¹² , ⁴⁴ Ca ¹²

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

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11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: April 15, 2004

Expiration Date:

EXPIRES
12/28/06

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

JoAnn Struthers

Certificate Approved By: Katalin Le, QC Manager

Katalin Le

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Paul Gaines

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
 phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
 e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s)), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade 10000 µg/mL Sodium in 1.4% (abs) HNO₃

Catalog Number: CGNA10-1, CGNA10-2, and CGNA10-5
 Lot Number: X-QNA02148
 Starting Material: Na₂CO₃
 Starting Material Purity (%): 99.999819
 Starting Material Lot No: 42063
 Matrix: 1.4% (abs) HNO₃

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10,006 ± 6 µg/mL

Certified Density: 1.032 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

(\bar{x}) = mean
 x_i = individual results
 n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2(\sum s_i^2)^{1/2}}{(n)^{1/2}}$$

$\sum s_i$ = The summation of all significant estimated errors.
 (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

- "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
- This IV product is Traceable to NIST via an unbroken chain of comparisons. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors. In rare cases where no NIST SRMs are available, the term 'in-house std.' is specified.

4.1 Assay Method #1 10,019 ± 33 µg/mL
 ICP Assay NIST SRM 3152a Lot Number: 990907
 Assay Method #2 10,006 ± 6 µg/mL
 Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 7/22/05
 DATE EXPIRED: 8/11/06
 DATE OPENED: 7/22/05
 INORG: 5310 PD: F55213

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- 4.2 BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 4.3 THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.
- 4.4 GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions 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.

<u>Q</u> Al < 0.00090	<u>M</u> Dy < 0.00600	<u>Q</u> Li < 0.00003	<u>M</u> Pr < 0.00030	<u>M</u> Te < 0.02998
<u>M</u> Sb < 0.00050	<u>M</u> Er < 0.00500	<u>M</u> Lu < 0.00040	<u>M</u> Re < 0.00100	<u>M</u> Tb < 0.00030
<u>M</u> As < 0.00999	<u>M</u> Eu < 0.00300	<u>Q</u> Mg 0.00010	<u>M</u> Rh < 0.00100	<u>M</u> Tl < 0.00100
<u>M</u> Ba < 0.00999	<u>M</u> Gd < 0.00100	<u>Q</u> Mn < 0.00003	<u>M</u> Rb < 0.00100	<u>M</u> Th < 0.00100
<u>Q</u> Be < 0.00020	<u>M</u> Ga < 0.00100	<u>Q</u> Hg < 0.01500	<u>M</u> Ru < 0.00200	<u>M</u> Tm < 0.00040
<u>M</u> Bi < 0.00040	<u>Q</u> Ge < 0.00150	<u>M</u> Mo < 0.00200	<u>M</u> Sm < 0.00100	<u>M</u> Sn < 0.00500
<u>Q</u> B < 0.00060	<u>Q</u> Au < 0.00300	<u>M</u> Nd < 0.00200	<u>Q</u> Sc < 0.00002	<u>Q</u> Ti < 0.00070
<u>M</u> Cd < 0.00300	<u>M</u> Hf < 0.00200	<u>Q</u> Ni < 0.00230	<u>Q</u> Se < 0.05000	<u>M</u> W < 0.00999
<u>Q</u> Ca 0.00050	<u>M</u> Ho < 0.00050	<u>M</u> Nb < 0.00050	<u>Q</u> Si < 0.00340	<u>M</u> U < 0.00200
<u>M</u> Ce < 0.00500	<u>M</u> In < 0.00999	<u>n</u> Os	<u>M</u> Ag < 0.00200	<u>Q</u> V < 0.00090
<u>M</u> Cs < 0.00030	<u>M</u> Ir < 0.00500	<u>M</u> Pd < 0.00500	<u>S</u> Na	<u>M</u> Yb < 0.00100
<u>M</u> Cr < 0.00500	<u>Q</u> Fe < 0.00110	<u>Q</u> P < 0.04000	<u>M</u> Sr < 0.00050	<u>M</u> Y < 0.03997
<u>M</u> Co < 0.00300	<u>M</u> La < 0.00050	<u>M</u> Pt < 0.00200	<u>Q</u> S < 0.07200	<u>Q</u> Zn 0.00250
<u>Q</u> Cu < 0.00140	<u>M</u> Pb < 0.00300	<u>Q</u> K 0.04000	<u>M</u> Ta < 0.00700	<u>M</u> Zr < 0.00500

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 including but not limited to the following:
 ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
 For the validation of analytical methods
 For the preparation of "working reference samples"
 For interference studies and the determination of correction coefficients
 For detection limit and linearity studies
 For additional intended uses, contact IV Technical Staff

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 22.98977; +1; (6); $\text{Na}^+(\text{aq})$ largely ionic in nature (Coordination Number in parentheses is assumed, not certain.)

Chemical Compatibility - Soluble in HCl , HNO_3 , H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Na Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Lithium carbonate fusion in graphite crucible followed by HCl dissolution - blank levels of Na in lithium carbonate critical); Organic Matrices (Sulfuric / peroxide digestion or nitric/sulfuric/perchloric acid decomposition).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES 589.595 nm	0.07 / 0.00009 $\mu\text{g/mL}$	1	atom	2 nd order radiation from R.E.s on some optical designs
ICP-OES 588.995 nm	0.03 / 0.006 $\mu\text{g/mL}$	1	atom	2 nd order radiation from R.E.s on some optical designs
ICP-OES 330.237 nm	2.0 / 0.09 $\mu\text{g/mL}$	1	atom	<u>Pd</u> , <u>Zn</u>
ICP-MS 23 amu	310 ppt	n/a	M	<u>Ti</u> , <u>Ca</u>

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)



10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (Bmwa), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

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11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: October 11, 2004

Expiration Date: **EXPIRES**
102006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Maida, QA Administrator

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Nicholas Maida
Katalin Le
Paul Gaines



inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
 phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
 e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

- 2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Lithium in 0.07% (abs) HNO₃

Catalog Number:	CGLI1-1, CGLI1-2, and CGLI1-5		
Lot Number:	X-LI02079	INORGANIC LABS/RADCHEM LABS	
Starting Material:	Li ₂ CO ₃	DATE RECEIVED:	5/19/05
Starting Material Purity (%):	99.997165	DATE EXPIRED:	6/1/06
Starting Material Lot No	1123	DATE OPENED:	5/19/05
Matrix:	0.07% (abs) HNO ₃	INORG:	5244
		PO:	55182

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 999 ± 3 µg/mL

Certified Density: 1.004 g/mL (measured at 22° C)

The Certified Value is the ICP value. The following equations are used in the calculations of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

(\bar{x}) = mean
 x_i = individual results
 n = number of measurements

$$\text{Uncertainty } (\pm) = 2 \left(\sum_{i=1}^n \sigma_i^2 \right)^{1/2}$$

$\sum \sigma_i^2$ = The summation of all significant estimated errors.
 (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

- "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
- This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1	Assay Method #1	999 ± 1 µg/mL
		Gravimetric NIST SRM Lot Number: See Sec. 4.2
	Assay Method #2	999 ± 3 µg/mL
		ICP Assay NIST SRM 3129a Lot Number: 000505

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- 4.2 BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 4.3 THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.
- 4.4 GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions 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.

<u>Q</u> Al 0.00120	<u>M</u> Dy < 0.01199	<u>S</u> Li	<u>M</u> Pr < 0.00060	<u>M</u> Te < 0.05994
<u>M</u> Sb < 0.00100	<u>M</u> Er < 0.00999	<u>M</u> Lu < 0.00080	<u>M</u> Re < 0.00200	<u>M</u> Tb < 0.00060
<u>M</u> As < 0.01998	<u>M</u> Eu < 0.00599	<u>Q</u> Mg 0.00650	<u>M</u> Rh < 0.00200	<u>M</u> Tl < 0.00200
<u>M</u> Ba < 0.01998	<u>M</u> Gd < 0.00200	<u>Q</u> Mn 0.00006	<u>M</u> Rb < 0.00200	<u>M</u> Th < 0.00200
<u>Q</u> Be < 0.00020	<u>M</u> Ga < 0.00200	<u>Q</u> Hg < 0.01500	<u>M</u> Ru < 0.00400	<u>M</u> Tm < 0.00080
<u>M</u> Bi < 0.00080	<u>M</u> Ge < 0.01199	<u>M</u> Mo < 0.00400	<u>M</u> Sm < 0.00200	<u>Q</u> Sn < 0.00600
<u>Q</u> B 0.00020	<u>M</u> Au < 0.00599	<u>M</u> Nd < 0.00400	<u>M</u> Sc < 0.01998	<u>Q</u> Ti < 0.00070
<u>M</u> Cd < 0.00599	<u>M</u> Hf < 0.00400	<u>Q</u> Ni < 0.00230	<u>M</u> Se < 0.01598	<u>Q</u> W < 0.00400
<u>Q</u> Ca 0.04050	<u>M</u> Ho < 0.00100	<u>M</u> Nb < 0.00100	<u>Q</u> Si 0.04650	<u>M</u> U < 0.00400
<u>M</u> Ce < 0.00999	<u>Q</u> In < 0.00400	<u>n</u> Os	<u>M</u> Ag < 0.00400	<u>Q</u> V 0.00009
<u>M</u> Cs < 0.00060	<u>M</u> Ir < 0.00999	<u>M</u> Pd < 0.00999	<u>Q</u> Na 0.03200	<u>M</u> Yb < 0.00200
<u>M</u> Cr < 0.00999	<u>Q</u> Fe 0.00200	<u>Q</u> P < 0.00250	<u>Q</u> Sr 0.00026	<u>M</u> Y < 0.07992
<u>M</u> Co < 0.00599	<u>M</u> La < 0.00100	<u>M</u> Pt < 0.00400	<u>Q</u> S 0.01250	<u>Q</u> Zn 0.00145
<u>Q</u> Cu 0.00100	<u>M</u> Pb < 0.00599	<u>Q</u> K 0.00950	<u>M</u> Ta < 0.01399	<u>M</u> Zr < 0.00999

M - Checked by ICP-MS Q - 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 including but not limited to the following:

ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

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2 of 4

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 6.941; +1; (6); $\text{Li}^+(\text{aq})$ large effective radius due to hydration sphere (Coordination Number in parentheses is assumed, not certain.)

Chemical Compatibility - Soluble in HCl , HNO_3 , H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 /LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 /LDPE container.

Li Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Sodium carbonate fusion in Pt followed by HCl dissolution-blank levels of Li in sodium carbonate critical); Organic Matrices (Sulfuric / peroxide digestion or nitric / sulfuric / perchloric acid decomposition).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES 670.784 nm	0.002 / 0.00002 $\mu\text{g/mL}$	1	atom	2 nd order radiation from R.E.s on some optical designs
ICP-OES 460.286 nm	0.9 / 0.04 $\mu\text{g/mL}$	1	atom	Zr, Th
ICP-OES 323.261 nm	1.1 / 0.05 $\mu\text{g/mL}$	1	atom	<u>Sb</u> , <u>Th</u> , <u>Ni</u>
ICP-MS 7 amu	10 ppt		n/a	M

8.0 **HAZARDOUS INFORMATION** - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

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3 of 4

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: December 10, 2004

Expiration Date:

EXPIRES
01/1/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Nick Makda, QA Administrator

Nicholas Makda
Katalin Le

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Paul Gaines

5244
4084

010202



SIGMA-ALDRICH

Certificate of Analysis

Product Name Sodium nitrite,
≥99.99%
Product Number 431605
Product Brand Sigma-Aldrich
CAS Number 7632-00-0
Molecular Formula NaNO₂
Molecular Weight 69.00

TEST	SPECIFICATION	LOT 06721HI RESULTS
APPEARANCE	OFF-WHITE TO PALE YELLOW CRYSTALS OR POWDER	OFF WHITE CRYSTALS
TITRATION	97.0% NANO2 (MINIMUM) (WITH KMNO4)	102.7% NANO2 (WITH KMNO4)
TRACE ANALYSIS, ICP	100 PPM (MAXIMUM) TOTAL METALLIC IMPURITIES	ZN 2.0 PPM

ICP ASSAY	CONFIRMS SODIUM COMPONENT.
INSOLUBLE MATTER	0.01% (MAXIMUM) (C=10%, H2O)
CALCIUM	0.01% (MAXIMUM)
CHLORIDE	0.005% (MAXIMUM)
IRON	0.001% (MAXIMUM)
HEAVY METALS	0.001% (MAXIMUM) (AS PB)
POTASSIUM	0.005% (MAXIMUM)
SULFATE	0.01% (MAXIMUM)

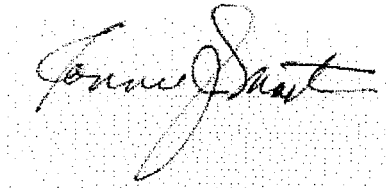
APPROVED FEBRUARY 22, 1999 JSB
OR
APPROVED FEBRUARY 22, 1999 JSB
OR

QUALITY CONTROL
ACCEPTANCE DATE

CA 1.2
TL 0.9
B,PD 0.8
AG 0.7
PT 0.6
MG 0.3
FE,BI,AL 0.1 PPM
CONFIRMS SODIUM COMPONENT
0.004% *
0.001% *
0.003% *
0.0001% *
0.001% AS PB *
0.0005% *
0.002% *
* SUPPLIER CERTIFICATE
* SUPPLIER CERTIFICATE
MEETS OR EXCEEDS ALL ACS 9TH ED REQUIREMENTS
MEETS OR EXCEEDS ALL ACS 9TH ED REQUIREMENTS
AUGUST 2000

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 7/16/01
DATE EXPIRED: 7/16/2012
DATE OPENED: 7/16/01
INORG: Z921 PO: N/A

pg 1 of 2

A handwritten signature in black ink, appearing to read "Ronnie J. Martin", is positioned above a circular, dotted stamp.

Ronnie J. Martin, Supervisor
Quality Control
Milwaukee, Wisconsin USA

010203

pg 2 of 2

SPXertificate™

Certificate of Reference Material

Catalog Number: ICMIX2-100 Lot No.: 28-164AS
 Description: IC Instrument Check Standard 2
 Matrix: H₂O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single ion concentrates of individual elements using Class A laboratory ware to give precise concentration.
 Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ION Chromatography:

Analyte	Labeled (mg/L)	Measured (mg/L)	NIST SRM
F ⁻	100	100	3183
Cl ⁻	200	196	3182
Br ⁻	400	400	3184
NO ₃ ⁻	400	402	3185
HPO ₄ ⁻²	600	596	3186
SO ₄ ⁻²	400	400	3181

Spex Reference Multi: Lot #IC-6-186VY

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and other. This CRM is guaranteed stable and accurate to +/- 0.5% on the average of all the certified concentrations with no single component exceeding +/- 2%. This guarantee is valid for a period of one year from the date of certification only when the material is kept tightly capped and transported and stored under laboratory conditions.

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 11/17/05

DATE EXPIRED: 11/20/06

DATE OPENED: 11/18/05

INORG: 5467 PO: 2828974

Date of Certification: NOV. 11, 2005 Certifying Officer: N. Kocherakota

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

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

$X = \bar{x} \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001 CERTIFIED



203 Norcross Avenue • Metuchen, NJ 08840 USA

732-549-7144 • 1-800-448-SPEX • Fax: 732-603-9647 • CRMSales@spexcorp.com • www.spexcorp.com

010206



1001 West Saint Paul Avenue
Milwaukee, WI 53233 USA
Tel.: 800-558-9160 • (414) 273-3850
Fax: 800-962-9591 • (414) 273-4979
e-mail: aldrich@sial.com

Certificate of Analysis

SOUTHWEST RESEARCH INST
DANNY RAMIREZ
6220 CULEBRA RD
SAN ANTONIO TX 78238

PO NBR: 130686E

INORGANICS LAB 27/28/29/30/34
DATE RECEIVED: 1/9/2001
DATE EXPIRED: 1/19/2002 DR
DATE OPENED: 1/19/2001
INCR: 2626 PO: 130686E

PRODUCT NUMBER: 236527-500G

LOT NUMBER: 15308EI

PRODUCT NAME: SODIUM HYDROGENCARBONATE, 99.7+%,
A.C.S. REAGENT

FORMULA: NaHCO_3

FORMULA WEIGHT: 84.01

APPEARANCE	WHITE POWDER
TITRATION	100.3 % (WITH HCL)
ICP ASSAY	CONFIRMS SODIUM COMPONENT
INSOLUBLE MATTER	0.001% *
CALCIUM	0.0050%
CHLORIDE	0.0014% *
IRON	< 0.0001% *
HEAVY METALS	<5PPM (AS PB) *
POTASSIUM	<0.0020 % *
MAGNESIUM	0.00025%
AMMONIUM	<5PPM *
PHOSPHATE	<0.001% *
CALCIUM, MAGNESIUM & R2O3 PRECIPITATE	0.016% *

CONTINUED ON NEXT PAGE

ALDRICH CHEMICAL COMPANY
DAVID SWESSEL
JANUARY 5, 2001

Sigma-Aldrich, Inc. warrants that its products conform to the information contained in this and other Sigma-Aldrich publications. Purchaser must determine the suitability of the product(s) for their particular use. Additional terms and conditions may apply. Please see reverse side of the invoice or packing slip.

Aldrich brand products are sold exclusively through Sigma-Aldrich, Inc.

Organics and Inorganics for Chemical Synthesis.

We are Committed to the Success of our Customers through Science, Technology and Service.



SIGMA-ALDRICH

010207

Certificate of Analysis

Product Name Sodium carbonate,
ACS reagent (primary standard), anhydrous 99.95-100.05% as dry basis
Product Number 22,348-4
Product Brand ALDRICH
CAS Number 497-19-8
Molecular Formula CNa_2O_3
Molecular Weight 105.99

TEST**LOT 04922MO RESULTS****APPEARANCE**

WHITE GRANULAR POWDER

TITRATION

99.97% (WITH HCL)

LOSS ON DRYING

<0.1% (285 DEG C) *

ICP ASSAY

CONFIRMS SODIUM COMPONENT

INSOLUBLE MATTER<0.002 (10%, H₂O) ***AMMONIUM HYDROXIDE**

0.002% *

PRECIPITATE**CALCIUM**

0.004% *

CHLORIDE

0.0006% *

IRON

<3 PPM *

HEAVY METALS

<3 PPM (AS PB) *

POTASSIUM

0.0005% *

MAGNESIUM

0.002% *

NITROGEN COMPOUNDS

<0.001% *

PHOSPHATE

0.0005% *

SULFUR COMPOUNDS

<0.003% *

SILICA

<0.005% *

*** SUPPLIER DATA**

MEETS REQUIREMENTS OF ACS 9TH ED

DECEMBER, 2001

QUALITY CONTROL**ACCEPTANCE DATE**

Ronnie J. Martin, Supervisor
Quality Control
Milwaukee, Wisconsin USA

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/11/02
DATE EXPIRED: 11/11/2012
DATE OPENED: 11/11/02
INORG: 3757 PD: 334588E

010208

SPEXTM Certificate

Certificate of Reference Material

Catalog Number: AS-F9-2X/2Y

Lot No. 27-122AS

Description: 1000 mg/L Fluoride

Matrix: H₂O

This ASSURANCE[®] certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 998 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM 3183

The CRM is prepared gravimetrically using high purity Sodium Fluoride Lot# M44142. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L:

Method: Potentiometric using Fluoride combination electrode

Instrumentation Analysis By Ion Chromatography: 999 mg/L:

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Ion	mg/L	Ion	mg/L
Br	<0.2	NO ₃	<0.2
Cl	<10	PO ₄	<1
NO ₂	<0.2	SO ₄	<0.5

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN. -- 2005

Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 01/19/05
 DATE EXPIRED: 01/15/2006
 DATE OPENED: 01/11/05
 INORG: 4951 PO: F55119

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001 CERTIFIED



203 Norcross Avenue • Metuchen, NJ 08840 USA

010210

SPE Certificate™**Certificate of Reference Material**

Catalog Number: AS-CL9-2X/2Y **Lot No.:** 26-150AS
Description: 1000 mg/L of Chloride
Matrix: Water

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: Chloride (Cl⁻): 998 mg/L ± 3 mg/L
Traceable to: NIST SRM 3182

The CRM is prepared gravimetrically using high purity Sodium Chloride (NaCl) Lot#02001F. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 998 mg/L

Method: Gravimetric analysis by precipitation using Silver Nitrate, filtering, drying and weighing as AgCl.

Instrumental Analysis by Ion Chromatography: 997 mg/L

Trace Anion Impurities in the Actual Solution via IC Analysis:

Component	mg/L	Component	mg/L
F ⁻	<0.05	NO ₃ ⁻	<0.15
PO ₄ ³⁻	<0.15	Br ⁻	<0.2
SO ₄ ²⁻	<0.15	NO ₂ ⁻	<0.2

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable to +/- 0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN. -- 2005

Certifying Officer: *N. Kocherakota*

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/10/05
DATE EXPIRED: 01/15/2006
DATE OPENED: 01/11/05
INORG: 4950
PO: F55119

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



203 Norcross Avenue • Metuchen, NJ 08840 USA

010212

SPE Certificate™**Certificate of Reference Material**

Catalog Number: AS-NO₂N9-2X/2Y **Lot No.:** 27-141AS
Description: 1000 mg/L of Nitrite-N
Matrix: H₂O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: Nitrite-N (NO₂⁻-N): 994 mg/L ± 3 mg/L
Traceable to: SPEX CRM #0902NO2

The CRM is prepared gravimetrically using high purity Sodium Nitrite (NaNO₂) Lot#0791R. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 999 mg/L

Method: Titrimetric analysis using KMnO₄. KMnO₄ standardized with As₂O₃ NIST SRM #83d.

Instrumental Analysis by Ion Chromatography: 995 mg/L

Trace Anion Impurities in the Actual Solution via IC Analysis:

Element	mg/L
F ⁻	<0.4
SO ₄ ⁻²	<0.4
PO ₄ ⁻³	<0.8
Cl ⁻	<20
Br ⁻	<20
NO ₃ ⁻	<40

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable to +/- 0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: MAR. -- 2005 **Certifying Officer:** *N. Kocherakota*

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 03/21/05
DATE EXPIRED: 03/30/2006
DATE OPENED: 03/21/05
INDRG: 5076 PO: F55155

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



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SPE Certificate™

Certificate of Reference Material

Catalog Number: AS-BR9-2X/2Y **Lot No.:** 27-142AS
Description: 1000 mg/L of Bromide
Matrix: H₂O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: Bromide (Br⁻): 998.5 mg/L \pm 3 mg/L

Traceable to: NIST SRM 3184

The CRM is prepared gravimetrically using high purity Sodium Bromide (NaBr) Lot#04931B. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1001 mg/L

Method: Gravimetric analysis by precipitation using Silver Nitrate, filtering, drying and weighing as AgBr.

Instrumental Analysis by Ion Chromatography: 996 mg/L

Trace Anion Impurities in the Actual Solution via IC Analysis:

Ion	mg/L
F ⁻	<0.02
NO ₂ ⁻	<0.05
NO ₃ ⁻	<0.05
PO ₄ ⁻³	<0.20
Cl ⁻	<1.50
SO ₄ ⁻²	<0.05

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 6/28/05

DATE EXPIRED: 6/30/06

DATE OPENED: 6/28/05

INORG: 5275 PO: D40374177

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable and accurate to \pm 0.5% of the certified concentration value for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JUN. -- 2005 Certifying Officer: *N. Kocherakota*

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep 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, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
CERTIFIED



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010216

SPEXcertificate™**Certificate of Reference Material**

Catalog Number: AS-NO₃N9-2X/2Y **Lot No.:** 27-120AS
Description: 1000 mg/L of Nitrate-N
Matrix: H₂O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: Nitrate-N (NO₃⁻-N): 1002.5 mg/L ± 3 mg/L
Traceable to: NIST SRM 3185

The CRM is prepared gravimetrically using high purity Sodium Nitrate (NaNO₃) Lot#M14156. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1001 mg/L

Method: Gravimetric analysis by precipitation using Nitron Acetate, filtering, drying and weighing as Nitron Nitrate (C₂₀H₁₇N₄.NO₃).

Instrumental Analysis by Ion Chromatography: 1004 mg/L

Trace Anion Impurities in the Actual Solution via IC Analysis:

<u>Element</u>	<u>mg/L</u>
F ⁻	<0.05
Cl ⁻	<0.2
NO ₂ ⁻	<0.2
Br ⁻	<0.5
SO ₄ ⁻	<0.5
PO ₄ ³⁻	<2.0

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable to +/- 0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN. -- 2005

Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 01/10/05
 DATE EXP. 01/15/2006
 DATE OPENED: 01/11/05
 INDRG: 495a PD: F55119

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 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 further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s \cdot s^2 \cdot m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k \cdot u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

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010218

SPE Certificate™**Certificate of Reference Material**

Catalog Number: AS-PO₄P9-2X/2Y **Lot No.:** 27-23AS
Description: 1000 mg/L of Phosphate-Phosphorus
Matrix: H₂O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: Phosphate-Phosphorus (P): 1002.5 mg/L \pm 3 mg/L
Traceable to: NIST SRM 3186

The CRM is prepared gravimetrically using high purity (99.999%) Potassium Dihydrogen Orthophosphate (KH₂PO₄) Lot#07991C. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1003 mg/L

Method: Gravimetric analysis by precipitation using Magnesia Mixture, filtering, drying and weighing as Mg₂P₂O₇.

Instrumental Analysis by Ion Chromatography: 1002 mg/L

Trace Anion Impurities in the Actual Solution via IC Analysis:

Element	mg/L	Element	mg/L
F ⁻	<0.1	NO ₃ ⁻	<0.2
Br ⁻	<0.1	NO ₂ ⁻	<0.2
SO ₄ ⁻²	<0.1	Cl ⁻	<2.0

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable and accurate to \pm 0.5% of the certified concentration value for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

JAN. -- 2005

Date of Certification: _____ Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/11/05
DATE EXPIRED: 01/15/2006
DATE OPENED: 01/11/05
INORG: 4953
PG: F55119

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

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Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2/m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' 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 = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

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SPEXcertificate™

Certificate of Reference Material

Catalog Number: AS-SO49-2X/2Y

Lot No. 28-26AS

Description: 1000 mg/L Sulfate

Matrix: H₂O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1000.5 mg/L

Uncertainty Associated with Measurement: ± 3.0 mg/L

Certified Value is Traceable to: NIST SRM 3181

The CRM is prepared gravimetrically using high purity Potassium Sulfate Lot# X34146. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

Method: Precipitated using Barium Chloride, filtered, ignited and weighed as BaSO₄

Instrumental Analysis by ICP spectrometer: 1001 mg/L

Uncertified Properties:

Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:

Element	mg/L	Element	mg/L
Cl ⁻	<0.01	Br ⁻	<0.01
F ⁻	<0.005	NO ₃ ⁻	<0.01
NO ₂ ⁻	<0.01	PO ₄ ⁻	<0.10

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 7/19/05

DATE EXPIRED: 7/30/06

DATE OPENED: 7/12/05

INORG: 5305 PD: 020445444

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to $\pm 0.5\%$ of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JUL -- 2005

Certifying Officer: N. Kocherakota

010221

**SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT**

CLIENT: Division 20

TASK ORDER: 051219-5

SRR: 28420

SDG: 271245

CASE: L. Yang

VTSR: December 16, 2005

PROJECT#: 06002.01.322

Pipette Calibrations

SwRI - Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

010222

Balance #: 34Thermometer #: G-011diH2O Temperature (°C): 21

Eppendorf #	True Value (μL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
Lab30	1000	1.0099	1.0078	1.0101
TMA1	1000	1.0065	1.0072	1.0045
TMA2	1000	1.0046	1.0068	1.0039
TMA3	1000	NOT	FOUND	
TMA6	1000	1.0088	1.0016	1.0018
TMB1	900	.9604	.9051	.9002
TMC1	800	.8004	.8003	.8001
TMDD1	750	.7577	.7556	.7504
TMD1	700	.7078	.7030	.6994
TMD2	700	.7052	.7048	.7045
TME1	600	.6009	.6004	.6021
TMF2	500	.4999	.4998	.5007
TMF5	500	.5068	.5061	.5073
ICF1	500	.5036	.5040	.5031
L30-500	500	.5082	.5064	.5028
TMG3	400	.4016	4001	.4003
TMH1	300	OUT OF	SERVICE	
TMH2	300	.3032	.3008	.2997
TMJ1	250	.2525	.2546	.2516
TMJ2	250	.2513	.2509	.2502
TMJ3	250	.2539	.2518	.2563
TMK2	200	.2017	.2038	.2020
TML1	150	.1513	.1501	.1511
TMM1	120	.1210	.1214	.1208
TMN3	100	OUT OF	SERVICE	
ICN1	100	.1019	.1011	.1010
TMQ1	80	NOT	FOUND	.0799
TMR1	70	OUT OF	SERVICE	
TMS1	60	OUT OF	SERVICE	
LAB-30A	50	OUT OF	SERVICE	
TMU1	40	.0400	.0400	.0397
TMU2	40	.0401	.0398	.0399
TMV1	30	.0300	.0299	.0300
L30-20	20	.0204	.0200	.0198
TMW1	25	.0252	.0251	.0254
TMY1	15	OUT OF	SERVICE	

Analyst: John WilkeDate: 11-23-05Reviewed by: Philip EODate: 11-28-05

SwRI - Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

(Space provide for Inorganic Laboratories' Fixed Volume Pipette Verification Spreadsheet)

SwRI - Div. 01, Inorganic Labs' Fixed Volume Pipette Spreadsheet

Eppendorf #	True Value (uL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
Lab30	1000	1.0099	1.0078	1.0101	1.01	100.93
TMA1	1000	0.9857	0.9828	0.9869	0.99	98.51
TMA2	1000	1.0046	1.0068	1.0039	1.01	100.51
TMA3	1000	NOT	FOUND			
TMA6	1000	1.0088	1.0016	1.0018	1.00	100.41
TMB1	900	0.9004	0.9021	0.9002	0.90	100.10
TMC1	800	0.8004	0.8003	0.8001	0.80	100.03
TMDD1	750	0.7577	0.7556	0.7504	0.75	100.61
TMD1	700	0.7078	0.7030	0.6994	0.70	100.49
TMD2	700	0.7052	0.7048	0.7045	0.70	100.69
TME1	600	0.6009	0.6004	0.6021	0.60	100.19
TMF2	500	0.4999	0.4998	0.5007	0.50	100.03
TMF5	500	0.5068	0.5061	0.5073	0.51	101.35
ICF1	500	0.5036	0.5040	0.5028	0.50	100.69
L30-500	500	0.5082	0.5064	0.5028	0.51	101.16
TMG3	400	0.4016	0.4001	0.4003	0.40	100.17
TMH1	300	OUT	OF	SERVICE		
TMH2	300	0.3032	0.3008	0.2997	0.30	100.41
TMJ1	250	0.2525	0.2546	0.2516	0.25	101.16
TMJ2	250	0.2513	0.2509	0.2502	0.25	100.32
TMJ3	250	0.2539	0.2518	0.2563	0.25	101.60
TMK2	200	0.2017	0.2038	0.2020	0.20	101.25
TML1	150	0.1513	0.1501	0.1511	0.15	100.56
TMM1	120	0.1210	0.1214	0.1208	0.12	100.89
TMN3	100	OUT	OF	SERVICE		
ICN1	100	0.1019	0.1011	0.1010	0.10	101.33
TMQ1	80	0.0802	0.0804	0.0799	0.08	100.21
TMR1	70	OUT	OF	SERVICE		
TMS1	60	OUT	OF	SERVICE		
LAB-30A	50	OUT	OF	SERVICE		
TMU1	40	0.0400	0.0400	0.0397	0.04	99.75
TMU2	40	0.0401	0.0398	0.0399	0.04	99.83
TMV1	30	0.0300	0.0299	0.0300	0.03	99.89
L30-20	20	0.0204	0.0200	0.0198	0.02	100.33
TMW1	25	0.0252	0.0251	0.0254	0.03	100.93
TMY1	15	OUT	OF	SERVICE		

Note: TMA2 - 1000 needed lubricating because the barrel and plungers were sticking. JW
 TMQ1 was relocated 11-23-05, reads 100.21 % accurately. JW

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

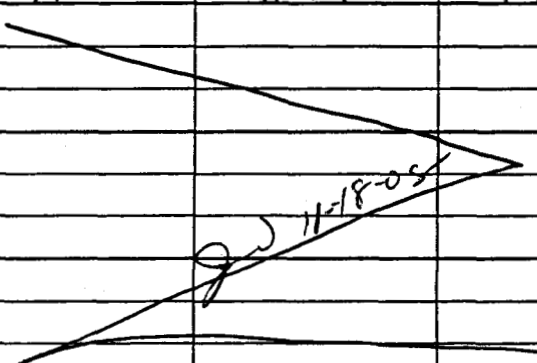
SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (μL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	20	0.0199	0.0200	0.0200	0.020	99.83
ADJ200-A	100	0.0985	0.0990	0.1022	0.100	99.90
	200	0.1991	0.1994	0.1997	0.199	99.70
	20					
ADJ200-C	100	OUT	OF	SERVICE		
	200					
	20	0.0202	0.0200	0.0203	0.020	100.83
ADJ200-D	100	0.0984	0.0991	0.0988	0.099	98.77
	200	0.1978	0.1984	0.1983	0.198	99.08
	20					
ADJ200-G	100					
	200					
	20					
ADJ200-H	100					
	200					
	20					
ADJ200-J	100					
	200					
	20					
ADJ200-K	100	NOT	IN USE-	GLOVEBOX		
	200					
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					

FRM-247a (Rev 4/Apr 04)

FRM-244 (Rev 2/Sept 02)

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010225Balance #: 34Thermometer #: G011diH2O Temperature (°C) 21

Eppendorf #	True Value (μL)	20 μL – 200 μL		
		1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
	20	.0199	.0200	.0200
ADJ200-A	100	.0985	.0990	.1022
	200	.1991	.1994	.1997
	20			
ADJ200-C	100	OUT	OF	SERVICE
	200			
	20	.0202	.0200	.0203
ADJ200-D	100	.0984	.0991	.0988
	200	.1978	.1984	.1983
	20			
ADJ200-G	100			
	200			
	20			
ADJ200-H	100			
	200			
	20			
ADJ200-J	100			
	200			
	20			
ADJ200-K	100	NOT	IN use –	Glovebox
	200			
	20			
ADJ200	100			
	200			

Analyst: John WilkeDate: 11-18-05Reviewed by: Vali AgnDate: 12/21/05

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010226

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (μL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
ADJ200-A	20					
	100					
	200					
ADJ200-C	20					
	100					
	200					
ADJ200-D	20					
	100					
	200					
ADJ200-G	20	0.0199	0.0199	0.0198	0.0199	99.33
	100	0.1013	0.1011	0.1005	0.1010	100.97
	200	0.1989	0.1990	0.1992	0.1990	99.52
	20	0.0203	0.0201	0.0201	0.0202	100.83
ADJ200-H	100	0.0995	0.0997	0.0996	0.0996	99.60
	200	0.1999	0.1993	0.1994	0.1995	99.77
	20	0.0203	0.0201	0.0202	0.0202	101.00
ADJ200-J	100	0.0996	0.0996	0.0993	0.0995	99.50
	200	0.1993	0.1992	0.1990	0.1992	99.58

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010227

Balance #: 16

Thermometer #: G011

diH2O Temperature (°C) 21°C

20 μ L – 200 μ L

Eppendorf #	True Value (μ L)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
	20	J.V. 12/01/05		
ADJ200-A	100			
	200			
	20			
ADJ200-C	100			
	200			
	20			
ADJ200-D	100			
	200			
	20			
ADJ200-G	100			
	200			
	20			
ADJ200-H	100			
	200			
	20			
ADJ200-J	100			
	200			
	20			
ADJ200-K	100			
	200			
	20			
ADJ200	100			
	200			

J.V. 12/01/05

Analyst: [Signature]

Reviewed by: [Signature]

Date: 12/01/05

Date: 12/01/05

Book/page: 08 095

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010228

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100	0.1006	0.1005	0.1008	0.101	100.63
ADJ1000-C	500	0.4926	0.4925	0.4943	0.494	98.86
	1000	0.9964	1.0052	1.0026	1.001	100.14
	100	0.1007	0.0999	0.1001	0.100	100.23
ADJ1000-D	500	0.4929	0.4952	0.4971	0.495	99.01
	1000	0.9946	0.9942	0.9936	0.994	99.41
	100	0.1008	0.1010	0.1011	0.101	100.97
ADJ1000-E	500	0.4976	0.4971	0.4980	0.498	99.51
	1000	1.0036	0.9972	1.0011	1.001	100.06
	100	0.1017	0.1012	0.1018	0.102	101.57
ADJ1000-F	500	0.4969	0.4978	0.4986	0.498	99.55
	1000	0.9993	1.0003	0.9985	0.999	99.94
	100					
ADJ1000-G	500					
	1000					
	100					
ADJ1000-H	500					
	1000					
	100					
ADJ1000-J	500					
	1000					
	100					
ADJ1000-K	500	NOT	IN USE-	GLOVEBOX		
	1000					
	100					
ADJ1000	500					
	1000					

gw
x4
12-21-05

FRM-247b (Rev 3/Apr 04)

FRM-244 (Rev 2/Sept 02)

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 341Thermometer #: 6011diH2O Temperature (° C) 21

010229

Eppendorf #	True Value (µL)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
100 µL – 1000 µL	100	.1006	.1005	.1008
	ADJ1000-C	500	.4926	.4925
		1000	.9964	1.0052
ADJ1000-D	100	.1007	.0999	.1001
	500	.4929	.4952	.4971
	1000	.9946	.9942	.9936
ADJ1000-E	100	.1008	.1010	.1011
	500	.4976	.4971	.4980
	1000	1.0036	.9972	1.0011
ADJ1000-F	100	.1017	.1012	.1018
	500	.4969	.4978	.4986
	1000	.9993	1.0003	.9985
ADJ1000-G	100			
	500			
	1000			
ADJ1000-H	100			
	500			
	1000			
ADJ1000-J	100			
	500			
	1000			
ADJ1000-K	100			
	500	NOT	in use - glovebox	
	1000			
ADJ1000	100			
	500			
	1000			

Analyst: John WilksReviewed by: Noble A. Jr.Date: 11-18-05Date: 12/21/05

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010230

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (μL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
ADJ1000-C	100				0.000	0.00
	500				0.000	0.00
	1000				0.000	0.00
ADJ1000-D	100				0.000	0.00
	500				0.000	0.00
	1000				0.000	0.00
ADJ1000-E	100				0.000	0.00
	500				0.000	0.00
	1000				0.000	0.00
ADJ1000-F	100				0.000	0.00
	500				0.000	0.00
	1000				0.000	0.00
ADJ1000-G	100	0.0988	0.0984	0.0989	0.099	98.70
	500	0.4990	0.4983	0.4978	0.498	99.67
	1000	0.9948	0.9957	0.9963	0.996	99.56
ADJ1000-H	100	0.0987	0.0983	0.0989	0.099	98.63
	500	0.4923	0.4943	0.4939	0.494	98.70
	1000	0.9859	0.9879	0.9903	0.988	98.80
ADJ1000-J	100	0.1002	0.1022	0.1027	0.102	101.70
	500	0.4972	0.4978	0.4983	0.498	99.55
	1000	0.9901	0.9951	0.9945	0.993	99.32
ADJ1000	100				0.000	0.00
	500				0.000	0.00
	1000				0.000	0.00
ADJ1000	100				0.000	0.00
	500				0.000	0.00
	1000				0.000	0.00

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010231Balance #: 16Thermometer #: 3011diH₂O Temperature (°C) 21.0

Eppendorf #	True Value (μL)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
	100			
	500			
	1000			
ADJ1000-C	100			
	500			
	1000			
ADJ1000-D	100			
	500			
	1000			
ADJ1000-E	100			
	500			
	1000			
ADJ1000-F	100			
	500			
	1000			
ADJ1000-G	100	0.0988	0.0984	0.0989
	500	0.4990	0.4983	0.4978
	1000	0.9948	0.9957	0.9963
ADJ1000-H	100	0.0987	0.0983	0.0989
	500	0.4973	0.4943	0.4939
	1000	0.9859	0.9879	0.9903
ADJ1000-J	100	0.1002	0.1022	0.1024
	500	0.4972	0.4978	0.4983
	1000	0.9901	0.9951	0.9945
ADJ1000-K	100			
	500			
	1000			
ADJ1000	100			
	500			
	1000			

Analyst: [Signature]Reviewed by: [Signature]Date: 12/01/05Date: 12/21/05

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet) **010232**

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	500	0.4940	0.4989	0.4993	0.497	99.48
ADJ5000-C	2500	2.4980	2.4976	2.4981	2.498	99.92
	5000	5.0261	5.0106	5.0099	5.016	100.31
	500					
ADJ5000-G	2500	OUT	OF	SERVICE		
	5000					
	500					
ADJ5000-H	2500	OUT	OF	SERVICE		
	5000					
	500	0.4994	0.5037	0.5031	0.502	100.41
ADJ5000-I	2500	2.4983	2.4989	2.4978	2.498	99.93
	5000	4.9899	5.0093	5.0049	5.001	100.03
	500					
ADJ5000-J	2500					
	5000					
	500					
ADJ5000-K	2500					
	5000					
	500					
ADJ5000-L	2500					
	5000					
	500					
ADJ5000-M	2500	NOT	IN USE-	GLOVEBOX		
	5000					
	500	0.4952	0.4966	0.4966	0.496	99.23
ADJ5000-N	2500	2.4982	2.4984	2.5006	2.499	99.96
	5000	5.0333	5.0114	5.0118	5.019	100.38
	500	0.4992	0.5000	0.4981	0.499	99.82
ADJ5000	2500	2.4988	2.4852	2.4967	2.494	99.74
	5000	5.0008	4.9954	4.9904	4.996	99.91
	500					
ADJ5000	2500					
	5000					

FRM-247c (Rev 3/Apr 04)

FRM-244 (Rev 2/Sept 02)

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

010233

Balance #: 34Thermometer #: G-011diH2O Temperature (° C) 21

Eppendorf #	True Value (μL)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
	500	.4940	.4989	.4993
ADJ5000-C	2500	2.4980	2.4976	2.4981
	5000	5.0261	5.0106	5.0099
	500			
ADJ5000-G	2500	OUT	OF	SERVICE
	5000			
	500			
ADJ5000-H	2500	OUT	OF	SERVICE
	5000			
	500	.4994	.5037	.5031
ADJ5000-I	2500	2.4983	2.4988 4989	2.4978
	5000	4.9899	5.0093 5.0105	5.0049
	500			
ADJ5000-J	2500			
	5000			
	500			
ADJ5000-K	2500			
	5000			
	500			
ADJ5000-L	2500			
	5000			
	500			
ADJ5000-M	2500	NOT	in use - glovebox	
	5000			
	500	.4952	.4966	.4966
ADJ5000-N	2500	2.4982	2.4984	2.5006
	5000	5.0333	5.0114	5.0118
	500	.4992	.5000	.4981
ADJ5000-O	2500	2.4988	2.4852	2.4967
	5000	5.0008	4.9954	4.9904
	500			
ADJ5000	2500			
	5000			

Analyst: John WithersDate: 11-18-05Reviewed by: Vale aprDate: 12/21/05

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010234

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	500				0.000	0.00
ADJ5000-C	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-G	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-H	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-I	2500				0.000	0.00
	5000				0.000	0.00
	500	0.5009	0.5003	0.5022	0.501	100.23
ADJ5000-J	2500	2.5099	2.5010	2.5087	2.507	100.26
	5000	5.0105	5.0111	5.0101	5.011	100.21
	500	0.5005	0.5019	0.5022	0.502	100.31
ADJ5000-K	2500	2.5009	2.5001	2.5007	2.501	100.02
	5000	5.0201	5.0191	5.0187	5.019	100.39
	500	0.5072	0.5066	0.5052	0.506	101.27
ADJ5000-L	2500	2.4903	2.4909	2.4909	2.491	99.63
	5000	4.9833	4.9799	4.9758	4.980	99.59

IV
12/01/05

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16Thermometer #: 6011diH2O Temperature (°C) 21.0

010235

Eppendorf #	True Value (μL)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
ADJ5000-C	500			
	2500			
	5000			
ADJ5000-G	500			
	2500			
	5000			
ADJ5000-H	500			
	2500			
	5000			
ADJ5000-I	500			
	2500			
	5000			
ADJ5000-J	500	0.5007	0.5003	0.5022
	2500	2.5044	2.5010	2.5087
	5000	5.0105	5.0111	5.0101
ADJ5000-K	500	0.5005	0.5019	0.5022
	2500	2.5009	2.5001	2.5007
	5000	5.0201	5.0191	5.0187
ADJ5000-L	500	0.5072	0.5066	0.5052
	2500	2.4963	2.4969	2.4909
	5000	4.9833	4.9799	4.9758
ADJ5000-M	500			
	2500			
	5000			
ADJ5000-N	500			
	2500			
	5000			
ADJ5000	500			
	2500			
	5000			
ADJ5000	500			
	2500			
	5000			

Analyst: J. KimDate: 12/01/05Reviewed by: J. KimDate: 12/21/05

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16

Thermometer #: 6011

diH2O Temperature (°C) 21.2

010236

Eppendorf #	True Value (μL)	20 μL – 200 μL		
		1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
	20			
ADJ200-A	100			
	200			
	20			
ADJ200-C	100			
	200			
	20			
ADJ200-D	100			
	200			
	20	0.0199	0.0199	0.0198
ADJ200-G	100	0.1013	0.1011	0.1005
	200	0.1989	0.1990	0.1992
	20	0.0203	0.0201	0.0201
ADJ200-H	100	0.0995	0.0997	0.0996
	200	0.1999	0.1993	0.1994
	20	0.0203	0.0201	0.0202
ADJ200-J	100	0.0996	0.0996	0.0993
	200	0.1993	0.1992	0.1990
	20			
ADJ200-K	100			
	200			
	20			
ADJ200	100			
	200			

Analyst: [Signature]
 Reviewed by: [Signature]

Date: 12/01/05
 Date: 12/21/05

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010237

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (μL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
ADJ200-A	20					
	100					
	200					
ADJ200-C	20					
	100					
	200					
ADJ200-D	20					
	100					
	200					
ADJ200-G	20	0.0199	0.0199	0.0198	0.0199	99.33
	100	0.1013	0.1011	0.1005	0.1010	100.97
	100	0.1013	0.1011	0.1005	0.1010	99.52
	200	0.1989	0.1990	0.1992	0.1990	100.83
ADJ200-H	20	0.0203	0.0201	0.0201	0.0202	99.60
	100	0.0995	0.0997	0.0996	0.0996	99.77
	200	0.1999	0.1993	0.1994	0.1995	101.00
	20	0.0203	0.0201	0.0202	0.0202	99.50
ADJ200-J	100	0.0996	0.0996	0.0993	0.0995	99.58
	200	0.1993	0.1992	0.1990	0.1992	

JV
12/01/05

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16Thermometer #: 3011diH₂O Temperature (°C) 21.0

Eppendorf #	True Value (μL)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
	100	010238		
ADJ1000-C	500			
	1000			
	100			
ADJ1000-D	500			
	1000			
	100			
ADJ1000-E	500			
	1000			
	100			
ADJ1000-F	500			
	1000			
	100	0.0988	0.0984	0.0989
ADJ1000-G	500	0.4990	0.4983	0.4978
	1000	0.9948	0.9957	0.9963
	100	0.0987	0.0983	0.0989
ADJ1000-H	500	0.4923	0.4943	0.4939
	1000	0.9859	0.9879	0.9903
	100	0.1002	0.1022	0.1021
ADJ1000-J	500	0.4972	0.4978	0.4983
	1000	0.9901	0.9851	0.9945
	100	JV 2/1/05		
ADJ1000-K	500			
	1000			
	100			
ADJ1000	500			
	1000			

Analyst: [Signature]Date: 12/01/05Reviewed by: [Signature]Date: 12/21/05

SwRI - Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

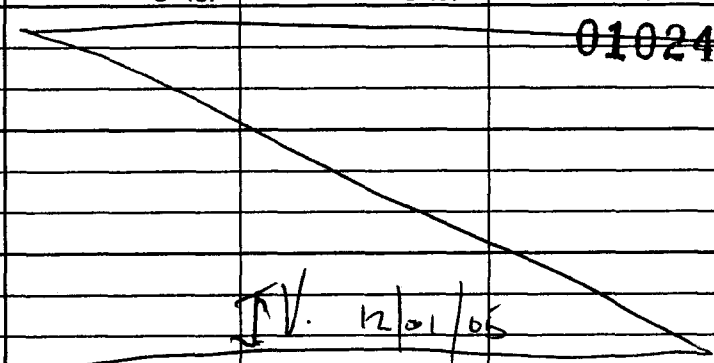
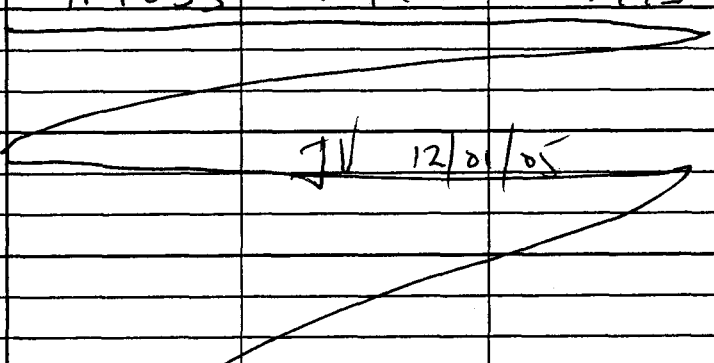
010239

SwRI - Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (μL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100				0.000	0.00
ADJ1000-C	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-D	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-E	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-F	500				0.000	0.00
	1000				0.000	0.00
	100	0.0988	0.0984	0.0989	0.099	98.70
ADJ1000-G	500	0.4990	0.4983	0.4978	0.498	99.67
	1000	0.9948	0.9957	0.9963	0.996	99.56
	100	0.0987	0.0983	0.0989	0.099	98.63
ADJ1000-H	500	0.4923	0.4943	0.4939	0.494	98.70
	1000	0.9859	0.9879	0.9903	0.988	98.80
	100	0.1002	0.1022	0.1027	0.102	101.70
ADJ1000-J	500	0.4972	0.4978	0.4983	0.498	99.55
	1000	0.9901	0.9951	0.9945	0.993	99.32
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16Thermometer #: 6011diH2O Temperature (°C) 21°C

Eppendorf #	True Value (µL)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
ADJ5000-C	500			
	2500			
	5000			
ADJ5000-G	500			
	2500			
	5000			
ADJ5000-H	500			
	2500			
	5000			
ADJ5000-I	500			
	2500			
	5000			
ADJ5000-J	500	0.5007	0.5003	0.5022
	2500	2.5044	2.5010	2.5087
	5000	5.0105	5.0111	5.0101
ADJ5000-K	500	0.5005	0.5019	0.5022
	2500	2.5009	2.5001	2.5007
	5000	5.0201	5.0191	5.0187
ADJ5000-L	500	0.5072	0.5066	0.5052
	2500	2.4963	2.4909	2.4909
	5000	4.9833	4.9799	4.9758
ADJ5000-M	500			
	2500			
	5000			
ADJ5000-N	500			
	2500			
	5000			
ADJ5000	500			
	2500			
	5000			
ADJ5000	500			
	2500			
	5000			

Analyst: J. [Signature]Date: 12/01/05Reviewed by: J. [Signature]Date: 12/21/05

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010241

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (μL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	500				0.000	0.00
ADJ5000-C	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-G	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-H	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-I	2500				0.000	0.00
	5000				0.000	0.00
	500	0.5009	0.5003	0.5022	0.501	100.23
ADJ5000-J	2500	2.5099	2.5010	2.5087	2.507	100.26
	5000	5.0105	5.0111	5.0101	5.011	100.21
	500	0.5005	0.5019	0.5022	0.502	100.31
ADJ5000-K	2500	2.5009	2.5001	2.5007	2.501	100.02
	5000	5.0201	5.0191	5.0187	5.019	100.39
	500	0.5072	0.5066	0.5052	0.506	101.27
ADJ5000-L	2500	2.4903	2.4909	2.4909	2.491	99.63
	5000	4.9833	4.9799	4.9758	4.980	99.59

IV
12/01/05

**SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT**

CLIENT: Division 20

010242

TASK ORDER: 051219-5

SRR: 28420

SDG: 271245

CASE: L. Yang

VTSR: December 16, 2005

PROJECT#: 06002.01.322

Balance Calibrations

#1-SN: 99-JS0526-15
 #2-SN: 99-JS0031-1

Southwest Research Institute®
 Division 01
BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
12	Bldg. 70 Lab 47	1122510787	±0.0005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
12-16-05	2.0000	2.0001	KE	1
"	100.0000	99.9998	N	2
12-19-05	2.0000	1.9999	KE	1
"	100.0000	99.9996	N	2
12-22-05	2.0000	1.9999	KE	1
"	100.0000	100.0000	N	2

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
 If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

#1 - SN: 99-J50624-5

#2 - SN: 5537

Southwest Research Institute®
Division 01
BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
19	Bldg. 70 Lab 47	0068597	±0.05	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
12-14-05	10.00	10.01	KE	1
"	400.04	399.99	"	2
12-15-05	10.00	10.01	KE	1
"	400.04	399.96	"	2
12-16-05	10.00	10.00	KE	1
"	400.04	399.95	"	2
12-19-05	10.00	10.00	KE	1
"	400.04	399.95	"	2
12-20-05	10.00	10.01	KE	1
"	400.04	399.93	"	2

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.

If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

#1 - SN: 99-J50526-15

#2 - SN: 99-J50031-1

Southwest Research Institute®
Division 01
BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
34	Bldg. 70 Lab 47	1116031935	±0.0005/0.00005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
13-DEC-2005	2.0000	2.0000	JK	1
13-DEC-2005	100.0000	100.0000	JK	2
12-14-05	2.0000	2.0000	KE	1
"	100.0000	100.0002	"	2
12-15-05	2.0000	2.0000	KE	1
"	100.0000	99.9996	"	2
12-16-05	2.0000	2.0000	KE	1
"	100.0000	99.9999	"	2
12-19-05	2.0000	2.0000	KE	1
"	100.0000	99.9999	"	2

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.

If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

Southwest Research Institute
Division 01
BALANCE VERIFICATION LOG

*1 - SN: 99-JS0526-15

*2 - SN: 99-SS0031-1

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
34	Bldg. 70 Lab 47	1116031935	±0.0005/0.00005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
12-20-05	2.0000	1.9999	KE	1
"	100.0000	100.0000	"	2
12-21-05	2.0000	2.0000	KE	1
"	100.0000	99.9998	"	2
12-22-05	2.0000	1.9999	KE	1
"	100.0000	99.9995	"	2
12-23-05	2.0000	2.0000	KE	1
"	100.0000	100.0004	"	2
12-27-05 JV	200.00 5.0000	1.9999	JV	1
	100.0000	99.9999		2

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.

If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

#1-SN: 99-JS0526-15
#2-SN: 99-JS0031-1

Southwest Research Institute®
Division 01
BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
12	Bldg. 70 Lab 47	1122510787	±0.0005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
12-16-05	2.0000	2.0001	KE	1
"	100.0000	99.9998	N	2
12-19-05	2.0000	1.9999	KE	1
"	100.0000	99.9996	N	2
12-21-05	2.0000	1.9999	KE	1
"	100.0000	100.0000	N	2
12-22-05	2.0000	1.9998	KE	1
"	100.0000	99.9999	N	2
12-23-05	2.0000	1.9999	KE	1
"	100.0000	100.0003	N	2

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.

If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

#1 - SN: 99-J50526-15

#2 - SN: 99-J50031-1

Southwest Research Institute®
Division 01
BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
34	Bldg. 70 Lab 47	1116031935	±0.0005/0.00005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
13-DEC-2005	2.0000	2.0000	JK	1
13-DEC-2005	100.0000	100.0000	JK	2
12-14-05	2.0000	2.0000	KE	1
"	100.0000	100.0002	"	2
12-15-05	2.0000	2.0000	KE	1
"	100.0000	99.9996	"	2
12-16-05	2.0000	2.0000	KE	1
"	100.0000	99.9999	"	2
12-19-05	2.0000	2.0000	KE	1
"	100.0000	99.9999	"	2

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.

If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

010249

SOUTHWEST RESEARCH INSTITUTE

NUCLEAR PROJECT

CLIENT: Division 20

TASK ORDER: 051219-5

SRR: 28420

SDG: 271245

CASE: L. Yang

VTSR: December 16, 2005

PROJECT#: 06002.01.322

DI Water Verification

D.I. WATER SYSTEM NOTEBOOK

SOUTHWEST RESEARCH INSTITUTE

BUILDING 70

040029

Contact U.S. Filter (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

HIGH PURITY SYSTEM (HP)

010250

DATE / TIME	INITIALS	RESISTIVITY MONITOR		QC LIGHTS		USAGE (GALS)	COMMENTS
		(M OHMS)	QC LT.	QC 1	QC 2		
11/29/05 730	DR	18.01	✓	✓	✓	12708.4	✓
11/30/05 8pm	DR	18.02	✓	✓	✓	12728.6	✓
12/1/05 730pm	DR	18.03	✓	✓	✓	12744.2	✓
12/2/05 710pm	DR	18.02	✓	✓	✓	12766.7	✓
12/5/05 738pm	DR	18.03	✓	✓	✓	12789.8	✓
12/6/05 640pm	DR	18.02	✓	✓	✓	12809.1	✓
12/7/05 8pm	DR	18.02	✓	✓	✓	12832.4	✓
12/8/05 705pm	DR	18.03	✓	✓	✓	12868.0	✓
12/9/05 530pm	DR	18.02	✓	✓	✓	12899.4	✓
12/10/05 710pm	DR	18.02	✓	✓	✓	12923.2	✓
12/13/05 658pm	DR	18.01	✓	✓	✓	12948.0	✓
12/14/05 620pm	DR	18.02	✓	✓	✓	12975.4	✓
12/15/05 541pm	DR	18.02	✓	✓	✓	13003.3	✓
12/16/05 510pm	DR	18.03	✓	✓	✓	13011.0	✓
12/19/05 700pm	DR	18.02	✓	✓	✓	13021.0	✓
12/20/05 915pm	DR	18.02	✓	✓	✓	13037.6	✓

Legend: Check = Green (OK); X = Red (call for service)

LOW PURITY SYSTEM (LP)

DATE / TIME	INITIALS	QC LIGHTS		USAGE (GALS)	COMMENTS
		QC 1	QC 2		
11/29/05 731	DR	X	13 ✓	31005.0	slight usage
11/30/05 701pm	DR	✓	12 ✓	31008.3	✓
12/1/05 731pm	DR	X	12.5 ✓	31009.5	slight usage
12/2/05 711pm	DR	✓	13 ✓	31009.9	✓
12/5/05 739pm	DR	✓	13.5 ✓	31011.3	✓
12/4/05 641pm	DR	X	13 ✓	31011.3	no usage
12/7/05 701pm	DR	X	13.5 ✓	31011.4	slight usage
12/8/05 706pm	DR	X	12.5 ✓	31011.4	no usage
12/9/05 531pm	DR	X	12.5 ✓	31011.4	no usage
12/10/05 721pm	DR	X	13 ✓	31011.9	slight usage
12/13/05 653pm	DR	✓	10.5 ✓	31013.4	✓
12/14/05 620pm	DR	✓	11.5 ✓	31014.5	✓
12/15/05 510pm	DR	✓	11 ✓	31015.6	✓
12/16/05 511pm	DR	X	11.5 ✓	31017.4	slight usage
12/19/05 701pm	DR	✓	11 ✓	31020.1	✓
12/20/05 916pm	DR	X	10.5 ✓	31020.3	slight usage

Legend: Check = Green (OK); X = Red (call for service)

D.I. WATER SYSTEM NOTEBOOK

SOUTHWEST RESEARCH INSTITUTE

BUILDING 70

740028

Contact U.S. Filter (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

HIGH PURITY SYSTEM (HP)

010251

DATE / TIME	INITIALS	RESISTIVITY MONITOR		QC LIGHTS		USAGE (GALS)	COMMENTS
		(M OHMS)	QC LT.	QC 1	QC 2		
11/3/05 7:30pm	DR	18.03	✓	✓	✓	12221.7	✓
11/4/05 7:55pm	DR	18.02	✓	✓	✓	12243.4	✓
11/7/05 7:20pm	DR	18.03	✓	✓	✓	12294.8	✓
11/8/05 7:15pm	DR	18.02	✓	✓	✓	12308.2	✓
11/9/05 8:20pm	DR	18.01	✓	✓	✓	12336.4	✓
11/10/05 8pm	DR	18.01	✓	✓	✓	12346.1	✓
11/11/05 6:20pm	DR	18.02	✓	✓	✓	12362.9	✓
11/14/05 6:20pm	DR	18.01	✓	X	✓	12372.8	✓ need to get P.O. for service call.
11/15/05 9:30pm	DR	18.02	✓	X	✓	12417.9	U.S. Filter called
11/16/05 8:30pm	DR	18.03	✓	✓	✓	12465.0	Mixed bed and Carbon Exchange. All OK
11/17/05 7:00pm	DR	18.02	✓	✓	✓	12549.2	✓
11/18/05 7:05pm	DR	18.03	✓	✓	✓	12581.8	✓
11/21/05 7:20pm	DR	18.02	✓	✓	✓	12619.3	✓
11/22/05 6:10pm	DR	18.02	✓	✓	✓	12650.7	✓
11/23/05 4:50pm	DR	18.02	✓	✓	✓	12672.3	✓
11/28/05 5:50pm	DR	18.03	✓	✓	✓	12678.7	✓

Legend: Check = Green (OK); X = Red (call for service)

LOW PURITY SYSTEM (LP)

DATE / TIME	INITIALS	QC LIGHTS		USAGE (GALS)	COMMENTS
		QC 1	QC 2		
11/3/05 7:40pm	DR	✓	✓ 6.5	30940.3	✓
11/4/05 7:50pm	DR	X	✓ 7	30940.5	slight usage
11/7/05 7:10pm	DR	X	✓ 6.5	30941.5	slight usage
11/8/05 7:16pm	DR	X	✓ 6.5	30941.5	no usage
11/9/05 8:20pm	DR	X	✓ 6.5	30943.5	might be due for tank x-change
11/10/05 8:00pm	DR	X	✓ 6	30944.8	slight usage
11/11/05 6:30pm	DR	✓	✓ 6.5	30945.5	✓
11/14/05 6:40pm	DR	X	✓ 6.5	30945.8	need P.O. for service call
11/15/05 9:30pm	DR	X	✓ 6	30948.9	U.S. Filter called
11/16/05 8:30pm	DR	✓	✓ 13.5	30979.2	Carbon, Mixed bed x-change. All OK
11/17/05 7:00pm	DR	✓	✓ 13.5	30989.0	✓
11/18/05 7:06pm	DR	✓	✓ 14	30990.1	✓
11/21/05 7:20pm	DR	✓	✓ 14	30998.0	✓
11/22/05 6:10pm	DR	X	✓ 14.5	30998.0	no usage
11/23/05 4:50pm	DR	X	✓ 14.5	30998.0	no usage
11/28/05 5:50pm	DR	✓	✓ 12	31001.5	✓

Legend: Check = Green (OK); X = Red (call for service)

D.I. WATER SYSTEM NOTEBOOK

SOUTHWEST RESEARCH INSTITUTE

BUILDING 70

040029

Contact U.S. Filter (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

HIGH PURITY SYSTEM (HP)

010252

DATE / TIME	INITIALS	RESISTIVITY MONITOR		QC LIGHTS		USAGE (GALS)	COMMENTS
		(M OHMS)	QC LT.	QC 1	QC 2		
11/29/05 730	DR	18.01	✓	✓	✓	12708.4	✓
11/30/05 9pm	DR	18.02	✓	✓	✓	12728.6	✓
12/1/05 230pm	DR	18.03	✓	✓	✓	12744.2	✓
12/2/05 210pm	DR	18.02	✓	✓	✓	12766.7	✓
12/5/05 238pm	DR	18.03	✓	✓	✓	12789.8	✓
12/6/05 640pm	DR	18.02	✓	✓	✓	12809.1	✓
12/7/05 2pm	DR	18.02	✓	✓	✓	12837.4	✓
12/8/05 205pm	DR	18.03	✓	✓	✓	12868.0	✓
12/9/05 530pm	DR	18.02	✓	✓	✓	12899.4	✓
12/10/05 210pm	DR	18.02	✓	✓	✓	12923.2	✓
12/13/05 650pm	DR	18.01	✓	✓	✓	12948.0	✓
12/14/05 620pm	DR	18.02	✓	✓	✓	12975.4	✓
12/15/05 540pm	DR	18.02	✓	✓	✓	13003.3	✓
12/16/05 510pm	DR	18.03	✓	✓	✓	13011.0	✓
12/19/05 210pm	DR	18.02	✓	✓	✓	13021.0	✓
12/20/05 915pm	DR	18.02	✓	✓	✓	13031.6	✓

Legend: Check = Green (OK); X = Red (call for service)

LOW PURITY SYSTEM (LP)

DATE / TIME	INITIALS	QC LIGHTS		USAGE (GALS)	COMMENTS
		QC 1	QC 2		
11/29/05 731	DR	X	13 ✓	31005.0	slight usage
11/30/05 201pm	DR	✓	12 ✓	31008.3	✓
12/1/05 231pm	DR	X	12.5 ✓	31009.5	slight usage
12/2/05 211pm	DR	✓	13 ✓	31009.9	✓
12/5/05 739pm	DR	✓	13.5 ✓	31011.3	✓
12/6/05 641pm	DR	X	13 ✓	31011.3	no usage
12/7/05 201pm	DR	X	13.5 ✓	31011.4	slight usage
12/8/05 206pm	DR	X	12.5 ✓	31011.4	no usage
12/9/05 531pm	DR	X	12.5 ✓	31011.4	no usage
12/10/05 221pm	DR	X	13 ✓	31011.9	slight usage
12/13/05 653pm	DR	✓	10.5 ✓	31013.4	✓
12/14/05 621pm	DR	✓	11.5 ✓	31014.5	✓
12/15/05 510pm	DR	✓	11 ✓	31015.6	✓
12/16/05 511pm	DR	X	11.5 ✓	31017.4	slight usage
12/19/05 210pm	DR	✓	11 ✓	31020.1	✓
12/20/05 916pm	DR	X	10.5 ✓	31020.3	slight usage

Legend: Check = Green (OK); X = Red (call for service)

**SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT**

CLIENT: Division 20

TASK ORDER: 051219-5

SRR: 28420

SDG: 271245

CASE: L. Yang

VTSR: December 16, 2005

PROJECT#: 06002.01.322

010253

**SURVEILLANCE REPORTS
From Division 30**



Institute Quality Assurance Surveillance Report

Project Number: 20-06002

Report Number: ~~2005-SR-0955~~ ^{med} 2/14/06 ~~2006-SR-0031~~ Page 1 of 1

Surveillance Scope: Review of a Division 01 test package for Div. 20, the Center for Nuclear Waste Regulatory Analysis. This is a Nuclear Surveillance.

Reference Documents: Documentation test packages for Task Orders 051021-6, 051110-8, and 051219-5

Starting Date: 2006-02-07

Ending Date: 2006-02-07

Institute QA Representative: Mark R. Ehnstrom *MRE*

Person(s) Conducting Test/Exam/Procedure: R. Presas

Satisfactory Findings

The data packages were reviewed for test activities performed in Division 01. The test activities were performed on a total of 23 samples provided by Dr. L. Yang of Division 20. A Laboratory Task Order form was used as a cover sheet for each package. The Laboratory Task Order form made reference to 10CFR 50, Appendix B and to 10CFR Part 21. A "Sample List/Chain of Custody" form was also used to assure positive control and responsibility for the samples. Data contained in the packages included:

- Calibration records on the specific instrumentation used during testing
- Certificates of Analysis
- Reports of Certificates
- Certificates of Reference Materials

When appropriate, test documentation was provided which showed traceability back to the National Institute of Standards. Test results had been reviewed by Division 01 supervisory personnel. Personnel training records were reviewed and were found to be satisfactory.

Unsatisfactory Findings: None

Nonconformance Report Number: N/A

CAR/SCAR Number: N/A

Attachments: None

Recommendations/Actions: N/A

Equipment Calibration: See above.

Approved: _____

Institute Quality Assurance

Date: _____

2.14.2006

Distribution: Original – IQS Records
CC: M.R.Ehnstrom (30)
PM – R. Presas (01)
J. Boyd (01)