010001

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040304-12
SRR: 25612
SDG: 241722
CASE: CNWRA
VTSR: March 04, 2004
PROJECT#: 06002.01.081

FINAL REPORT

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010003

Sample ID

pt11

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/04/04

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 040304-12

SRR: 25612

Lab System ID: 241722

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Chromium	<0.167	0.167
Cobalt	<0.167	0.167
Iron	<1.67	1.67
Molybdenum	<0.333	0.333
Nickel	<0.167	0.167
Potassium	748	20.0
Sodium	2.14	1.67
Tungsten	<0.333	0.333

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010004

Sample ID
pt12

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/04/04

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 040304-12

SRR: 25612

Lab System ID: 241723

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Chromium	<0.167	0.167
Cobalt	<0.167	0.167
Iron	<1.67	1.67
Molybdenum	<0.333	0.333
Nickel	0.266	0.167
Potassium	1515	20.0
Sodium	3.91	1.67
Tungsten	<0.333	0.333

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SOUTHWEST RESEARCH INSTITUTE

DUPLICATE SUMMARY

010005
Sample ID
pt12

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/04/04

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 040304-12

SRR: 25612

Lab System ID: 241723

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Chromium	<0.167	<0.167	0.00%
Cobalt	<0.167	<0.167	0.00%
Iron	<1.67	<1.67	0.00%
Molybdenum	<0.333	<0.333	0.00%
Nickel	0.266	0.249	6.60%
Potassium	1515	1502	0.86%
Sodium	3.91	3.63	7.43%
Tungsten	<0.333	<0.333	0.00%

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010006

Sample ID

pt13

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/04/04

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 040304-12

SRR: 25612

Lab System ID: 241724

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Chromium	<0.167	0.167
Cobalt	<0.167	0.167
Iron	<1.67	1.67
Molybdenum	<0.333	0.333
Nickel	<0.167	0.167
Potassium	2305	20.0
Sodium	8.60	1.67
Tungsten	<0.333	0.333

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010007

Sample ID
pt14

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/04/04

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 040304-12

SRR: 25612

Lab System ID: 241725

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Chromium	<0.167	0.167
Cobalt	<0.167	0.167
Iron	<1.67	1.67
Molybdenum	<0.333	0.333
Nickel	<0.167	0.167
Potassium	1290	20.0
Sodium	4.25	1.67
Tungsten	<0.333	0.333

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SOUTHWEST RESEARCH INSTITUTE

MATRIX SPIKE SUMMARY

010008

Sample ID
pt14

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/04/04

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 040304-12

SRR: 25612

Lab System ID: 241725

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Chromium	<0.167	6.79	6.67	102%
Cobalt	<0.167	17.1	16.7	102%
Iron	<1.67	37.7	33.3	113%
Molybdenum	<0.333	140	133	105%
Nickel	<0.167	16.8	16.7	101%
Potassium	1290	3323	2000	102%
Sodium	4.25	663	666	98.9%
Tungsten	<0.333	138	133	104%

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010009

Sample ID
W11

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/04/04

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 040304-12

SRR: 25612

Lab System ID: 241726

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Chromium	<0.167	0.167
Cobalt	<0.167	0.167
Iron	<1.67	1.67
Molybdenum	<0.333	0.333
Nickel	<0.167	0.167
Potassium	62343	100
Sodium	29.6	1.67
Tungsten	<0.333	0.333

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010010

Sample ID
W12

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/04/04

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 040304-12

SRR: 25612

Lab System ID: 241727

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Chromium	<0.167	0.167
Cobalt	<0.167	0.167
Iron	<1.67	1.67
Molybdenum	<0.333	0.333
Nickel	0.464	0.167
Potassium	65602	100
Sodium	28.5	1.67
Tungsten	<0.333	0.333

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010011

Sample ID
W13

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/04/04

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 040304-12

SRR: 25612

Lab System ID: 241728

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Chromium	<0.167	0.167
Cobalt	<0.167	0.167
Iron	<1.67	1.67
Molybdenum	<0.333	0.333
Nickel	0.238	0.167
Potassium	58775	100
Sodium	34.5	1.67
Tungsten	<0.333	0.333

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010012

Sample ID
W14

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/04/04

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 040304-12

SRR: 25612

Lab System ID: 241729

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Chromium	<0.167	0.167
Cobalt	<0.167	0.167
Iron	<1.67	1.67
Molybdenum	<0.333	0.333
Nickel	0.907	0.167
Potassium	53185	100
Sodium	32.3	1.67
Tungsten	<0.333	0.333

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SOUTHWEST RESEARCH INSTITUTE

LABORATORY CONTROL SAMPLE 010013

Sample ID
LCSW - C09E1

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 040304-12

SRR: 25612

Lab System ID: NA

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Chromium	6.71	6.67	101%
Cobalt	16.9	16.7	101%
Iron	36.4	33.3	109%
Molybdenum	138	133	104%
Nickel	16.5	16.7	98.8%
Potassium	2002	2000	100%
Sodium	601	666	90.2%
Tungsten	136	133	102%

NA- Not Applicable.

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SOUTHWEST RESEARCH INSTITUTE

BLANK SUMMARY

010014

Sample ID
PBW - C09E1

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 040304-12

SRR: 25612

Lab System ID: NA

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Chromium	<0.167	0.167
Cobalt	<0.167	0.167
Iron	<1.67	1.67
Molybdenum	<0.333	0.333
Nickel	<0.167	0.167
Potassium	<20.0	20.0
Sodium	<1.67	1.67
Tungsten	<0.333	0.333

NA- Not Applicable.

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010015

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040304-12
SRR: 25612
SDG: 241722
CASE: CNWRA
VTSR: March 04, 2004
PROJECT#: 06002.01.081

Task Orders/01-QPP-015

Southwest Research Institute

Laboratory Task Order

TO #: 040304-12 Revision: 1

010016

SDG: 241722
VTSR: 03/04/04
CASE: CNWRA

SRR #'s: 25612
Client(s): DIV 20

Project(s): 06002.01.081
Manager(s): DAMMANN, MIKE
To PM: 03/17/04
To QA: 04/21/04
To Client: 04/23/04

Instructions

DIVISION 20 - CNWRA. 2-week TAT listed on COC, 21-day TAT for hardcopy, subject to change. Point of contact is Darrell Dunn (ext. 6090). Work is 10 CFR 50, Part 21, Appendix B. CONTACT Charlie Butcher (ext. 5928, pager 271-5172) BEFORE starting any work. ICP analyses for Chromium, Cobalt, Iron, Molybdenum, Nickel, Potassium, Sodium and Tungsten. Results are critical for project determination, are needed ASAP. CONTACT PM WITH ANY QUESTIONS.
revision 1: updated task order. (dramirez042104)

Documents Related to this task order: 9648[COC 25612], 9649[QPP]

Test: DIL-DILUTION
Section: METALPREP

Holding: 28 days from CED

Prep, Dilution Cnt: 8

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
241722		1	Liquid	pt11	12 Nov 03	10 Dec 03
241722		2	Liquid	pt11	12 Nov 03	10 Dec 03
241723		1	Liquid	pt12	23 Dec 03	20 Jan 04
241723		2	Liquid	pt12	23 Dec 03	20 Jan 04
241724		1	Liquid	pt13	20 Jan 04	17 Feb 04
241724		2	Liquid	pt13	20 Jan 04	17 Feb 04
241725		1	Liquid	pt14	04 Mar 04	01 Apr 04
241725		2	Liquid	pt14	04 Mar 04	01 Apr 04
241726		1	Liquid	W11	12 Nov 03	10 Dec 03
241726		2	Liquid	W11	12 Nov 03	10 Dec 03
241727		1	Liquid	W12	23 Dec 03	20 Jan 04
241727		2	Liquid	W12	23 Dec 03	20 Jan 04
241728		1	Liquid	W13	20 Jan 04	17 Feb 04
241728		2	Liquid	W13	20 Jan 04	17 Feb 04
241729		1	Liquid	W14	04 Mar 04	01 Apr 04
241729		2	Liquid	W14	04 Mar 04	01 Apr 04

Test: ICP-SWRI
Section: METALS

Holding: 180 days from CED

ICP Analysis by SwRI Method (for Cr, Co, Fe, Mo, Ni, K, Na, W) Cnt: 8

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
241722		1	Liquid	pt11	12 Nov 03	10 May 04
241722		2	Liquid	pt11	12 Nov 03	10 May 04
241723		1	Liquid	pt12	23 Dec 03	20 Jun 04
241723		2	Liquid	pt12	23 Dec 03	20 Jun 04
241724		1	Liquid	pt13	20 Jan 04	18 Jul 04
241724		2	Liquid	pt13	20 Jan 04	18 Jul 04
241725		1	Liquid	pt14	04 Mar 04	31 Aug 04
241725		2	Liquid	pt14	04 Mar 04	31 Aug 04
241726		1	Liquid	W11	12 Nov 03	10 May 04
241726		2	Liquid	W11	12 Nov 03	10 May 04
241727		1	Liquid	W12	23 Dec 03	20 Jun 04
241727		2	Liquid	W12	23 Dec 03	20 Jun 04
241728		1	Liquid	W13	20 Jan 04	18 Jul 04
241728		2	Liquid	W13	20 Jan 04	18 Jul 04
241729		1	Liquid	W14	04 Mar 04	31 Aug 04
241729		2	Liquid	W14	04 Mar 04	31 Aug 04

010017

Sample Receipt

Southwest Research Institute

Sample Receipt Number: 25612

VTSR: 03/04/04

Time: 15:23:00

Project: 06002.01.081
Case #: CNWRA
Client: DIV 20

Manager: DAMMANN, MIKE
Logged in by: Dino.Roman
Creation Date: 03/04/04

Notes

Samples were received at ambient temperature (22.0).

Qc Note: As per method.

Parameters: Analysis/See attached.

Note: See chain of custody as part of the SRR system for more information. Contact Project Manager for questions.

Note: TAT (14 days), as per COC.

Note: Samples were received intact.

Note: Project is Nuclear Safety Related, 10 CFR 50, Part 21, and Appendix B.

Note: Contact Joann Boyd @ 2169 or Pager 351-1617. For Institute QA contact before starting any work on this project.

Note: Have SPQP (Latest Revision) on the bench at the time of prep or analysis of samples.

Note: All personnel must be QA Nuclear Certified.

POC: D. Dunn X6090
*** Dino.Roman Mar 4 2004 4:06PM ***

System ID	Customer ID	CED	Matrix	Containers	Special Reqs.
241722	pt11	11/12/03	Liquid	2	Oth
241723	pt12	12/23/03	Liquid	2	Oth
241724	pt13	01/20/04	Liquid	2	Oth
241725	pt14	03/04/04	Liquid	2	Oth
241726	W11	11/12/03	Liquid	2	Oth
241727	W12	12/23/03	Liquid	2	Oth
241728	W13	01/20/04	Liquid	2	Oth
241729	W14	03/04/04	Liquid	2	Oth
Containers: 16				**Samples: 8**	

These documents are associated with this receipt: 9648[COC 25612], 9649[QPP]

Thermometer: 027
Temperature: 22.0

Client: DIV 20

SR#: 25612

FRM-002

Page Printed: 21 Apr 2004 10:22:35
ver (2/27/2004)

9649

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01-QPP-015
Division 01
Revision 4
November 2002

010018

Document No. 3

Division 01

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

DIV. 20 SRR #25612
PROJECT #06002.01.081
CASE: CNWRA
VTSR: 03/04/04 01523

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

010019

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

JOANN BOYD (210) 522-2169 — 10/30/02 DATE
Quality Assurance Manager

REZA KARIMI (210) 522-2412 — 10/30/02 DATE
Director, Department of Analytical and Environmental Chemistry

for MICHAEL G. MACNAUGHTON (210) 522-5162 — 10/30/02 DATE
Vice President, Chemistry and Chemical Engineering Division

CHRISTOPHER HOBSON (210) 522-5838 — 10/30/02 DATE
Quality Assurance Engineer

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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. Institute Quality Systems (IQS) personnel shall perform this training and documentation shall be evident in the personnel training files maintained in Division 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, Work 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.

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. Work 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 then 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 or 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) Work 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 work 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 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 work order shall specify all applicable documents and appropriate document revision level for each document. The work order shall then serve as the Valid Documents List (VDL) for each individual project.

5.0 HISTORY OF REVISIONS

Revision 4
Title of document changed from the Standard Project Quality Plan *SPQP-CHIAN* 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.*

010027

Valerie DeJesus

From: Rod Weber [rodney.weber@swri.org]
Sent: Wednesday, April 21, 2004 10:00 AM
To: Valerie DeJesus; Michael J Dammann
Cc: Charles S Butcher; Robert D Brient
Subject: Waiver of QC Inspection of Test Documentation

Per our telephone conversation this morning, and with the concurrence of the Division 20 QA Director, Bob Brient, I am waiving the requirement to inspect documentation on the following test:

Task Order 040304-12
SRR 25612
Liquid Samples, 8 Ea.
ICP Analysis

If you have any questions, please contact me at Ext 3161

Rodney M. Weber
Assistant Director
Institute Quality Systems

Valerie DeJesus 010028

From: Valerie DeJesus [vdejesus@bams.ccf.swri.edu]
Sent: Thursday, April 08, 2004 3:25 PM
To: Darrell S Dunn
Cc: Jacqueline M. Ranger
Subject: preliminary sample results - TO#040301-12, SRR#25612

Attached are the preliminary results for the samples received on 03/04/04, task order 040304-12, SRR 25612.
The report for ICP is attached as an Excel (040304-12.xls) and PDF (040304-12.pdf) file.
Hard copies of the report will follow shortly.
If you have any questions, please contact Jackie Ranger (522.3320).

Thank you,

Valerie DeJesus
Southwest Research Institute
Department of Analytical and Environmental Chemistry
Division 01
Phone 210-522-3129
Fax 210-522-5938

010029

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040304-12
SRR: 25612
SDG: 241722
CASE: CNWRA
VTSR: March 04, 2004
PROJECT#: 06002.01.081

Chain of Custody/Login Paperwork

9648

SAMPLE LIST/CHAIN OF CUSTODY

Southwest Research Institute
Chemistry and Chemical Engineering Division
6220 Culebra Road
San Antonio, Texas 78238-5166

Requested Turnaround:
- [x] 2 Weeks
- [ ] 3 Weeks
- [ ] Other: _____

Shipper Name/Address:

Client: CNWRA - Div 20
Darrell Dunn X6090

Client Purchase Order/Other ID:

Site/Zone ID:

SwRI Contact: Darrell Dunn X6090

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	ICP Analysis See Additional Sheet										REMARKS Preservation
w 11 ✓	11/12/03	2:00pm	L		2	✓										Samples Intact
pt 11 ✓	11/12/03	2:30pm	L		2	✓										
w 12 ✓	12/23/03	2:00pm	L		2	✓										
pt 12 ✓	12/23/03	2:30pm	L		2	✓										
w 13 ✓	1/20/04	3:00pm	L		2	✓										
pt 13 ✓	1/20/04	3:30pm	L		2	✓										
w 14 ✓	3/4/04	2:00pm	L		2	✓										
pt 14 ✓	3/4/04	3:00pm	L		2	✓										

DIV. 20 SRR #25612
PROJECT #06002.01.081
CASE: CNWRA
VTSR: 03/04/04 01523

Preservation:
- **a** = HCl to pH <2
- **b** = HNO_3 to pH <2
- **c** = H_2SO_4 to pH <2
- **d** = NaOH to pH >12
- **e** = Cool (4°C±2°C)
- **f** = Other (specify)

Matrix Types:
- **A** – Air
- **B** – Biota
- **D** - Dust
- **E** – Emission/Stack
- **L** - Liquid
- **P** – Product
- **Sd** - Solid
- **S** – Soil
- **SED** – Sediment
- **T** - Tissue
- **W** - Water
- **WP** - Wipe

Sample Types:
- **D** - Duplicate
- **ER** – Equipment Rinsate
- **ES** – Environmental Sample
- **FB** – Field Blank
- **FD** – Field Duplicate
- **MS** – Matrix Spike
- **MSD** – Matrix Spike Dup
- **TB** – Trip Blank

Temp: 22.0°C

Therm #: 027

Comments:

Relinquished by (Print/Signature)	Date	Time
Brian K. Derby / [signature]	3/4/04	15:23
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time

SwRI Project#: 20.06002.01.081

Received by SwRI Lab: (Signature) [signature] OMKN

Date: 3/4/04 Time: 1523

Samples Disposed: Date: Time:

Samples Disposed by:

Div 01 COC Form 01-01-001, Rev 8/02

9648

FORM FOR REQUESTING WORK FROM OTHER DIVISIONS

A. TO BE COMPLETED BY DIVISION 20 PERSONNEL

Requester: Darrell Dunn **Request Date:** 3/4/04 010031
Project No.: 20.06002.01.081 **Phone No.:** X 6090
Description of Work Requested:
ICP Analysis for
Chromium - Cobalt - Iron - Molybdenum - Nickel
Potassium - Sodium - Tungsten

☐ Optical Microscopy ☐ SEM ☐ Hardness ☐ Profilometer ☐ Auger ☐ Other

***QUALITY REQUIREMENTS:** The work requested is governed by the CNWRA Quality Assurance Program which addresses requirements of 10CFR50, Appendix B. Personnel performing this work shall be qualified under the CNWRA QA program or equivalently under the SwRI Nuclear QA program. Test and analysis methods shall be documented by approved procedures or recognized, standard methods. Measuring and test equipment shall be calibrated and controlled according to CNWRA and SwRI Nuclear QA program requirements.*

Sample Identification	Description
W 11 = KCl Solution	pt 13 = 20% HCl Solution
pt 11 = 20% HCl Solution	W 14 = KCl Solution
W 12 = KCl Solution	pt 14 = 20% HCl Solution
pt 12 = 20% HCl Solution	
W 13 = KCl Solution	

B. TO BE COMPLETED BY DIVISION PERFORMING WORK[1]

☐ Optical Microscopy ☐ SEM ☐ Hardness ☐ Profilometer ☐ Auger ☐ Other

Person Assigned: _____ **Signature:** _____
Division: _____ **Date:** _____

Make, Model & Serial No. of Equipment Used (*attach list if necessary*): _____

Software Used (If any): _____

Standards Used (If any): _____

Photographic Negative Numbers (If Applicable): _____

DIV. 20 SRR #25612
PROJECT #06002.01.081
CASE: CNWRA
VTSR: 03/04/04 01523

[1] Please sign and date any hardcopy of analysis or list of photographs (The photographs themselves need not be signed). If error occurred during entry, do not erase or overwrite, but strikeout with single line, initial and date, and then reenter correct information.

Southwest Research Institute

LOG-IN CHECKLIST

010032

Sample Receipt Report No.: **25612**

Project Information All product information shall be derived from a contract, statement of work (SOW), or project manager (PM).				
Previous PM information	Yes	☐	No	☒
Current PM information	Yes	☒	No	☐
Sponsor's Documentation All original documentation must be attached to the work order and sent to Div 01 Quality Assurance (DQA).				
Delivery documentation (*) = (Tape on 8 ½ x 11 white paper)	Yes	☐	No	☒
Hand carried	Yes	☒	No	☐
Correspondence	Yes	☐	No	☒
Custody seals*	Yes	☐	No	☒
Chain-of-custody/Traffic report	Yes	☒	No	☐
Sample tags* (Confirm with container information before removal)	Yes	☐	No	☒
Hazard notifications	Yes	☒	No	☐
Product Condition Sample(s) shall not be left unattended once an ice chest has been opened.				
Sample(s) received intact	Yes	☒	No	☐
Container(s) received leaking	Yes	☐	No	☒
Container(s) received damaged	Yes	☐	No	☒
Lid(s) received damaged	Yes	☐	No	☒
Product Preparation				
FRM-115 (pH) Preservation Report / Metals & Wetchem H2O	Yes	☐	No	☒
Product Storage Sample(s) shall be stored in a designated location with their corresponding sample control records (SCR).				
Sample(s) in designated location	Yes	☒	No	☐
Sample Receipt Report All copies must be legible.				
Computerized sample receipt report with original documents	Yes	☒	No	☐
Sample custodian signature and date on all original documents.	Yes	☒	No	☐
Copy of sample receipt report to PM	Yes	☒	No	☐
PM sample receipt report approval with initial and date	Yes	☒	No	☐
Case file documents to DQA	Yes	☒	No	☐
Print sample log-in page and place in log-in notebook	Yes	☒	No	☐
Chain-of-Custody/Traffic Report				
Sample Custodian's signature, date, and time	Yes	☒	No	☐
Document thermometer no. / temperature (Confirm calibration is current)	Yes	☒	No	☐
Document condition of sample(s)	Yes	☒	No	☐
FRM-109				
Discrepancies	Yes	☐	No	☒
FRM-109 to PM	Yes	☐	No	☒
FRM-109 to Client (Only for required contracts)	Yes	☐	No	☒
FRM-109 to Inorganics for discrepancies of FRM-115	Yes	☐	No	☒
Ice Chest Shipment				
Clean ice chest/Discard used bags and ice/Return Sponsor's packing material	Yes	☐	No	☒
SwRI shipping ticket with project identification	Yes	☐	No	☒
Log-In Closure				
Sample Custodian's Signature:	Date: 03/04/04		Time: 4:26 PM	

SAMPLE LOG-IN SHEET

010033

Lab Name: Southwest Research Institute	Page 1 of 1
Received By (Print Name): DINO ROMAN	Log-in Date: 03/04/2004
Received By (Signature): DR	
Case Number: CNWRA	Sample Delivery Group No.
SAS Number: N/A	
Remarks: 06002.01.081	

1.	Custody Seal(s)	Present/Absent* Intact/Broken
2.	Custody Seal Nos.	N/A
3.	Chain-of Custody Records	Present/Absent*
4.	Traffic Reports or Packing Lists	Present/Absent*
5.	Airbill	Airbill/Sticker Present/Absent*
6.	Airbill No.	HAND DELIVERED
7.	Sample Tags	Present/Absent*
	Sample Tag Numbers	Listed/Not listed on Chain of Custody
8.	Sample Condition	Intact/Broken*/Leaking
9.	Cooler Temperature	22.0C
10.	Does Information on custody records, traffic reports, and sample tags agree?	Yes/No*
11.	Date Received at Lab	03/04/2004
12.	Time Received	15:23:00

EPA Sample #	Corresponding Sample Tag #	Corresponding Assigned Lab #	Remarks: Condition of Sample Shipment, etc
pt11	None	241722	Intact
pt12	None	241723	Intact
pt13	None	241724	Intact
pt14	None	241725	Intact
W11	None	241726	Intact
W12	None	241727	Intact
W13	None	241728	Intact
W14	None	241729	Intact

Sample Transfer

Fraction: Inorg	Fraction
Area #: Inorg #2	Area #
By: DINO ROMAN	By
On: 03/04/2004	On

* Contact SMO and attach record of resolution

Reviewed By	CYNTHIA A. SALCEDA	Logbook No.	Sample Receipt (25612)
Date	03.04.2004	Logbook Page No.	✓ 5001 (SECTION 2 OF 2)

010034

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040304-12
SRR: 25612
SDG: 241722
CASE: CNWRA
VTSR: March 04, 2004
PROJECT#: 06002.01.081

Copies of Login Book

Sample Login Book

Mar 04, 2004

010035

SwRI Login Area
Division 1

Sample Receipt: 25611	Project: 10192.01.10X	Client: Lynx, LTD.
VTSR Date: Mar 04, 2004	VTSR Time: 14:45:00	Manager: SUN, GANG

System ID	Customer Sample ID	Matrix
241718	0403021305	Water
241719	0403021506	Water
241720	0403030820	Water
241721	0403031035	Water

Sample Receipt: 25612	Project: 06002.01.081	Client: DIV 20
VTSR Date: Mar 04, 2004	VTSR Time: 15:23:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
241722	pt11	Liquid
241723	pt12	Liquid
241724	pt13	Liquid
241725	pt14	Liquid
241726	W11	Liquid
241727	W12	Liquid
241728	W13	Liquid
241729	W14	Liquid

Number of samples for today: 27

Number of Containers for today: 35

010036

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040304-12
SRR: 25612
SDG: 241722
CASE: CNWRA
VTSR: March 04, 2004
PROJECT#: 06002.01.081

RAW DATA

div 20
to#040304-12
06002.01.081

JR 4/20/04 Harris Harris 3/30/04 3-30-04

system id	elem	result	qual	units	rl	tv	rec	ug/ml	rl	df	mg/L	date	time
241722	Co2286	0.167	U	mg/L	0.167			0.00407	0.005	33.3	0.1357	03/22/04	10:09
241722	Cr2677	0.167	U	mg/L	0.167			0.00054	0.005	33.3	0.0180	03/22/04	10:09
241722	Fe2714	1.67	U	mg/L	1.67			0.00946	0.05	33.3	0.3153	03/22/04	10:09
241722	K_766	748		mg/L	20.0			7.48360	0.2	100	748.36	03/23/04	
241722	Mo2020	0.333	U	mg/L	0.333			0.00334	0.01	33.3	0.1113	03/22/04	10:09
241722	Na5889	2.14		mg/L	1.67			0.06420	0.05	33.3	2.1400	03/22/04	10:09
241722	Ni2316	0.167	U	mg/L	0.167			0.00015	0.005	33.3	0.0050	03/22/04	10:09
241722	W_2079	0.333	U	mg/L	0.333			0.00488	0.01	33.3	0.1627	03/22/04	10:09
241723	Co2286	0.167	U	mg/L	0.167			0.00360	0.005	33.3	0.1200	03/22/04	10:14
241723	Cr2677	0.167	U	mg/L	0.167			0.00243	0.005	33.3	0.0810	03/22/04	10:14
241723	Fe2714	1.67	U	mg/L	1.67			0.01849	0.05	33.3	0.6163	03/22/04	10:14
241723	K_766	1515		mg/L	20.0			15.14910	0.2	100	1514.91	03/23/04	
241723	Mo2020	0.333	U	mg/L	0.333			0.00288	0.01	33.3	0.0960	03/22/04	10:14
241723	Na5889	3.91		mg/L	1.67			0.11740	0.05	33.3	3.9133	03/22/04	10:14
241723	Ni2316	0.266		mg/L	0.167			0.00798	0.005	33.3	0.2660	03/22/04	10:14
241723	W_2079	0.333	U	mg/L	0.333			0.00074	0.01	33.3	0.0247	03/22/04	10:14
241723d	Co2286	0.167	U	mg/L	0.167			0.00419	0.005	33.3	0.1397	03/22/04	10:19
241723d	Cr2677	0.167	U	mg/L	0.167			0.00227	0.005	33.3	0.0757	03/22/04	10:19
241723d	Fe2714	1.67	U	mg/L	1.67			0.02845	0.05	33.3	0.9483	03/22/04	10:19
241723d	K_766	1502		mg/L	20.0			15.01530	0.2	100	1501.53	03/23/04	
241723d	Mo2020	0.333	U	mg/L	0.333			0.00309	0.01	33.3	0.1030	03/22/04	10:19
241723d	Na5889	3.63		mg/L	1.67			0.10880	0.05	33.3	3.6267	03/22/04	10:19
241723d	Ni2316	0.249		mg/L	0.167			0.00746	0.005	33.3	0.2487	03/22/04	10:19
241723d	W_2079	0.333	U	mg/L	0.333			0.00180	0.01	33.3	0.0600	03/22/04	10:19
241724	Co2286	0.167	U	mg/L	0.167			0.00389	0.005	33.3	0.1297	03/22/04	10:25
241724	Cr2677	0.167	U	mg/L	0.167			-0.00035	0.005	33.3	-0.0117	03/22/04	10:25
241724	Fe2714	1.67	U	mg/L	1.67			0.00308	0.05	33.3	0.1027	03/22/04	10:25
241724	K_766	2305		mg/L	20.0			23.05260	0.2	100	2305.26	03/23/04	
241724	Mo2020	0.333	U	mg/L	0.333			0.00080	0.01	33.3	0.0267	03/22/04	10:25
241724	Na5889	8.60		mg/L	1.67			0.25790	0.05	33.3	8.5967	03/22/04	10:25
241724	Ni2316	0.167	U	mg/L	0.167			0.00007	0.005	33.3	0.0023	03/22/04	10:25
241724	W_2079	0.333	U	mg/L	0.333			0.00190	0.01	33.3	0.0633	03/22/04	10:25
241725	Co2286	0.167	U	mg/L	0.167			0.00403	0.005	33.3	0.1343	03/22/04	10:30
241725	Cr2677	0.167	U	mg/L	0.167			0.00207	0.005	33.3	0.0690	03/22/04	10:30
241725	Fe2714	1.67	U	mg/L	1.67			0.03408	0.05	33.3	1.1360	03/22/04	10:30
241725	K_766	1290		mg/L	20.0			12.90060	0.2	100	1290.06	03/23/04	
241725	Mo2020	0.333	U	mg/L	0.333			0.00000	0.01	33.3	0.0000	03/22/04	10:30
241725	Na5889	4.25		mg/L	1.67			0.12760	0.05	33.3	4.2533	03/22/04	10:30
241725	Ni2316	0.167	U	mg/L	0.167			0.00362	0.005	33.3	0.1207	03/22/04	10:30

R Spears 4/21/04

010037

div 20
to#040304-12
06002.01.081

system id	elem	result	qual	units	rl	tv	rec	ug/ml	rl	df	mg/L	date	time
241725	W_2079	0.333	U	mg/L	0.333			0.00059	0.01	33.3	0.0197	03/22/04	10:30
241725s	Co2286	17.1		mg/L	0.167	16.7	102.8%	0.51400	0.005	33.3	17.1333	03/22/04	10:35
241725s	Cr2677	6.79		mg/L	0.167	6.67	101.8%	0.20362	0.005	33.3	6.7873	03/22/04	10:35
241725s	Fe2714	37.7		mg/L	1.67	33.3	113.0%	1.12979	0.05	33.3	37.6597	03/22/04	10:35
241725s	K_766	3323		mg/L	20.0	2000	101.7%	33.23220	0.2	100	3323.22	03/23/04	
241725s	Mo2020	140		mg/L	0.333	133	104.8%	4.19116	0.01	33.3	139.7053	03/22/04	10:35
241725s	Na3302	663		mg/L	1.67	666	98.9%	19.89167	0.05	33.3	663.0557	03/22/04	10:35
241725s	Ni2316	16.8		mg/L	0.167	16.7	100.7%	0.50334	0.005	33.3	16.7780	03/22/04	10:35
241725s	W_2079	138		mg/L	0.333	133	103.4%	4.13035	0.01	33.3	137.6783	03/22/04	10:35
241726r	Co2286	0.167	U	mg/L	0.167			0.00090	0.005	33.3	0.0300	03/29/04	14:21
241726	Cr2677	0.167	U	mg/L	0.167			0.00017	0.005	33.3	0.0057	03/22/04	10:41
241726	Fe2714	1.67	U	mg/L	1.67			-0.00324	0.05	33.3	-0.1080	03/22/04	10:41
241726	K_766	62343		mg/L	100			124.68640	0.2	500	62343.20	03/23/04	
241726	Mo2020	0.333	U	mg/L	0.333			0.00178	0.01	33.3	0.0593	03/22/04	10:41
241726r	Na5889	29.6		mg/L	1.67			0.88940	0.05	33.3	29.6467	03/29/04	14:21
241726	Ni2316	0.167	U	mg/L	0.167			0.00376	0.005	33.3	0.1253	03/22/04	10:41
241726	W_2079	0.333	U	mg/L	0.333			0.00208	0.01	33.3	0.0693	03/22/04	10:41
241727r	Co2286	0.167	U	mg/L	0.167			0.00080	0.005	33.3	0.0267	03/29/04	14:26
241727	Cr2677	0.167	U	mg/L	0.167			0.00031	0.005	33.3	0.0103	03/22/04	10:46
241727	Fe2714	1.67	U	mg/L	1.67			0.01090	0.05	33.3	0.3633	03/22/04	10:46
241727	K_766	65602		mg/L	100			131.20420	0.2	500	65602.10	03/23/04	
241727	Mo2020	0.333	U	mg/L	0.333			0.00110	0.01	33.3	0.0367	03/22/04	10:46
241727r	Na5889	28.5		mg/L	1.67			0.85480	0.05	33.3	28.4933	03/29/04	14:26
241727	Ni2316	0.464		mg/L	0.167			0.01393	0.005	33.3	0.4643	03/22/04	10:46
241727	W_2079	0.333	U	mg/L	0.333			-0.00042	0.01	33.3	-0.0140	03/22/04	10:46
241728r	Co2286	0.167	U	mg/L	0.167			0.00100	0.005	33.3	0.0333	03/29/04	14:32
241728	Cr2677	0.167	U	mg/L	0.167			0.00076	0.005	33.3	0.0253	03/22/04	11:09
241728	Fe2714	1.67	U	mg/L	1.67			-0.00897	0.05	33.3	-0.2990	03/22/04	11:09
241728	K_766	58775		mg/L	100			117.55000	0.2	500	58775.00	03/23/04	
241728	Mo2020	0.333	U	mg/L	0.333			0.00119	0.01	33.3	0.0397	03/22/04	11:09
241728r	Na5889	34.5		mg/L	1.67			1.03500	0.05	33.3	34.5000	03/29/04	14:32
241728	Ni2316	0.238		mg/L	0.167			0.00713	0.005	33.3	0.2377	03/22/04	11:09
241728	W_2079	0.333	U	mg/L	0.333			-0.00143	0.01	33.3	-0.0477	03/22/04	11:09
241729r	Co2286	0.167	U	mg/L	0.167			0.00050	0.005	33.3	0.0167	03/29/04	14:37
241729	Cr2677	0.167	U	mg/L	0.167			0.00045	0.005	33.3	0.0150	03/22/04	11:14
241729	Fe2714	1.67	U	mg/L	1.67			0.00799	0.05	33.3	0.2663	03/22/04	11:14
241729	K_766	53185		mg/L	100			106.37040	0.2	500	53185.20	03/23/04	
241729	Mo2020	0.333	U	mg/L	0.333			0.00055	0.01	33.3	0.0183	03/22/04	11:14
241729r	Na5889	32.3		mg/L	1.67			0.96770	0.05	33.3	32.2567	03/29/04	14:37

010038

div 20
to#040304-12
06002.01.081

system id	elem	result	qual	units	rl	tv	rec	ug/ml	rl	df	mg/L	date	time
241729	Ni2316	0.907		mg/L	0.167			0.02720	0.005	33.3	0.9067	03/22/04	11:14
241729	W_2079	0.333	U	mg/L	0.333			0.00122	0.01	33.3	0.0407	03/22/04	11:14
lcsw-C09E1	Co2286	16.9		mg/L	0.167	16.7	101.5%	0.50751	0.005	33.3	16.9170	03/22/04	10:04
lcsw-C09E1	Cr2677	6.71		mg/L	0.167	6.67	100.6%	0.20128	0.005	33.3	6.7093	03/22/04	10:04
lcsw-C09E1	Fe2714	36.4		mg/L	1.67	33.3	109.2%	1.09170	0.05	33.3	36.3900	03/22/04	10:04
lcsw	K_766	2002		mg/L	20.0	2000	100.1%	20.02220	0.2	100	2002.22	03/23/04	
lcsw-C09E1	Mo2020	138		mg/L	0.333	133	103.2%	4.12878	0.01	33.3	137.6260	03/22/04	10:04
lcsw-C09E1	Na3302	601		mg/L	1.67	666	90.2%	18.02388	0.05	33.3	600.7960	03/22/04	10:04
lcsw-C09E1	Ni2316	16.5		mg/L	0.167	16.7	99.2%	0.49601	0.005	33.3	16.5337	03/22/04	10:04
lcsw-C09E1	W_2079	136		mg/L	0.333	133	102.0%	4.07768	0.01	33.3	135.9227	03/22/04	10:04
pbw-C09E1 pg56-085	Co2286	0.167	U	mg/L	0.167			0.00330	0.005	33.3	0.1100	03/22/04	09:58
pbw-C09E1 pg56-085	Cr2677	0.167	U	mg/L	0.167			-0.00062	0.005	33.3	-0.0207	03/22/04	09:58
pbw-C09E1 pg56-085	Fe2714	1.67	U	mg/L	1.67			0.00379	0.05	33.3	0.1263	03/22/04	09:58
pbw	K_766	20	U	mg/L	20.0			-0.05630	0.2	100	-5.6300	03/23/04	
pbw-C09E1 pg56-085	Mo2020	0.333	U	mg/L	0.333			0.00059	0.01	33.3	0.0197	03/22/04	09:58
pbw-C09E1 pg56-085	Na5889	1.67	U	mg/L	1.67			0.00530	0.05	33.3	0.1767	03/22/04	09:58
pbw-C09E1 pg56-085	Ni2316	0.167	U	mg/L	0.167			-0.00094	0.005	33.3	-0.0313	03/22/04	09:58
pbw-C09E1 pg56-085	W_2079	0.333	U	mg/L	0.333			-0.00023	0.01	33.3	-0.0077	03/22/04	09:58

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ICP ANALYSIS

FOR K ~~& NA~~
JR 3/29/04

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
06002.01.081	Div 20	040304-123-23-04		Liquid	NA

INSTRUMENT: Spectro FILENAME: 040323

INSTRUMENT DL:

010041

EVOLUTION by Micro-Active Australia Pty Ltd 3:12:10 PM March 23, 2004

BACKGROUND CORRECTED INTENSITIES
Identity 1 : BLK_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 3:05:46 PM March 23, 2004

	K_766	Li670	Na589	Sc361
# 1	29.0	-9.0	18.5	4358.5
# 2	17.0	-15.0	16.5	3997.5
Mean	23.0	-12.0	17.5	4178.0
SD	8.5	4.2	1.4	255.3
%RSD	36.9	35.4	8.1	6.1

INTENSITIES
Identity 1 : BLK_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 3:05:46 PM March 23, 2004

	K_766	Li670	Na589	Sc361
# 1	0.0	-0.0	0.0	4358.5
# 2	0.0	-0.0	0.0	3997.5
Mean	0.0	-0.0	0.0	4178.0
SD	0.0	0.0	0.0	255.3
%RSD	31.1	41.0	2.0	6.1

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_STD1_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 3:08:52 PM March 23, 2004

	K_766	Li670	Na589
# 1	4301.0	35089.0	22983.5
# 2	4189.0	34462.0	22527.5
Mean	4245.0	34775.5	22755.5
SD	79.2	443.4	322.4
%RSD	1.9	1.3	1.4

INTENSITIES
Identity 1 : CLP_STD1_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 3:08:52 PM March 23, 2004

	K_766	Li670	Na589
# 1	1.0	7.9	5.2
# 2	1.0	8.0	5.2
Mean	1.0	7.9	5.2
SD	0.0	0.0	0.0
%RSD	0.5	0.1	0.1

3/29/04

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 3:12:00 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1704.5	17350.5	13495.0	4435.0	4435.0
# 2	1635.5	16696.5	13025.0	4280.0	4280.0
Mean	1670.0	17023.5	13260.0	4357.5	4357.5
SD	48.8	462.4	332.3	109.6	109.6
%RSD	2.9	2.7	2.5	2.5	2.5

3-23-04

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 3:12:00 PM March 23, 2004

010041-A

EVOLUTION by Micro-Active Australia Pty Ltd 3:19:40 PM March 23, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.6327	4.9236	29.2343	4435.000 H	106.1609
# 2	19.5185	4.9096	29.2380	4280.000 H	102.4452
Mean	19.5756	4.9166	29.2361	4357.500 H	104.3030
SD	0.0807	0.0099	0.0026	109.602	2.6274
%RSD	0.4124	0.2012	0.0089	2.515	2.5190

Checking calibration verification ...
Identity 1 : CLP_CCV_SC Identity 2 :

Report name	Low limit	Value	High limit
K_766	18.000	19.576	22.000
Li670	4.500	4.917	5.500
Na589	27.000	29.236	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 3:16:14 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	14.5	-5.5	23.5	4560.0	4560.0
# 2	6.5	-8.5	34.5	4455.0	4455.0
Mean	10.5	-7.0	29.0	4507.5	4507.5
SD	5.7	2.1	7.8	74.2	74.2
%RSD	53.9	30.3	26.8	1.6	1.6

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 3:16:14 PM March 23, 2004

		K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	L	-0.1205	0.0021	0.0093	4560.000 H	109.1574
# 2	L	-0.2097	0.0012	0.0342	4455.000 H	106.6403
Mean	L	-0.1651	0.0017	0.0217	4507.500 H	107.8988
SD		0.0631	0.0006	0.0176	74.246	1.7798
%RSD		38.1964	37.7352	81.0472	1.647	1.6495

Checking calibration blank ...
Identity 1 : Calibration blank Identity 2 :

Report name	CRDL	Value	
K_766	0.100	-0.165	Contaminated
Li670	0.010	0.002	
Na589	0.050	0.022	
Sc361	0.000	107.899	

BACKGROUND CORRECTED INTENSITIES
Identity 1 : pbw Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:19:22 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	27.0	-6.0	39.5	4328.0	4328.0
# 2	11.0	-14.0	20.5	4234.0	4234.0
Mean	19.0	-10.0	30.0	4281.0	4281.0
SD	11.3	5.7	13.4	66.5	66.5
%RSD	59.5	56.6	44.9	1.6	1.6

APPARENT CONCENTRATIONS
Identity 1 : pbw Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:19:22 PM March 23, 2004

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EVOLUTION by Micro-Active Australia Pty Ltd 3:29:10 PM March 23, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.0380	0.0019	0.0475	4328.000 H	103.5958
# 2 L	-0.1507 L	-0.0005	0.0063	4234.000 H	101.3424
Mean L	-0.0563	0.0007	0.0269	4281.000 H	102.4691
SD	0.1334	0.0017	0.0291	66.468	1.5934
%RSD	236.8593	258.2660	108.3801	1.553	1.5550

BACKGROUND CORRECTED INTENSITIES
Identity 1 : lcsw Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:22:28 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1694.0	-10.0	9093.5	4320.0	4320.0
# 2	1643.0	-26.0	8833.5	4196.0	4196.0
Mean	1668.5	-18.0	8963.5	4258.0	4258.0
SD	36.1	11.3	183.8	87.7	87.7
%RSD	2.2	62.9	2.1	2.1	2.1

SML Blank Spiked with ZOUL ICAL-1 #4245 DL 3-23-04

APPARENT CONCENTRATIONS
Identity 1 : lcsw Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:22:28 PM March 23, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	20.0369	0.0007	20.2113	4320.000 H	103.4041
# 2	20.0076 L	-0.0042	20.2136	4196.000 H	100.4315
Mean	20.0222 L	-0.0017	20.2124	4258.000 H	101.9178
SD	0.0208	0.0035	0.0016	87.681	2.1019
%RSD	0.1036	198.3998	0.0082	2.059	2.0624

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 241722 df100 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:25:36 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	649.5	-12.0	31.5	4316.5	4316.5
# 2	631.5	-16.0	44.5	4228.5	4228.5
Mean	640.5	-14.0	38.0	4272.5	4272.5
SD	12.7	2.8	9.2	62.2	62.2
%RSD	2.0	20.2	24.2	1.5	1.5

APPARENT CONCENTRATIONS
Identity 1 : 241722 df100 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:25:36 PM March 23, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	7.5128	0.0001	0.0299	4316.500 H	103.3201
# 2	7.4545 L	-0.0011	0.0609	4228.500 H	101.2106
Mean	7.4836 L	-0.0005	0.0454	4272.500 H	102.2654
SD	0.0412	0.0009	0.0219	62.225	1.4917
%RSD	0.5511	173.2286	48.3112	1.456	1.4586

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 241723 df100 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:28:44 PM March 23, 2004

EVOLUTION by Micro-Active Australia Pty Ltd 3:35:16 PM March 23, 2004

010043

	K_766	Li670	Na589	Sc	Sc361
# 1	1311.0	-12.5	20.0	4402.0	4402.0
# 2	1294.0	-8.5	37.0	4345.0	4345.0
Mean	1302.5	-10.5	28.5	4373.5	4373.5
SD	12.0	2.8	12.0	40.3	40.3
%RSD	0.9	26.9	42.2	0.9	0.9

APPARENT CONCENTRATIONS
Identity 1 : 241723 df100 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:28:44 PM March 23, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	15.1493	0.0000	0.0034	4402.000 H	105.3698
# 2	15.1490	0.0012	0.0416	4345.000 H	104.0034
Mean	15.1491	0.0006	0.0225	4373.500 H	104.6866
SD	0.0002	0.0008	0.0270	40.305	0.9662
%RSD	0.0014	131.7090	119.9874	0.922	0.9229

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 241723d df100 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:31:52 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1292.0	-13.0	48.5	4407.0	4407.0
# 2	1276.0	-18.0	22.5	4292.0	4292.0
Mean	1284.0	-15.5	35.5	4349.5	4349.5
SD	11.3	3.5	18.4	81.3	81.3
%RSD	0.9	22.8	51.8	1.9	1.9

APPARENT CONCENTRATIONS
Identity 1 : 241723d df100 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:31:52 PM March 23, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	14.9083 L	-0.0001	0.0656	4407.000 H	105.4896
# 2	15.1222 L	-0.0017	0.0101	4292.000 H	102.7328
Mean	15.0153 L	-0.0009	0.0379	4349.500 H	104.1112
SD	0.1513	0.0011	0.0392	81.317	1.9494
%RSD	1.0073	125.7231	103.5534	1.870	1.8724

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 241724 df100 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:34:58 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	2013.5	-15.5	70.5	4498.0	4498.0
# 2	1980.5	-22.5	70.5	4372.0	4372.0
Mean	1997.0	-19.0	70.5	4435.0	4435.0
SD	23.3	4.9	0.0	89.1	89.1
%RSD	1.2	26.1	0.0	2.0	2.0

APPARENT CONCENTRATIONS
Identity 1 : 241724 df100 Identity 2 : Type : SAMPLE

Weight : 1.0000 Volume : 1.00 Printed : 3:34:58 PM March 23, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm

EVOLUTION by Micro-Active Australia Pty Ltd 3:44:42 PM March 23, 2004 010044

# 1	22.9139 L	-0.0007	0.1105	4498.000 H	107.6711
# 2	23.1913 L	-0.0029	0.1148	4372.000 H	104.6506
Mean	23.0526 L	-0.0018	0.1127	4435.000 H	106.1609
SD	0.1962	0.0015	0.0031	89.095	2.1358
%RSD	0.8509	84.4366	2.7274	2.009	2.0119

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 241725 df100 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:38:06 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1126.5	-15.0	40.5	4466.5	4466.5
# 2	1114.5	-12.0	30.5	4342.5	4342.5
Mean	1120.5	-13.5	35.5	4404.5	4404.5
SD	8.5	2.1	7.1	87.7	87.7
%RSD	0.8	15.7	19.9	2.0	2.0

APPARENT CONCENTRATIONS
Identity 1 : 241725 df100 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:38:06 PM March 23, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	12.7856 L	-0.0006	0.0469	4466.500 H	106.9160
# 2	13.0156	0.0001	0.0273	4342.500 H	103.9434
Mean	12.9006 L	-0.0002	0.0371	4404.500 H	105.4297
SD	0.1627	0.0005	0.0139	87.681	2.1019
%RSD	1.2608	222.9755	37.4715	1.991	1.9937

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 241725s df100 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:41:14 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	2887.5	-4.0	9190.0	4454.0	4454.0
# 2	2828.5	-15.0	9069.0	4384.0	4384.0
Mean	2858.0	-9.5	9129.5	4419.0	4419.0
SD	41.7	7.8	85.6	49.5	49.5
%RSD	1.5	81.9	0.9	1.1	1.1

APPARENT CONCENTRATIONS
Identity 1 : 241725s df100 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:41:14 PM March 23, 2004

SML sample spiked with ZOUL ICAL-1 #4295
DL 3-23-04

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	33.3127	0.0025	19.8104	4454.000 H	106.6163
# 2	33.1517 L	-0.0007	19.8619	4384.000 H	104.9383
Mean	33.2322	0.0009	19.8362	4419.000 H	105.7773
SD	0.1138	0.0022	0.0364	49.497	1.1866
%RSD	0.3426	250.4761	0.1833	1.120	1.1218

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 241726 df500 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:44:20 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	10898.0	-11.5	33.0	4517.5	4517.5
# 2	10648.0	-18.5	63.0	4417.5	4417.5

EVOLUTION by Micro-Active Australia Pty Ltd 3:53:12 PM March 23, 2004

010045

Mean	10773.0	-15.0	48.0	4467.5	4467.5
SD	176.8	4.9	21.2	70.7	70.7
%RSD	1.6	33.0	44.2	1.6	1.6

APPARENT CONCENTRATIONS
Identity 1 : 241726 df500 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:44:22 PM March 23, 2004

		K_766 ppm		Li670 ppm	Na589 ppm		Sc		Sc361 ppm
# 1	H	124.7377		0.0004	0.0300		4517.500	H	108.1386
# 2	H	124.6350	L	-0.0017	0.0969		4417.500	H	105.7413
Mean	H	124.6864	L	-0.0006	0.0634		4467.500	H	106.9399
SD		0.0727		0.0015	0.0473		70.711		1.6951
%RSD		0.0583		234.7897	74.5917		1.583		1.5851

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 241727 df500 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:47:28 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	11590.0	-16.5	46.5	4593.0	4593.0
# 2	11469.0	-21.5	34.5	4496.0	4496.0
Mean	11529.5	-19.0	40.5	4544.5	4544.5
SD	85.6	3.5	8.5	68.6	68.6
%RSD	0.7	18.6	21.0	1.5	1.5

APPARENT CONCENTRATIONS
Identity 1 : 241727 df500 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 3:47:28 PM March 23, 2004

		K_766 ppm		Li670 ppm	Na589 ppm		Sc		Sc361 ppm
# 1	H	130.4908	L	-0.0009	0.0571		4593.000	H	109.9485
# 2	H	131.9175	L	-0.0024	0.0335		4496.000	H	107.6232
Mean	H	131.2042	L	-0.0017	0.0453		4544.500	H	108.7858
SD		1.0088		0.0011	0.0167		68.589		1.6442
%RSD		0.7689		63.9660	36.7893		1.509		1.5114

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 3:52:48 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1775.5	17444.5	13789.5	4639.0	4639.0
# 2	1723.5	17044.5	13480.5	4511.0	4511.0
Mean	1749.5	17244.5	13635.0	4575.0	4575.0
SD	36.8	282.8	218.5	90.5	90.5
%RSD	2.1	1.6	1.6	2.0	2.0

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 3:52:48 PM March 23, 2004

K_766 Li670 Na589 Sc Sc361

	ppm	ppm	ppm		ppm
# 1	19.5500	4.7327	28.5577	4639.000 H	111.0512
# 2	19.5154	4.7554	28.7102	4511.000 H	107.9827

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Mean	19.5327	4.7441	28.6339	4575.000 H	109.5170
SD	0.0245	0.0160	0.1078	90.510	2.1697
%RSD	0.1252	0.3380	0.3765	1.978	1.9812

Checking calibration verification ...
Identity 1 : CLP_CCV_SC Identity 2 :

Report name	Low limit	Value	High limit
K_766	18.000	19.533	22.000
Li670	4.500	4.744	5.500
Na589	27.000	28.634	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 3:57:02 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	21.0	-12.5	37.5	4736.0	4736.0
# 2	30.0	2.5	50.5	4596.0	4596.0
Mean	25.5	-5.0	44.0	4666.0	4666.0
SD	6.4	10.6	9.2	99.0	99.0
%RSD	25.0	212.1	20.9	2.1	2.1

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 3:57:02 PM March 23, 2004

		K_766	Li670	Na589	Sc	Sc361
		ppm	ppm	ppm		ppm
# 1	L	-0.0555	0.0003	0.0359	4736.000 H	113.3765
# 2		0.0530	0.0043	0.0654	4596.000 H	110.0204
Mean	L	-0.0013	0.0023	0.0506	4666.000 H	111.6984
SD		0.0767	0.0028	0.0209	98.995	2.3731
%RSD		6101.8442	123.3740	41.2328	2.122	2.1246

Checking calibration blank ...
Identity 1 : Calibration blank Identity 2 :

Report name	CRDL	Value	
K_766	0.100	-0.001	
Li670	0.010	0.002	
Na589	0.050	0.051	Contaminated
Sc361	0.000	111.698	

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 241728 df500 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 4:00:10 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	10457.5	-9.5	66.5	4608.5	4608.5
# 2	10198.5	-14.5	42.5	4476.5	4476.5
Mean	10328.0	-12.0	54.5	4542.5	4542.5
SD	183.1	3.5	17.0	93.3	93.3
%RSD	1.8	29.5	31.1	2.1	2.1

APPARENT CONCENTRATIONS
Identity 1 : 241728 df500 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 4:00:10 PM March 23, 2004

		K_766 ppm		Li670 ppm	Na589 ppm		Sc		Sc361 ppm
# 1	H	117.3153		0.0010	0.0985		4608.500	H	110.3200
# 2	H	117.7846	L	-0.0005	0.0510		4476.500	H	107.1557

EVOLUTION by Micro-Active Australia Pty Ltd 4:10:42 PM March 23, 2004

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Mean	H	117.5500		0.0003	0.0748		4542.500	H	108.7379
SD		0.3318		0.0010	0.0336		93.338		2.2375
%RSD		0.2823		375.2706	44.8992		2.055		2.0577

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 241729 df500 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 4:03:18 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	9452.5	-25.5	35.0	4607.5	4607.5
# 2	9340.5	-18.5	43.0	4524.5	4524.5
Mean	9396.5	-22.0	39.0	4566.0	4566.0
SD	79.2	4.9	5.7	58.7	58.7
%RSD	0.8	22.5	14.5	1.3	1.3

APPARENT CONCENTRATIONS
Identity 1 : 241729 df500 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 4:03:18 PM March 23, 2004

		K_766 ppm		Li670 ppm	Na589 ppm		Sc		Sc361 ppm
# 1	H	106.0366	L	-0.0033	0.0328		4607.500	H	110.2961
# 2	H	106.7041	L	-0.0015	0.0511		4524.500	H	108.3064
Mean	H	106.3704	L	-0.0024	0.0420		4566.000	H	109.3012
SD		0.4720		0.0013	0.0130		58.690		1.4069
%RSD		0.4438		52.7051	30.9256		1.285		1.2872

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 4:08:38 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1775.5	17341.5	13769.5	4649.5	4649.5
# 2	1731.5	16963.5	13456.5	4515.5	4515.5
Mean	1753.5	17152.5	13613.0	4582.5	4582.5
SD	31.1	267.3	221.3	94.8	94.8
%RSD	1.8	1.6	1.6	2.1	2.1

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 4:08:38 PM March 23, 2004

		K_766 ppm		Li670 ppm	Na589 ppm		Sc		Sc361 ppm
# 1		19.5052		4.6942	28.4517		4649.500	H	111.3029
# 2		19.5875		4.7281	28.6304		4515.500	H	108.0906
Mean		19.5463		4.7112	28.5411		4582.500	H	109.6968
SD		0.0582		0.0240	0.1263		94.752		2.2714
%RSD		0.2977		0.5091	0.4426		2.068		2.0706

Checking calibration verification ...
Identity 1 : CLP_CCV_SC Identity 2 :

Report name	Low limit	Value	High limit
K_766	18.000	19.546	22.000

Li670	4.500	4.711	5.500
Na589	27.000	28.541	33.000

EVOLUTION by Micro-Active Australia Pty Ltd 4:18:00 PM March 23, 2004

010048

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 4:12:52 PM March 23, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	18.5	0.5	37.0	4757.5	4757.5
# 2	20.5	3.5	36.0	4625.5	4625.5
Mean	19.5	2.0	36.5	4691.5	4691.5
SD	1.4	2.1	0.7	93.3	93.3
%RSD	7.3	106.1	1.9	2.0	2.0

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 4:12:52 PM March 23, 2004

		K_766	Li670	Na589	Sc		Sc361
		ppm	ppm	ppm			ppm
# 1	L	-0.0838	0.0037	0.0345	4757.500	H	113.8919
# 2	L	-0.0556	0.0046	0.0346	4625.500	H	110.7276
Mean	L	-0.0697	0.0042	0.0346	4691.500	H	112.3097
SD		0.0199	0.0006	0.0000	93.338		2.2375
%RSD		28.5712	13.9487	0.1132	1.990		1.9923

Checking calibration blank ...
Identity 1 : Calibration blank Identity 2 :

Report name	CRDL	Value
K_766	0.100	-0.070
Li670	0.010	0.004
Na589	0.050	0.035
Sc361	0.000	112.310

010049

ICP ANALYSIS

For Cr, Co, Fe, Mo, Ni, W, Na

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
06002.01.081	Div 20	040304-12	3-22-04	Liquid	SG 085

INSTRUMENT: TRACE FILENAME: ~~B430A~~ B040304 12
Div20040304(12)

INSTRUMENT DL:

Method: DAILY2 Standard: blk
Run Time: 03/22/04 09:14:23

010050

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Avge	-.0000	.0004	-.0001	.0000	-.0000	-.0001	-.0000
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	459.1	1.861	43.09	.3637	20.56	1.779	108.4
#1	-.0000	.0004	-.0000	.0000	-.0000	-.0001	-.0000
#2	.0000	.0004	-.0001	.0000	-.0000	-.0001	-.0000

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Avge	.0000	-.0000	-.0000	.0000	.0004	.0000	.0003
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	20.56	212.6	130.5	275.5	1.491	26.02	2.310
#1	.0000	-.0000	-.0000	.0000	.0004	.0000	.0003
#2	.0000	.0000	-.0000	-.0000	.0004	.0000	.0003

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Avge	-.0000	.0001	-.0000	.0000	-.0000	-.0002	-.0112
SDev	.0000	.0000	.0000	.0000	.0001	.0000	.0001
%RSD	427.2	14.42	105.9	38.23	141.4	.5487	.9234
#1	-.0000	.0001	-.0000	.0000	.0000	-.0002	-.0113
#2	.0000	.0001	-.0000	.0000	-.0001	-.0002	-.0111

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Avge	-.0000	.0000	.0002	.0000	.0000	.0001	-.0013
SDev	.0000	.0000	.0001	.0000	.0000	.0000	.0000
%RSD	274.4	9.066	61.96	70.44	11.42	22.54	1.451
#1	-.0000	.0000	.0001	.0000	.0001	.0001	-.0013
#2	.0000	.0000	.0003	.0000	.0000	.0001	-.0013

Elem	Sc3613	1960/1	1960/2	Si2881	Sn1899	Sr4215	Th2837
Avge	77.10	-.0002	.0002	.0019	-.0000	.0000	.0000
SDev	.28	.0001	.0000	.0000	.0000	.0000	.0000
%RSD	.3618	35.97	19.05	.3793	80.57	54990.	24.37
#1	77.30	-.0001	.0002	.0019	-.0000	-.0000	.0000
#2	76.90	-.0002	.0002	.0018	-.0000	.0000	.0000

Elem	Ti3349	Tl1908	U_4090	V_2924	W_2079	Y_3710	Zn2062
Avge	-.0001	-.0004	-.0004	-.0000	.0003	.0000	-.0000
SDev	.0000	.0001	.0001	.0000	.0000	.0000	.0000
%RSD	21.97	13.54	25.40	18.64	11.79	.0000	427.2
#1	-.0002	-.0004	-.0005	-.0000	.0004	.0000	-.0000
#2	-.0001	-.0003	-.0003	-.0000	.0003	.0000	.0000

Elem	Zr3496
Avge	.0001
SDev	.0001
%RSD	37.29
#1	.0001
#2	.0002

3-22-04

3/29/04

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	770924	10000	--	--	--	--	--
SDev	2803.678	.0000000	--	--	--	--	--
%RSD	.3636774	.0000000	--	--	--	--	--
#1	772907	10000	--	--	--	--	--
#2	768942	10000	--	--	--	--	--

Standardization Rpt. 03/22/04 09:24:25 AM

Method: DAILY2 Standard: clp_std4
Run Time: 03/22/04 09:19:41

Elem	Ag3280	As1890	2203/1	2203/2	Sb2068	1960/1	1960/2
Avge	.0822	.1247	.3447	.2948	.1873	.2535	.2591
SDev	.0000	.0004	.0015	.0016	.0007	.0009	.0016
%RSD	.0372	.3252	.4417	.5318	.3805	.3765	.6346
#1	.0821	.1244	.3458	.2937	.1868	.2542	.2580
#2	.0822	.1250	.3436	.2959	.1878	.2528	.2603

Elem	Tl1908
Avge	.2472
SDev	.0009
%RSD	.3514
#1	.2466
#2	.2478

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	754396	10000	--	--	--	--	--
SDev	99.70206	.0000000	--	--	--	--	--
%RSD	.0132161	.0000000	--	--	--	--	--
#1	754467	10000	--	--	--	--	--
#2	754326	10000	--	--	--	--	--

010053

Method: DAILY2 Standard: clp_std1
Run Time: 03/22/04 09:24:37

Elem	Al3082	Ca3179	Fe2714	K_7664	Li6707	Mg2790	Na3302
Avge	.1134	.2144	.1096	.1939	3.324	.0931	.0092
SDev	.0002	.0008	.0004	.0008	.014	.0003	.0000
%RSD	.2017	.3552	.3640	.4268	.4323	.3772	.2065
#1	.1136	.2139	.1093	.1945	3.334	.0928	.0092
#2	.1133	.2150	.1099	.1933	3.314	.0933	.0092

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	747566	10000	--	--	--	--	--
SDev	624.3753	.0000000	--	--	--	--	--
%RSD	.0835210	.0000000	--	--	--	--	--
#1	748008	10000	--	--	--	--	--
#2	747125	10000	--	--	--	--	--

Standardization Rpt. 03/22/04 09:32:51 AM

Method: DAILY2 Standard: clp_std5
Run Time: 03/22/04 09:28:50

Elem	B_2496	Bi2230	Mo2020	P_1782	Si2881	Sn1899	Sr4215
Avge	.1756	.0357	.3591	.0205	.1787	.1764	2.562
SDev	.0007	.0001	.0005	.0003	.0002	.0002	.000
%RSD	.4226	.3387	.1480	1.208	.0873	.1042	.0129
#1	.1751	.0358	.3587	.0203	.1788	.1765	2.562
#2	.1762	.0357	.3594	.0206	.1786	.1763	2.563

Elem	Ti3349
Avge	2.667
SDev	.003
%RSD	.1096
#1	2.664
#2	2.669

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	758628	10000	--	--	--	--	--
SDev	3420.275	.0000000	--	--	--	--	--
%RSD	.4508505	.0000000	--	--	--	--	--
#1	756209	10000	--	--	--	--	--
#2	761046	10000	--	--	--	--	--

Standardization Rpt. 03/22/04 09:36:43 AM page 1

Method: DAILY2 Standard: clp_std2
Run Time: 03/22/04 09:33:03

Elem	Ba4934	Be3130	Cr2677	Cu3247	Ni2316
Avge	1.120	1.378	.4264	.3191	.3807
SDev	.002	.001	.0005	.0001	.0002
%RSD	.1613	.0697	.1246	.0472	.0445
#1	1.119	1.379	.4267	.3192	.3808
#2	1.121	1.377	.4260	.3190	.3805

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	759748	10000	--	--	--	--	--
SDev	2906.916	.0000000	--	--	--	--	--
%RSD	.3826161	.0000000	--	--	--	--	--
#1	757692	10000	--	--	--	--	--
#2	761803	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std3
Run Time: 03/22/04 09:36:55

010056

Elem	Cd2265	Co2286	Mn2576	V_2924	Zn2062
Avge	1.055	.2304	.8898	.2001	.3243
SDev	.004	.0008	.0022	.0004	.0021
%RSD	.4255	.3373	.2515	.1790	.6507
#1	1.051	.2298	.8882	.1999	.3228
#2	1.058	.2309	.8914	.2004	.3258

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	769262	10000	--	--	--	--	--
SDev	2085.965	.0000000	--	--	--	--	--
%RSD	.2711645	.0000000	--	--	--	--	--
#1	767787	10000	--	--	--	--	--
#2	770737	10000	--	--	--	--	--

Standardization Rpt. 03/22/04 09:45:31 AM

Method: DAILY2 Standard: clp_std6
Run Time: 03/22/04 09:41:08

Elem	La3988	Na5889	Pd3404	S_1820	Th2837	U_4090	W_2079
Avge	.4820	.0475	.2124	.0356	.1161	.0719	.2285
SDev	.0000	.0003	.0001	.0002	.0001	.0001	.0001
%RSD	.0065	.5659	.0704	.4952	.0671	.2011	.0439
#1	.4820	.0473	.2123	.0355	.1160	.0718	.2284
#2	.4819	.0477	.2125	.0357	.1161	.0720	.2285

Elem	Y_3710	Zr3496
Avge	.7879	1.918
SDev	.0001	.001
%RSD	.0176	.0281
#1	.7880	1.919
#2	.7878	1.918

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	761682	10000	--	--	--	--	--
SDev	975.1003	.0000000	--	--	--	--	--
%RSD	.1280193	.0000000	--	--	--	--	--
#1	760993	10000	--	--	--	--	--
#2	762372	10000	--	--	--	--	--

010058

Standardization Report 03/22/04 09:45:32 AM page 1

Method: DAILY2 Slope = Conc(SIR)/IR

Element	Wavelen	High std	Low std	Slope	Y-intercept	Date Standardized
Ag3280	328.068	clp_std4	blk	24.3393	.000141	03/22/04 09:41:08
Al3082	308.215	clp_std1	blk	442.481	-.189701	03/22/04 09:41:08
As1890	189.042	clp_std4	blk	80.1764	.004476	03/22/04 09:41:08
B_2496	249.678	clp_std5	blk	56.9466	-.002585	03/22/04 09:41:08
Ba4934	493.409	clp_std2	blk	8.92963	.000203	03/22/04 09:41:08
Be3130	313.042	clp_std2	blk	3.62867	.000311	03/22/04 09:41:08
Bi2230	223.061	clp_std5	blk	138.578	.003857	03/22/04 09:41:08
Ca3179	317.933	clp_std1	blk	233.215	-.003178	03/22/04 09:41:08
Cd2265	226.502	clp_std3	blk	9.48028	.000024	03/22/04 09:41:08
Co2286	228.616	clp_std3	blk	43.4072	.000730	03/22/04 09:41:08
Cr2677	267.716	clp_std2	blk	23.4550	-.000257	03/22/04 09:41:08
Cu3247	324.753	clp_std2	blk	31.3727	-.012412	03/22/04 09:41:08
Fe2714	271.441	clp_std1	blk	456.589	-.017463	03/22/04 09:41:08
K_7664	766.491	clp_std1	blk	258.260	-.073033	03/22/04 09:41:08
La3988	398.853	clp_std6	blk	20.7666	.000174	03/22/04 09:41:08
Li6707	670.784	clp_std1	blk	3.00861	-.000334	03/22/04 09:41:08
Mg2790	279.078	clp_std1	blk	268.531	.001391	03/22/04 09:41:08
Mn2576	257.610	clp_std3	blk	11.2397	-.000160	03/22/04 09:41:08
Mo2020	202.030	clp_std5	blk	27.8520	.001050	03/22/04 09:41:08
Na3302	330.232	clp_std1	blk	5298.70	1.06533	03/22/04 09:41:08
Na5889	588.991	clp_std6	blk	17.1315	.191673	03/22/04 09:41:08
Ni2316	231.604	clp_std2	blk	26.2694	.000254	03/22/04 09:41:08
P_1782	178.287	clp_std5	blk	489.676	-.014289	03/22/04 09:41:08
2203/1	220.351	clp_std4	blk	29.0294	-.005749	03/22/04 09:41:08
2203/2	220.352	clp_std4	blk	33.9216	-.000703	03/22/04 09:41:08
Pd3404	340.458	clp_std6	blk	48.3430	-.002257	03/22/04 09:41:08
S_1820	182.040	clp_std6	blk	281.130	-.018606	03/22/04 09:41:08
Sb2068	206.838	clp_std4	blk	53.0122	.069657	03/22/04 09:41:08
Sc3613	361.384	blk	dark	1.29700	.000000	03/22/04 09:41:08
1960/1	196.021	clp_std4	blk	39.4239	.006704	03/22/04 09:41:08
1960/2	196.022	clp_std4	blk	38.6192	-.007662	03/22/04 09:41:08
Si2881	288.158	clp_std5	blk	56.3307	-.104305	03/22/04 09:41:08
Pb220	220.353	NONE	NONE	1.00000	.000000	*NOT STANDARDIZED
Se196	196.026	NONE	NONE	1.00000	.000000	*NOT STANDARDIZED
Sn1899	189.989	clp_std5	blk	56.7212	.000514	03/22/04 09:41:08
Sr4215	421.552	clp_std5	blk	3.90251	-.000000	03/22/04 09:41:08
Th2837	283.730	clp_std6	blk	89.9479	-.003093	03/22/04 09:41:08
Ti3349	334.941	clp_std5	blk	3.75006	.000554	03/22/04 09:41:08
Tl1908	190.864	clp_std4	blk	40.3825	.015449	03/22/04 09:41:08
U_4090	409.014	clp_std6	blk	146.191	.059327	03/22/04 09:41:08
V_2924	292.402	clp_std3	blk	49.9592	.002170	03/22/04 09:41:08
W_2079	207.914	clp_std6	blk	21.9095	-.007274	03/22/04 09:41:08
Y_3710	371.030	clp_std6	blk	12.6893	.000000	03/22/04 09:41:08
Zn2062	206.200	clp_std3	blk	30.8400	.000040	03/22/04 09:41:08
Zr3496	349.621	clp_std6	blk	5.69842	-.000821	03/22/04 09:41:08

Analysis Report QC Standard 03/22/04 09:50:51 AM page 1

Method: DAILY2 Sample Name: icv/ccv Operator:
Run Time: 03/22/04 09:45:44
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.013	9.953	5.128	4.800	10.22	1.008	4.919
SDev	.001	.003	.007	.011	.01	.001	.014
%RSD	.0515	.0344	.1304	.2252	.0997	.0523	.2925
#1	1.013	9.955	5.123	4.793	10.22	1.008	4.909
#2	1.014	9.950	5.132	4.808	10.23	1.007	4.929
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.02	1.013	5.013	1.992	2.039	10.10	18.84
SDev	.04	.001	.004	.002	.000	.01	.01
%RSD	.2029	.1039	.0837	.0868	.0059	.0957	.0484
#1	20.05	1.014	5.016	1.994	2.039	10.11	18.83
#2	19.99	1.013	5.010	1.991	2.039	10.09	18.85
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	20.00	1.000	5.000	2.000	2.000	10.00	20.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.006	4.742	20.08	1.019	5.011	28.09	Q41.99
SDev	.005	.004	.02	.000	.004	.03	.03
%RSD	.1077	.0932	.1228	.0252	.0840	.1192	.0612
#1	5.010	4.739	20.10	1.019	5.008	28.11	Q42.01
#2	5.002	4.746	20.06	1.019	5.014	28.06	Q41.97
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail
Value	5.000	5.000	20.00	1.000	5.000	30.00	30.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.946	4.827	4.925	4.943	1.020	.9848	.9906
SDev	.002	.081	.011	.000	.001	.0106	.0006
%RSD	.0370	1.682	.2246	.0096	.1108	1.074	.0626
#1	4.948	4.769	4.917	4.943	1.020	.9923	.9902
#2	4.945	4.884	4.933	4.943	1.019	.9774	.9910
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass
Value	5.000	5.000			1.000	1.000	1.000
Range	10.00	10.00			10.00	10.00	10.00

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.83	5.314	5.330	5.028	4.937	5.324	4.877
SDev	.26	.002	.011	.002	.004	.008	.002
%RSD	.2733	.0466	.2053	.0465	.0810	.1525	.0334
#1	96.64	5.312	5.322	5.026	4.934	5.319	4.878
#2	97.01	5.316	5.337	5.029	4.940	5.330	4.876
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				5.000	5.000	5.000	5.000
Range				10.00	10.00	10.00	10.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.086	.9820	4.859	5.218	.9824	5.010	.9987
SDev	.002	.0017	.000	.020	.0083	.001	.0030
%RSD	.0395	.1700	.0066	.3918	.8481	.0190	.2989
#1	5.088	.9832	4.859	5.203	.9883	5.011	.9966
#2	5.085	.9808	4.859	5.232	.9765	5.010	1.001
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000	5.000	1.000	5.000	1.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.973	1.019	4.956
SDev	.004	.000	.005
%RSD	.0863	.0197	.1085
#1	4.976	1.019	4.959
#2	4.970	1.020	4.952
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	746470	10000	--	--	--	--	--
SDev	2073.237	.0000000	--	--	--	--	--
%RSD	.2777388	.0000000	--	--	--	--	--
#1	745004	10000	--	--	--	--	--
#2	747936	10000	--	--	--	--	--

Analysis Report Blank Sample 03/22/04 09:58:32 AM page 1

Method: DAILY2 Sample Name: icb/ccb Operator:
Run Time: 03/22/04 09:53:26
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0010	.0012	.0029	-.0000	-.0000	.0046
SDev	.0001	.0017	.0005	.0003	.0000	.0000	.0013
%RSD	13.90	181.0	40.92	9.494	88.52	155.6	27.63
#1	-.0006	-.0003	.0016	.0031	-.0000	.0000	.0037
#2	-.0008	.0022	.0009	.0027	-.0000	-.0000	H.0055
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	.0000	-.0003	-.0004	.0002	.0020	-.0045
SDev	.0005	.0001	.0002	.0002	.0001	.0099	.0030
%RSD	58.66	2700.	79.35	47.89	20.83	494.1	66.33
#1	.0011	-.0001	-.0001	-.0002	.0002	.0090	-.0066
#2	.0005	.0001	-.0004	-.0005	.0003	-.0050	-.0024
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0002	.0006	-.0001	.0014	H.1487	.0026
SDev	.0002	.0001	.0014	.0000	.0006	.1057	.0033
%RSD	261.4	42.31	247.4	18.26	45.76	71.11	125.1
#1	.0001	.0003	-.0004	-.0001	.0009	H.2234	.0003
#2	-.0002	.0001	.0016	-.0000	.0018	H.0739	.0049
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0008	-.0024	-.0023	-.0017	-.0006	-.0083	.0026
SDev	.0006	.0150	.0001	.0010	.0009	.0136	.0005
%RSD	79.03	622.0	5.198	58.74	148.0	163.9	20.16
#1	-.0013	.0082	-.0024	-.0024	-.0013	.0013	.0030
#2	-.0004	L-.0130	-.0022	-.0010	.0000	L-.0179	.0022
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.68	-.0041	-.0005	-.0001	-.0019	-.0017	.0004
SDev	1.20	.0024	.0042	.0025	.0007	.0020	.0026
%RSD	1.207	59.67	782.0	1803.	37.23	116.4	685.7
#1	98.83	-.0058	.0024	-.0019	-.0024	-.0003	.0022
#2	100.5	-.0024	-.0035	.0016	-.0014	-.0031	-.0015
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0005	.0001	.0010	.0058	-.0002	-.0022
SDev	.0000	.0006	.0000	.0019	.0019	.0002	.0017
%RSD	111.2	112.3	13.56	191.7	32.97	158.8	76.43
#1	.0000	.0001	.0001	-.0003	.0071	.0000	-.0010
#2	.0000	.0010	.0001	.0023	.0044	-.0003	-.0035
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0001	-.0001
SDev	.0000	.0001	.0002
%RSD	36.37	239.6	276.4
#1	.0001	-.0000	-.0002
#2	.0000	.0002	.0001
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	768400	10000	--	--	--	--	--
SDev	9270.170	.0000000	--	--	--	--	--
%RSD	1.206425	.0000000	--	--	--	--	--
#1	761845	10000	--	--	--	--	--
#2	774955	10000	--	--	--	--	--

Analysis Report 03/22/04 10:03:50 AM

Method: DAILY2 Sample Name: pbw-C09E1 pg56-085 Operator:
Run Time: 03/22/04 09:58:44
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0116	-.0012	.0025	-.0001	-.0001	.0022
SDev	.0000	.0061	.0017	.0006	.0001	.0000	.0013
%RSD	2.493	52.48	139.5	23.49	134.6	33.94	59.60
#1	-.0002	.0159	-.0000	.0021	-.0001	-.0001	.0013
#2	-.0002	.0073	-.0024	.0029	-.0000	-.0001	.0031
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0240	.0001	.0033	-.0006	.0013	.0038	.0140
SDev	.0004	.0000	.0003	.0009	.0003	.0075	.0032
%RSD	1.868	37.35	10.68	144.7	26.54	197.9	22.99
#1	.0244	.0001	.0031	-.0013	.0010	.0091	.0163
#2	.0237	.0001	.0036	.0000	.0015	-.0015	.0117
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	.0003	.0070	-.0000	.0006	H.1765	.0053
SDev	.0005	.0000	.0002	.0001	.0001	.3038	.0066
%RSD	149.1	3.691	3.341	408.9	9.447	172.1	125.4
#1	.0007	.0003	.0069	-.0001	.0006	H.3914	.0100
#2	-.0000	.0002	.0072	.0001	.0006	-.0383	.0006
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0009	.0062	.0046	-.0022	.0021	.0070	.0009
SDev	.0004	.0011	.0040	.0042	.0016	.0048	.0018
%RSD	41.54	17.93	88.09	186.0	76.27	68.41	205.9
#1	-.0012	.0054	.0074	-.0052	.0033	.0036	.0022
#2	-.0007	.0070	.0017	.0007	.0010	H.0104	-.0004
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.21	.0023	-.0041	H.0111	.0001	-.0019	.0017
SDev	.80	.0019	.0029	.0014	.0014	.0013	.0001
%RSD	.8318	81.39	71.42	12.27	2614.	67.98	5.635
#1	96.77	.0036	-.0061	H.0121	-.0010	-.0029	.0018
#2	95.64	.0010	-.0020	H.0102	.0011	-.0010	.0017
Errors	NOCHECK	NOCHECK	NOCHECK	LC High	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0018	-.0001	.0023	.0193	-.0005	-.0002
SDev	.0000	.0048	.0003	.0018	.0092	.0003	.0008
%RSD	15.50	257.9	213.2	77.16	48.01	49.62	335.3
#1	.0001	-.0052	-.0003	.0035	.0258	-.0007	-.0008
#2	.0001	.0015	.0001	.0010	.0127	-.0003	.0003
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	H.0148	-.0003
SDev	.0002	.0008	.0005
%RSD	965.5	5.593	160.8
#1	-.0001	H.0142	-.0007
#2	.0001	H.0154	.0000
Errors	LC Pass	LC High	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	741669	10000	--	--	--	--	--
SDev	6127.788	.0000000	--	--	--	--	--
%RSD	.8262159	.0000000	--	--	--	--	--
#1	746002	10000	--	--	--	--	--
#2	737336	10000	--	--	--	--	--

Analysis Report 03/22/04 10:09:10 AM page 1

Method: DAILY2 Sample Name: lcsw-C09E1 Operator:
Run Time: 03/22/04 10:04:02
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0514	1.975	2.055	.0014	2.077	.0508	-.0002
SDev	.0011	.004	.003	.0003	.003	.0001	.0054
%RSD	2.223	.1777	.1221	19.89	.1662	.2532	3534.
#1	.0506	1.972	2.057	.0012	2.079	.0508	-.0040
#2	.0523	1.977	2.053	.0016	2.075	.0509	.0037

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.36	.0502	.5075	.2013	.2549	1.092	17.07
SDev	.02	.0000	.0026	.0001	.0003	.006	.03
%RSD	.0803	.0748	.5099	.0316	.1221	.5045	.1612
#1	20.35	.0502	.5057	.2013	.2547	1.088	17.09
#2	20.37	.0502	.5093	.2012	.2551	1.096	17.06

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0004	20.58	.5111	4.129	18.02	27.04
SDev	.0014	.0001	.02	.0003	.006	.05	.14
%RSD	871.2	19.88	.1180	.0638	.1466	.2730	.5292
#1	-.0012	.0004	20.56	.5109	4.125	17.99	27.14
#2	.0009	.0005	20.60	.5113	4.133	18.06	26.94

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4960	.0019	.4953	.4923	.0018	-.0081	.5016
SDev	.0030	.0052	.0013	.0045	.0005	.0016	.0010
%RSD	.6082	274.4	.2710	.9136	27.29	19.87	.2021
#1	.4939	.0055	.4944	.4892	.0021	-.0070	.5023
#2	.4981	-.0018	.4963	.4955	.0014	-.0092	.5009

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	93.24	2.047	2.037	-.0055	.4933	2.040	-.0001
SDev	.89	.002	.034	.0062	.0034	.022	.0015
%RSD	.9569	.0916	1.668	112.6	.6986	1.079	2395.
#1	93.87	2.048	2.013	-.0099	.4909	2.025	.0010
#2	92.61	2.045	2.061	-.0011	.4958	2.056	-.0011

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	-.0153	.0002	2.074	.0185	.5040	4.078
SDev	.0001	.0002	.0000	.012	.0301	.0003	.003
%RSD	8.660	1.471	3.789	.5707	162.8	.0587	.0642
#1	.0006	-.0151	.0002	2.065	-.0028	.5042	4.076
#2	.0007	-.0154	.0002	2.082	.0397	.5038	4.080

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.5104	.0002
SDev	.0000	.0024	.0005
%RSD	68.31	.4715	246.4
#1	-.0001	.5087	-.0002
#2	-.0000	.5121	.0006

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	718816	10000	--	--	--	--	--
SDev	6822.873	.0000000	--	--	--	--	--
%RSD	.9491828	.0000000	--	--	--	--	--
#1	723640	10000	--	--	--	--	--
#2	713991	10000	--	--	--	--	--

010070

Analysis Report 03/22/04 10:14:28 AM

Method: DAILY2 Sample Name: 241722 Operator:
Run Time: 03/22/04 10:09:21
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0147	.0002	.0031	.0002	-.0000	.0059
SDev	.0004	.0000	.0005	.0007	.0000	.0000	.0001
%RSD	145.2	.2339	249.2	23.47	20.44	23.41	2.325
#1	-.0000	.0147	-.0002	.0026	.0001	-.0000	.0058
#2	.0006	.0148	.0006	.0036	.0002	-.0000	.0059

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0328	.0001	.0041	.0005	.0005	.0095	16.40
SDev	.0005	.0000	.0006	.0004	.0006	.0009	.03
%RSD	1.578	26.28	14.47	71.08	107.8	9.451	.1728
#1	.0324	.0001	.0037	.0003	.0001	.0101	16.38
#2	.0332	.0002	.0045	.0008	.0009	.0088	16.42

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0004	.0071	.0001	.0033	.2591	.0642
SDev	.0000	.0000	.0036	.0000	.0001	.0235	.0005
%RSD	12.26	8.682	50.46	38.88	4.613	9.066	.7550
#1	.0003	.0004	.0046	.0001	.0035	.2425	.0639
#2	.0003	.0004	.0097	.0001	.0032	.2757	.0645

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	-.0007	-.0051	-.0011	-.0008	-.0019	.0065
SDev	.0003	.0061	.0013	.0005	.0008	.0060	.0049
%RSD	230.9	861.8	26.15	44.79	103.8	319.5	75.57
#1	-.0001	-.0050	-.0061	-.0014	-.0014	-.0061	.0099
#2	.0004	.0036	-.0042	-.0007	-.0002	.0023	.0030

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	95.88	-.0064	-.0009	.0422	-.0024	-.0027	.0036
SDev	.24	.0041	.0035	.0008	.0008	.0037	.0031
%RSD	.2466	64.05	385.1	1.783	31.91	135.8	85.30
#1	96.05	-.0094	-.0034	.0417	-.0030	-.0054	.0058
#2	95.72	-.0035	.0016	.0428	-.0019	-.0001	.0014

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0022	.0002	.0034	.0061	.0002	.0049
SDev	.0000	.0002	.0001	.0037	.0029	.0004	.0007
%RSD	3.777	8.591	52.32	108.8	47.85	153.2	13.54
#1	.0001	.0021	.0001	.0060	.0082	-.0000	.0053
#2	.0001	.0024	.0002	.0008	.0041	.0005	.0044

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0011	-.0002
SDev	.0001	.0001	.0001
%RSD	1213.	8.065	39.22
#1	-.0001	.0011	-.0002
#2	.0001	.0010	-.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	739268	10000	--	--	--	--	--
SDev	1826.457	.0000000	--	--	--	--	--
%RSD	.2470630	.0000000	--	--	--	--	--
#1	740559	10000	--	--	--	--	--
#2	737976	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 241723 Operator:
Run Time: 03/22/04 10:14:40
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0166	.0021	.0049	.0002	-.0000	.0005
SDev	.0006	.0011	.0031	.0000	.0000	.0000	.0011
%RSD	136.4	6.614	144.4	.8225	8.912	10.73	205.3
#1	-.0000	.0158	-.0000	.0050	.0002	-.0000	.0013
#2	-.0008	.0174	.0043	.0049	.0002	-.0000	-.0002

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0310	-.0000	.0036	.0024	.0047	.0185	35.81
SDev	.0018	.0001	.0013	.0010	.0004	.0166	.12
%RSD	5.735	6109.	34.83	40.03	8.434	89.55	.3402
#1	.0323	.0001	.0045	.0017	.0044	.0302	35.72
#2	.0297	-.0001	.0027	.0031	.0050	.0068	35.90

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0005	.0034	.0001	.0029	.2768	.1174
SDev	.0006	.0000	.0068	.0000	.0012	.1153	.0013
%RSD	1020.	4.098	199.1	4.438	40.83	41.66	1.084
#1	.0004	.0005	.0082	.0001	.0037	.3584	.1165
#2	-.0003	.0004	-.0014	.0001	.0021	.1953	.1183

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0080	.0019	-.0010	.0002	.0011	.0036	.0026
SDev	.0007	.0071	.0046	.0001	.0022	.0031	.0027
%RSD	8.922	368.9	470.1	59.55	187.6	84.73	101.3
#1	.0075	.0069	.0023	.0001	.0027	.0058	.0007
#2	.0085	-.0031	-.0043	.0002	-.0004	.0014	.0045

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.04	-.0042	-.0012	.0684	-.0002	-.0022	.0019
SDev	.52	.0001	.0013	.0022	.0015	.0008	.0015
%RSD	.5394	3.266	103.5	3.162	705.2	36.65	75.82
#1	95.67	-.0043	-.0003	.0699	.0008	-.0016	.0030
#2	96.41	-.0041	-.0022	.0668	-.0013	-.0028	.0009

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0010	.0002	.0013	.0139	.0006	.0007
SDev	.0000	.0033	.0000	.0014	.0233	.0000	.0010
%RSD	10.45	343.4	13.67	110.4	168.4	3.206	133.0
#1	.0003	-.0014	.0002	.0023	.0304	.0006	.0014
#2	.0003	.0033	.0002	.0003	-.0026	.0006	.0000

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Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0052	-.0001
SDev	.0001	.0002	.0003
%RSD	57.99	4.481	310.3
#1	.0001	.0053	-.0003
#2	.0002	.0050	.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	740419	10000	--	--	--	--	--
SDev	3934.342	.0000000	--	--	--	--	--
%RSD	.5313670	.0000000	--	--	--	--	--
#1	737637	10000	--	--	--	--	--
#2	743201	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 241723d Operator:
Run Time: 03/22/04 10:19:58
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0271	.0020	.0037	.0002	-.0000	.0044
SDev	.0007	.0079	.0004	.0003	.0000	.0000	.0042
%RSD	132.8	29.04	22.61	8.762	22.39	45.91	94.54
#1	.0010	.0327	.0017	.0039	.0001	-.0000	.0015
#2	.0000	.0215	.0023	.0035	.0002	-.0001	.0073

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0323	.0002	.0042	.0023	.0047	.0285	35.63
SDev	.0014	.0001	.0003	.0006	.0004	.0044	.01
%RSD	4.219	58.33	7.760	26.17	9.005	15.34	.0287
#1	.0333	.0002	.0044	.0019	.0050	.0315	35.63
#2	.0313	.0001	.0040	.0027	.0044	.0254	35.64

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0014	.0005	.0108	.0000	.0031	.3553	.1088
SDev	.0009	.0000	.0076	.0001	.0005	.2106	.0044
%RSD	63.29	3.246	70.51	261.7	15.10	59.27	4.008
#1	.0020	.0005	.0162	-.0000	.0028	.5043	.1119
#2	.0008	.0005	.0054	.0001	.0034	.2064	.1057

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0075	.0097	.0022	-.0018	.0043	.0068	.0011
SDev	.0001	.0006	.0013	.0033	.0021	.0047	.0011
%RSD	1.794	5.671	60.72	187.2	48.00	69.80	94.12
#1	.0076	.0093	.0031	-.0041	.0058	.0034	.0004
#2	.0074	.0100	.0012	.0006	.0029	.0101	.0019

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	94.04	-.0001	-.0030	.0752	-.0004	-.0020	.0018
SDev	.20	.0060	.0020	.0051	.0018	.0007	.0015
%RSD	.2139	8674.	66.40	6.803	406.2	34.89	83.89
#1	94.18	.0042	-.0044	.0788	-.0017	-.0015	.0007
#2	93.90	-.0043	-.0016	.0716	.0008	-.0025	.0029

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	-.0021	.0001	.0017	.0552	.0003	.0018
SDev	.0000	.0036	.0001	.0013	.0377	.0004	.0012
%RSD	12.83	173.9	186.8	76.79	68.14	137.1	67.77
#1	.0004	-.0046	-.0000	.0008	.0819	.0005	.0027
#2	.0003	.0005	.0002	.0027	.0286	.0000	.0009

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0053	.0000
SDev	.0000	.0003	.0003
%RSD	2.364	4.850	13120.
#1	.0000	.0055	-.0002
#2	.0000	.0052	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	725010	10000	--	--	--	--	--
SDev	1527.351	.0000000	--	--	--	--	--
%RSD	.2106661	.0000000	--	--	--	--	--
#1	726090	10000	--	--	--	--	--
#2	723930	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 241724 Operator:
Run Time: 03/22/04 10:25:17
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0127	.0026	.0057	.0000	-.0000	.0016
SDev	.0004	.0035	.0000	.0004	.0000	.0000	.0026
%RSD	350.4	27.83	.4765	7.496	108.5	45.53	161.6
#1	-.0002	.0102	.0026	.0060	.0001	-.0000	.0035
#2	.0004	.0151	.0026	.0054	.0000	-.0000	-.0002

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0254	.0000	.0039	-.0004	.0011	.0031	44.44
SDev	.0001	.0001	.0000	.0001	.0002	.0079	.09
%RSD	.3294	198.3	.5276	24.98	17.18	255.5	.2128
#1	.0255	.0001	.0039	-.0004	.0012	.0087	44.37
#2	.0254	-.0000	.0039	-.0003	.0009	-.0025	44.51

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0005	.0058	.0000	.0008	.3346	.2579
SDev	.0007	.0000	.0031	.0000	.0006	.0746	.0042
%RSD	404.9	5.799	54.10	53.30	79.50	22.30	1.641
#1	-.0003	.0005	.0036	.0000	.0013	.2818	.2549
#2	.0006	.0005	.0080	.0000	.0004	.3874	.2609

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0124	.0013	-.0008	.0009	.0132	.0015
SDev	.0010	.0027	.0023	.0012	.0008	.0170	.0014
%RSD	1289.	21.58	176.7	148.2	90.93	128.3	95.09
#1	.0008	.0105	.0029	-.0017	.0015	.0252	.0025
#2	-.0006	.0143	-.0003	.0000	.0003	.0012	.0005

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	95.13	-.0030	.0007	.1263	-.0001	-.0005	.0026
SDev	.51	.0023	.0015	.0005	.0001	.0018	.0003
%RSD	.5333	75.58	223.8	.4289	65.25	328.5	11.38
#1	94.77	-.0014	.0018	.1266	-.0002	.0007	.0028
#2	95.48	-.0046	-.0004	.1259	-.0001	-.0018	.0024

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0008	.0001	-.0022	.0193	-.0001	.0019
SDev	.0000	.0016	.0000	.0016	.0243	.0006	.0029
%RSD	4.114	195.4	19.99	71.17	126.1	914.1	152.6
#1	.0001	-.0003	.0002	-.0034	.0021	-.0005	-.0002
#2	.0002	.0020	.0001	-.0011	.0365	.0004	.0040

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0013	-.0004
SDev	.0000	.0001	.0004
%RSD	.0602	10.04	93.70
#1	.0001	.0013	-.0007
#2	.0001	.0012	-.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	733402	10000	--	--	--	--	--
SDev	3910.300	.0000000	--	--	--	--	--
%RSD	.5331729	.0000000	--	--	--	--	--
#1	730637	10000	--	--	--	--	--
#2	736167	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 241725 Operator:
Run Time: 03/22/04 10:30:35
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0309	.0054	.0114	.0002	-.0000	.0045
SDev	.0001	.0017	.0011	.0003	.0000	.0000	.0087
%RSD	57.36	5.390	19.73	2.216	3.554	2.288	192.5
#1	-.0001	.0297	.0046	.0112	.0002	-.0000	.0106
#2	-.0003	.0320	.0061	.0116	.0003	-.0000	-.0016

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.5135	.0000	.0040	.0021	.0017	.0341	37.06
SDev	.0004	.0003	.0007	.0004	.0001	.0045	.01
%RSD	.0752	3040.	17.69	19.42	3.597	13.17	.0394
#1	.5132	-.0002	.0045	.0018	.0016	.0309	37.05
#2	.5137	.0002	.0035	.0024	.0017	.0373	37.07

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0005	.0088	.0002	.0000	.3361	.1276
SDev	.0001	.0000	.0041	.0001	.0004	.1002	.0007
%RSD	148.2	1.483	46.78	33.37	4545.	29.82	.5183
#1	-.0002	.0005	.0059	.0002	-.0003	.4070	.1281
#2	.0000	.0005	.0117	.0003	.0003	.2652	.1271

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0036	.0151	.0052	-.0003	.0024	-.0002	.0022
SDev	.0001	.0052	.0010	.0004	.0023	.0014	.0011
%RSD	3.028	34.36	18.82	135.2	98.26	785.9	52.63
#1	.0036	.0188	.0045	-.0000	.0040	-.0012	.0014
#2	.0037	.0115	.0059	-.0006	.0007	.0008	.0030

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	93.88	-.0046	-.0002	.1913	.0015	-.0017	.0010
SDev	.21	.0031	.0038	.0011	.0000	.0015	.0016
%RSD	.2188	67.16	1854.	.5889	2.876	90.83	159.1
#1	94.02	-.0024	-.0029	.1921	.0015	-.0027	-.0001
#2	93.73	-.0069	.0025	.1905	.0016	-.0006	.0022

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	.0019	.0153	.0035	.0137	.0003	.0006
SDev	.0000	.0012	.0002	.0038	.0067	.0004	.0023
%RSD	2.242	61.69	1.303	107.7	48.83	131.0	384.2
#1	.0006	.0028	.0152	.0062	.0184	.0000	.0022
#2	.0006	.0011	.0154	.0008	.0089	.0006	-.0010

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0002	.0049	.0000
SDev	.0000	.0003	.0002
%RSD	6.864	5.183	1186.
#1	.0002	.0047	-.0001
#2	.0002	.0050	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	723747	10000	--	--	--	--	--
SDev	1528.765	.0000000	--	--	--	--	--
%RSD	.2112292	.0000000	--	--	--	--	--
#1	724828	10000	--	--	--	--	--
#2	722666	10000	--	--	--	--	--

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Analysis Report 03/22/04 10:41:00 AM

Method: DAILY2 Sample Name: 241725s Operator:
Run Time: 03/22/04 10:35:54
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0520	2.029	2.066	.0106	2.068	.0510	-.0022
SDev	.0002	.001	.005	.0008	.000	.0001	.0025
%RSD	.4215	.0686	.2222	7.560	.0234	.2475	110.8
#1	.0522	2.028	2.070	.0100	2.068	.0511	-.0005
#2	.0519	2.030	2.063	.0111	2.069	.0509	-.0040

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	21.64	.0505	.5140	.2036	.2595	1.130	61.34
SDev	.02	.0001	.0006	.0005	.0007	.004	.19
%RSD	.1014	.1921	.1125	.2407	.2816	.3211	.3150
#1	21.66	.0504	.5136	.2033	.2590	1.127	61.21
#2	21.62	.0506	.5144	.2040	.2600	1.132	61.48

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	.0007	21.51	.5112	4.191	19.89	31.11
SDev	.0007	.0000	.01	.0001	.011	.27	.09
%RSD	89.08	1.896	.0604	.0146	.2662	1.351	.2745
#1	.0013	.0007	21.52	.5113	4.183	19.70	31.05
#2	.0003	.0007	21.50	.5112	4.199	20.08	31.17

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.5033	.0020	.4971	.4991	.0036	-.0013	.5053
SDev	.0006	.0112	.0022	.0008	.0006	.0017	.0045
%RSD	.1132	552.0	.4521	.1509	17.80	131.7	.8972
#1	.5029	-.0059	.4987	.4996	.0041	-.0025	.5085
#2	.5037	.0099	.4955	.4985	.0032	-.0001	.5021

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	92.49	2.054	2.089	.1641	.4984	2.077	.0038
SDev	.06	.001	.004	.0014	.0013	.003	.0011
%RSD	.0658	.0636	.1873	.8815	.2510	.1466	29.40
#1	92.54	2.055	2.092	.1631	.4993	2.080	.0046
#2	92.45	2.053	2.087	.1651	.4975	2.075	.0030

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0012	-.0131	.0154	2.078	.0335	.5026	4.130
SDev	.0000	.0011	.0001	.017	.0058	.0008	.010
%RSD	1.575	8.117	.7219	.8051	17.24	.1655	.2432
#1	.0012	-.0124	.0153	2.067	.0295	.5032	4.137
#2	.0012	-.0139	.0154	2.090	.0376	.5020	4.123

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.5196	.0004
SDev	.0000	.0008	.0004
%RSD	129.4	.1612	114.3
#1	-.0000	.5202	.0007
#2	-.0000	.5190	.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	713048	10000	--	--	--	--	--
SDev	441.9417	.0000000	--	--	--	--	--
%RSD	.0619792	.0000000	--	--	--	--	--
#1	713361	10000	--	--	--	--	--
#2	712736	10000	--	--	--	--	--

010082

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Method: DAILY2 Sample Name: 241726 Operator:
Run Time: 03/22/04 10:41:12
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0208	.0023	.0896	.0001	-.0001	.0076
SDev	.0004	.0054	.0022	.0012	.0001	.0000	.0023
%RSD	718.8	26.00	92.81	1.372	56.76	26.61	30.80
#1	.0003	.0246	.0008	.0888	.0002	-.0000	.0059
#2	-.0002	.0170	.0039	.0905	.0001	-.0001	.0092

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0717	-.0000	.0056	.0002	.0019	-.0032	1204.
SDev	.0014	.0002	.0007	.0001	.0004	.0221	7.
%RSD	2.004	382.2	12.69	48.13	23.63	682.9	.5875
#1	.0707	-.0002	.0061	.0002	.0016	-.0189	1209.
#2	.0727	.0001	.0051	.0001	.0022	.0124	1199.

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0032	.0121	-.0001	.0018	.6675	1.357
SDev	.0003	.0004	.0027	.0000	.0009	.3912	.008
%RSD	266.3	12.61	22.03	20.45	50.54	58.60	.5541
#1	-.0003	.0029	.0140	-.0001	.0024	.3909	1.362
#2	.0001	.0035	.0103	-.0001	.0011	.9441	1.351

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0038	.0694	-.0014	.0021	.0010	.0169	.0029
SDev	.0006	.0040	.0003	.0000	.0013	.0032	.0003
%RSD	16.85	5.833	22.18	.3384	127.5	18.94	8.734
#1	.0033	.0722	-.0016	.0021	.0001	.0191	.0031
#2	.0042	.0665	-.0012	.0021	.0019	.0146	.0027

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	92.98	-.0022	-.0023	1.881	.0010	-.0022	-.0007
SDev	.34	.0034	.0012	.002	.0001	.0003	.0016
%RSD	.3632	156.7	51.87	.1055	11.13	15.22	227.3
#1	93.21	.0002	-.0031	1.883	.0009	-.0020	-.0019
#2	92.74	-.0046	-.0014	1.880	.0010	-.0025	.0004

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	-.0019	-.0000	.0061	.0159	-.0004	.0021
SDev	.0000	.0022	.0001	.0040	.0033	.0001	.0028
%RSD	.4100	114.8	638.8	65.08	20.96	27.53	133.1
#1	.0002	-.0035	-.0001	.0089	.0182	-.0004	.0041
#2	.0002	-.0004	.0001	.0033	.0135	-.0005	.0001

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0079	-.0005
SDev	.0000	.0002	.0001
%RSD	38.49	2.290	11.28
#1	-.0001	.0078	-.0004
#2	-.0001	.0081	-.0005

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	716818	10000	--	--	--	--	--
SDev	2566.798	.0000000	--	--	--	--	--
%RSD	.3580822	.0000000	--	--	--	--	--
#1	718633	10000	--	--	--	--	--
#2	715003	10000	--	--	--	--	--

Analysis Report 03/22/04 10:51:37 AM

Method: DAILY2 Sample Name: 241727 Operator:
Run Time: 03/22/04 10:46:30
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0384	-.0020	.0363	.0017	-.0001	.0037
SDev	.0018	.0130	.0017	.0013	.0000	.0000	.0040
%RSD	2899.	33.94	82.79	3.639	1.530	42.91	108.9
#1	.0012	.0476	-.0032	.0354	.0016	-.0001	.0065
#2	-.0013	.0292	-.0008	.0372	.0017	-.0000	.0008

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1030	-.0001	.0056	.0003	.0187	.0109	1248.
SDev	.0042	.0003	.0012	.0007	.0002	.0505	8.
%RSD	4.067	248.2	21.54	221.5	.9203	463.5	.6709
#1	.1060	.0001	.0064	.0008	.0189	.0467	1254.
#2	.1000	-.0003	.0047	-.0002	.0186	-.0248	1242.

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0037	.0168	.0001	.0011	.5974	1.274
SDev	.0026	.0001	.0171	.0001	.0005	.7270	.001
%RSD	17530.	1.952	101.8	46.73	45.88	121.7	.1017
#1	.0019	.0036	.0289	.0001	.0007	1.112	1.273
#2	-.0018	.0037	.0047	.0001	.0015	.0833	1.275

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0139	.0181	-.0013	.0018	.0018	.0122	.0005
SDev	.0001	.0024	.0046	.0044	.0108	.0030	.0002
%RSD	1.083	13.22	352.6	243.1	601.4	24.33	50.09
#1	.0140	.0197	.0019	-.0013	.0095	.0143	.0006
#2	.0138	.0164	-.0045	.0050	-.0059	.0101	.0003

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	90.35	-.0036	.0002	1.233	.0008	-.0010	.0013
SDev	1.21	.0010	.0011	.004	.0014	.0010	.0024
%RSD	1.339	26.82	507.8	.3274	178.4	99.40	190.8
#1	89.50	-.0043	-.0005	1.236	-.0002	-.0018	.0030
#2	91.21	-.0029	.0010	1.230	.0018	-.0003	-.0004

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	-.0001	.0002	.0061	.0055	.0002	-.0004
SDev	.0001	.0023	.0001	.0020	.0659	.0003	.0020
%RSD	16.26	2068.	39.55	32.26	1197.	125.2	469.0
#1	.0006	-.0017	.0002	.0047	.0521	.0000	.0010
#2	.0005	.0015	.0003	.0076	-.0411	.0005	-.0018

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0002	.0763	.0003
SDev	.0000	.0000	.0003
%RSD	1.301	.0484	107.2
#1	.0002	.0763	.0006
#2	.0002	.0763	.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	696570	10000	--	--	--	--	--
SDev	9385.429	.0000000	--	--	--	--	--
%RSD	1.347379	.0000000	--	--	--	--	--
#1	689933	10000	--	--	--	--	--
#2	703206	10000	--	--	--	--	--

Analysis Report QC Standard 03/22/04 11:01:42 AM page 1

Method: DAILY2 Sample Name: icv/ccv Operator:
Run Time: 03/22/04 10:56:35
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.009	9.830	5.125	4.768	10.15	1.012	4.892
SDev	.000	.003	.009	.013	.01	.001	.001
%RSD	.0270	.0342	.1723	.2649	.0900	.1294	.0126
#1	1.009	9.832	5.119	4.759	10.16	1.011	4.891
#2	1.008	9.827	5.132	4.777	10.14	1.013	4.892
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.03	1.017	5.028	1.998	2.020	10.13	18.19
SDev	.01	.001	.005	.000	.002	.01	.02
%RSD	.0592	.0546	.0982	.0244	.0940	.0497	.1371
#1	20.04	1.018	5.024	1.997	2.021	10.12	18.21
#2	20.02	1.017	5.031	1.998	2.019	10.13	18.17
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	20.00	1.000	5.000	2.000	2.000	10.00	20.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.990	4.646	20.02	1.024	5.023	27.38	Q40.92
SDev	.004	.021	.01	.000	.013	.02	.19
%RSD	.0728	.4435	.0608	.0109	.2518	.0823	.4592
#1	4.993	4.660	20.03	1.024	5.014	27.40	Q41.05
#2	4.987	4.631	20.01	1.024	5.032	27.37	Q40.79
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail
Value	5.000	5.000	20.00	1.000	5.000	30.00	30.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.936	4.602	4.919	4.960	1.003	.9867	.9851
SDev	.023	.010	.012	.015	.002	.0063	.0027
%RSD	.4644	.2210	.2359	.2976	.1524	.6381	.2751
#1	4.920	4.610	4.911	4.971	1.002	.9912	.9870
#2	4.952	4.595	4.927	4.950	1.004	.9823	.9832
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass
Value	5.000	5.000			1.000	1.000	1.000
Range	10.00	10.00			10.00	10.00	10.00

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	94.37	5.245	5.317	4.969	4.947	5.293	4.897
SDev	.51	.011	.014	.005	.006	.005	.006
%RSD	.5389	.2149	.2607	.0955	.1208	.1036	.1253
#1	94.73	5.237	5.327	4.972	4.951	5.297	4.893
#2	94.01	5.253	5.307	4.966	4.942	5.289	4.902
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				5.000	5.000	5.000	5.000
Range				10.00	10.00	10.00	10.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.049	.9853	4.849	5.223	.9757	5.015	.9997
SDev	.004	.0065	.002	.010	.0223	.004	.0009
%RSD	.0824	.6558	.0406	.1940	2.283	.0767	.0876
#1	5.052	.9899	4.847	5.216	.9600	5.018	1.000
#2	5.046	.9807	4.850	5.230	.9915	5.012	.9991
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000	5.000	1.000	5.000	1.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.961	1.030	4.941
SDev	.001	.003	.003
%RSD	.0170	.2895	.0509
#1	4.961	1.028	4.940
#2	4.962	1.032	4.943
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	727583	10000	--	--	--	--	--
SDev	3945.656	.0000000	--	--	--	--	--
%RSD	.5422963	.0000000	--	--	--	--	--
#1	730373	10000	--	--	--	--	--
#2	724793	10000	--	--	--	--	--

Analysis Report Blank Sample 03/22/04 11:09:24 AM page 1

Method: DAILY2 Sample Name: icb/ccb Operator:
Run Time: 03/22/04 11:04:17
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0015	-.0002	.0018	.0000	-.0000	.0032
SDev	.0006	.0016	.0001	.0006	.0001	.0000	.0054
%RSD	141.6	107.7	93.55	35.67	2323.	9.050	169.9
#1	-.0009	.0004	-.0001	.0022	.0001	-.0000	-.0006
#2	.0000	.0027	-.0003	.0013	-.0001	-.0000	H.0070
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0013	-.0001	.0001	-.0005	-.0004	-.0072	.0030
SDev	.0016	.0001	.0003	.0002	.0001	.0096	.0198
%RSD	125.0	83.56	392.7	39.03	30.86	133.9	665.5
#1	.0001	-.0000	.0003	-.0006	-.0003	-.0139	-.0110
#2	.0024	-.0001	-.0001	-.0003	-.0004	-.0004	.0170
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	.0003	-.0020	.0000	.0008	H.1399	.0066
SDev	.0006	.0000	.0022	.0000	.0004	.1010	.0008
%RSD	170.6	5.057	107.8	138.0	50.14	72.16	12.23
#1	-.0008	.0003	-.0035	.0000	.0011	H.0685	.0071
#2	.0001	.0003	-.0005	.0000	.0005	H.2113	.0060
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	-.0047	-.0006	-.0000	.0012	-.0055	.0028
SDev	.0006	.0099	.0040	.0004	.0039	.0009	.0017
%RSD	389.0	208.2	681.0	1325.	329.4	16.90	59.60
#1	.0003	.0022	-.0034	.0002	-.0016	-.0062	.0016
#2	-.0005	L-.0117	.0022	-.0003	.0039	-.0049	.0039
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.10	-.0019	.0006	-.0018	-.0002	-.0002	.0001
SDev	1.17	.0048	.0005	.0042	.0011	.0013	.0011
%RSD	1.179	248.5	80.49	230.3	568.0	568.6	1744.
#1	99.92	.0015	.0003	-.0048	-.0010	.0007	.0008
#2	98.27	-.0053	.0010	.0011	.0006	-.0011	-.0007
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	-.0001	.0001	.0025	.0070	.0005	-.0008
SDev	.0000	.0008	.0002	.0008	.0121	.0000	.0008
%RSD	.0165	674.6	215.6	33.53	173.6	3.254	100.8
#1	.0000	.0005	.0002	.0019	-.0016	.0006	-.0013
#2	.0000	-.0007	-.0001	.0030	.0155	.0005	-.0002
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0001	-.0002
SDev	.0001	.0004	.0001
%RSD	199.5	598.7	31.65
#1	.0001	-.0002	-.0001
#2	-.0000	.0003	-.0002
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	764007	10000	--	--	--	--	--
SDev	9060.866	.0000000	--	--	--	--	--
%RSD	1.185966	.0000000	--	--	--	--	--
#1	770414	10000	--	--	--	--	--
#2	757600	10000	--	--	--	--	--

Analysis Report 03/22/04 11:14:42 AM

Method: DAILY2 Sample Name: 241728 Operator:
Run Time: 03/22/04 11:09:36
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0208	-.0011	.0538	.0003	-.0001	.0006
SDev	.0005	.0035	.0009	.0016	.0001	.0000	.0011
%RSD	251.0	17.00	82.83	2.966	49.63	30.80	185.8
#1	.0002	.0233	-.0005	.0527	.0002	-.0001	.0014
#2	-.0006	.0183	-.0018	.0549	.0004	-.0001	-.0002

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1465	.0001	.0041	.0008	.0038	-.0090	1172.
SDev	.0007	.0003	.0003	.0018	.0009	.0030	8.
%RSD	.4484	252.3	6.612	237.0	23.22	32.98	.6998
#1	.1470	.0004	.0043	-.0005	.0032	-.0069	1178.
#2	.1461	-.0001	.0039	.0021	.0045	-.0111	1166.

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	.0033	.0081	.0001	.0012	.5965	1.492
SDev	.0004	.0005	.0067	.0002	.0005	.0690	.012
%RSD	157.7	15.68	82.72	196.8	40.36	11.57	.7908
#1	.0000	.0029	.0129	-.0000	.0009	.5477	1.484
#2	-.0006	.0037	.0034	.0003	.0015	.6453	1.500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0071	.0049	.0019	.0008	-.0011	.0137	.0024
SDev	.0012	.0047	.0029	.0022	.0017	.0014	.0050
%RSD	16.70	97.54	155.2	278.5	151.0	9.891	206.1
#1	.0063	.0015	.0039	-.0008	.0001	.0146	-.0011
#2	.0080	.0082	-.0002	.0024	-.0023	.0127	.0059

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	89.34	-.0062	-.0005	2.119	.0012	-.0024	.0016
SDev	1.36	.0026	.0003	.001	.0005	.0011	.0016
%RSD	1.525	41.90	62.01	.0389	44.14	44.98	102.0
#1	88.38	-.0043	-.0003	2.118	.0008	-.0016	.0027
#2	90.31	-.0080	-.0007	2.119	.0016	-.0031	.0004

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	.0034	.0003	.0029	.0052	.0008	-.0014
SDev	.0000	.0046	.0004	.0015	.0206	.0007	.0011
%RSD	4.818	135.8	133.3	52.45	393.8	89.07	74.78
#1	.0006	.0001	.0000	.0018	.0198	.0003	-.0022
#2	.0006	.0066	.0007	.0040	-.0094	.0012	-.0007

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0002	.0134	.0007
SDev	.0002	.0001	.0010
%RSD	103.9	.6127	148.9
#1	.0001	.0133	-.0000
#2	.0004	.0135	.0014

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	688764	10000	--	--	--	--	--
SDev	10475.08	.0000000	--	--	--	--	--
%RSD	1.520852	.0000000	--	--	--	--	--
#1	681357	10000	--	--	--	--	--
#2	696171	10000	--	--	--	--	--

010094

Method: DAILY2 Sample Name: 241729 Operator:
Run Time: 03/22/04 11:14:54
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0011	.0334	.0027	.0708	.0009	-.0001	.0079
SDev	.0003	.0019	.0021	.0008	.0001	.0000	.0083
%RSD	29.04	5.698	75.82	1.057	7.442	6.478	104.6
#1	.0008	.0321	.0013	.0713	.0010	-.0001	.0021
#2	.0013	.0348	.0042	.0703	.0009	-.0001	.0138

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	13.40	.0002	.0056	.0005	.0067	.0080	1066.
SDev	.03	.0001	.0001	.0008	.0004	.0013	2.
%RSD	.2329	52.46	2.287	169.6	6.053	16.40	.2099
#1	13.38	.0001	.0055	.0010	.0070	.0071	1064.
#2	13.42	.0002	.0056	-.0001	.0064	.0089	1067.

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0011	.0032	.1216	.0039	.0006	.8097	1.482
SDev	.0002	.0004	.0071	.0001	.0005	.3274	.018
%RSD	21.96	12.92	5.831	2.545	91.69	40.44	1.218
#1	.0009	.0029	.1166	.0040	.0009	.5782	1.495
#2	.0013	.0035	.1266	.0038	.0002	1.041	1.470

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0272	-.0000	.0019	-.0003	.0027	.0259	-.0003
SDev	.0006	.0125	.0016	.0014	.0076	.0022	.0022
%RSD	2.400	650000.	82.41	531.2	283.0	8.525	693.9
#1	.0267	-.0088	.0008	-.0012	-.0027	.0244	.0012
#2	.0277	.0088	.0030	.0007	.0080	.0275	-.0019

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	91.71	-.0073	-.0012	2.620	.0005	-.0032	.0011
SDev	1.69	.0032	.0016	.001	.0015	.0000	.0005
%RSD	1.839	44.18	133.5	.0511	305.4	.6683	45.81
#1	92.90	-.0096	-.0001	2.621	-.0006	-.0032	.0015
#2	90.52	-.0050	-.0023	2.619	.0015	-.0032	.0007

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0130	-.0027	.0008	.0058	.0418	.0002	.0012
SDev	.0000	.0043	.0002	.0019	.0289	.0000	.0001
%RSD	.2959	156.0	28.91	32.37	69.11	14.60	8.764
#1	.0130	.0003	.0010	.0045	.0214	.0002	.0011
#2	.0129	-.0058	.0007	.0072	.0623	.0002	.0013

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.1058	-.0001
SDev	.0001	.0008	.0003
%RSD	278.5	.7977	247.9
#1	-.0000	.1052	.0001
#2	.0001	.1064	-.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	707042	10000	--	--	--	--	--
SDev	13062.38	.0000000	--	--	--	--	--
%RSD	1.847471	.0000000	--	--	--	--	--
#1	716278	10000	--	--	--	--	--
#2	697805	10000	--	--	--	--	--

Analysis Report QC Standard 03/22/04 11:30:06 AM page 1

Method: DAILY2 Sample Name: icv/ccv Operator:
Run Time: 03/22/04 11:24:59
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.007	9.825	5.122	4.772	10.17	1.010	4.908
SDev	.001	.019	.012	.013	.00	.000	.004
%RSD	.0569	.1982	.2418	.2652	.0266	.0482	.0777
#1	1.007	9.839	5.113	4.763	10.17	1.010	4.911
#2	1.007	9.812	5.131	4.781	10.17	1.011	4.906
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	19.93	1.011	5.021	1.994	2.020	10.11	18.07
SDev	.01	.001	.003	.000	.003	.05	.05
%RSD	.0420	.0713	.0529	.0110	.1658	.4517	.2751
#1	19.92	1.011	5.023	1.994	2.023	10.07	18.11
#2	19.93	1.012	5.019	1.995	2.018	10.14	18.03
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	20.00	1.000	5.000	2.000	2.000	10.00	20.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.990	4.638	19.96	1.023	5.023	27.39	Q40.84
SDev	.003	.009	.00	.000	.014	.10	.13
%RSD	.0522	.1918	.0190	.0174	.2788	.3490	.3191
#1	4.992	4.645	19.96	1.023	5.013	27.46	Q40.93
#2	4.989	4.632	19.96	1.023	5.033	27.33	Q40.74
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail
Value	5.000	5.000	20.00	1.000	5.000	30.00	30.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.938	4.588	4.899	4.918	1.004	.9992	.9899
SDev	.002	.029	.017	.048	.000	.0114	.0040
%RSD	.0323	.6301	.3491	.9668	.0376	1.138	.4075
#1	4.940	4.608	4.912	4.952	1.004	.9912	.9871
#2	4.937	4.567	4.887	4.885	1.004	1.007	.9928
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass
Value	5.000	5.000			1.000	1.000	1.000
Range	10.00	10.00			10.00	10.00	10.00

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	94.80	5.226	5.293	4.966	4.912	5.271	4.890
SDev	.40	.009	.051	.007	.037	.037	.006
%RSD	.4169	.1737	.9580	.1491	.7614	.6988	.1207
#1	94.52	5.232	5.329	4.971	4.938	5.297	4.886
#2	95.08	5.219	5.257	4.961	4.886	5.245	4.894
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				5.000	5.000	5.000	5.000
Range				10.00	10.00	10.00	10.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.058	.9794	4.855	5.227	.9722	5.008	1.001
SDev	.022	.0003	.006	.019	.0037	.004	.001
%RSD	.4322	.0258	.1232	.3622	.3832	.0881	.1106
#1	5.042	.9792	4.851	5.213	.9749	5.011	1.001
#2	5.073	.9796	4.860	5.240	.9696	5.005	1.002
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000	5.000	1.000	5.000	1.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.961	1.026	4.943
SDev	.005	.002	.006
%RSD	.1015	.1633	.1195
#1	4.964	1.025	4.939
#2	4.957	1.027	4.947
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	730812	10000	--	--	--	--	--
SDev	3008.739	.0000000	--	--	--	--	--
%RSD	.4116984	.0000000	--	--	--	--	--
#1	728684	10000	--	--	--	--	--
#2	732939	10000	--	--	--	--	--

Analysis Report Blank Sample 03/22/04 11:37:47 AM page 1

Method: DAILY2 Sample Name: icb/ccb Operator:
Run Time: 03/22/04 11:32:41
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0012	-.0037	.0006	.0031	.0001	-.0000	.0009
SDev	.0005	.0009	.0009	.0008	.0000	.0000	.0008
%RSD	38.66	25.76	141.1	25.18	51.26	391.7	85.24
#1	-.0015	-.0043	.0012	.0036	.0001	.0000	.0004
#2	-.0009	-.0030	.0000	.0025	.0000	-.0000	.0015
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	-.0002	-.0006	.0002	-.0004	-.0141	-.0098
SDev	.0019	.0000	.0007	.0007	.0002	.0127	.0034
%RSD	314.5	.1637	126.5	335.3	44.77	90.46	34.63
#1	-.0008	-.0002	-.0011	.0007	-.0005	-.0230	-.0122
#2	.0020	-.0002	-.0001	-.0003	-.0003	-.0051	-.0074
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0003	-.0027	-.0001	.0010	.0085	.0031
SDev	.0006	.0000	.0023	.0000	.0016	.0119	.0089
%RSD	87.30	9.529	85.92	3.225	151.5	138.9	283.0
#1	-.0011	.0003	-.0043	-.0001	.0022	.0002	-.0032
#2	-.0003	.0003	-.0010	-.0001	-.0001	.0169	.0094
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0033	-.0037	.0024	-.0030	.0031	.0025
SDev	.0012	.0130	.0064	.0016	.0034	.0071	.0006
%RSD	6835.	394.7	173.8	67.43	112.3	230.8	23.74
#1	.0009	-.0059	-.0082	.0035	L-.0054	-.0020	.0021
#2	-.0008	H.0125	.0008	.0012	-.0006	.0081	.0029
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.09	-.0049	.0004	-.0035	.0004	-.0014	-.0004
SDev	.67	.0010	.0011	.0015	.0011	.0010	.0039
%RSD	.6718	19.80	282.7	43.19	282.4	76.02	1003.
#1	98.62	-.0056	-.0004	-.0045	-.0004	-.0021	-.0031
#2	99.56	-.0042	.0012	-.0024	.0011	-.0006	.0024
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0022	.0002	.0026	-.0103	.0006	-.0026
SDev	.0000	.0012	.0001	.0004	.0095	.0002	.0017
%RSD	430.3	53.69	75.10	13.77	92.86	29.78	63.50
#1	-.0000	.0013	.0003	.0029	-.0170	.0005	-.0038
#2	.0000	.0030	.0001	.0024	-.0035	.0007	-.0015
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0002	.0001
SDev	.0000	.0000	.0001
%RSD	11.35	16.56	127.3
#1	.0001	.0002	.0002
#2	.0001	.0002	.0000
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	763934	10000	--	--	--	--	--
SDev	5101.068	.0000000	--	--	--	--	--
%RSD	.6677368	.0000000	--	--	--	--	--
#1	760327	10000	--	--	--	--	--
#2	767541	10000	--	--	--	--	--

010102

ICP ANALYSIS

Co, Na

PROJ. NO.	PROJECT	WO#	DATE	MATRIX
06062.01.081	Div 20	040304-12	3-29-04	SG 116

INSTRUMENT: TRACE 2 FILENAME: B040329 ~~B~~ D

INSTRUMENT DL _____

Method: DAILY2 Standard: blk
Run Time: 03/29/04 13:21:21

010103

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Avge	.0000	.0004	-.0001	.0000	-.0000	-.0001	.0000
SDev	.0001	.0000	.0000	.0000	.0000	.0000	.0001
%RSD	1714.	1.756	28.89	2.252	14.22	1.971	526.6
#1	-.0000	.0004	-.0001	.0000	-.0000	-.0001	-.0000
#2	.0000	.0004	-.0000	.0000	-.0000	-.0001	.0001

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Avge	.0000	-.0000	-.0000	.0000	.0003	.0000	.0002
SDev	.0000	.0000	.0000	.0000	.0000	.0001	.0002
%RSD	84.37	4.486	601.8	80.11	4.326	808.6	103.4
#1	.0000	-.0000	-.0000	.0000	.0003	-.0000	.0001
#2	.0000	-.0000	.0000	.0000	.0003	.0001	.0003

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Avge	.0000	.0001	.0000	.0000	-.0000	-.0002	-.0092
SDev	.0001	.0001	.0000	.0000	.0000	.0001	.0003
%RSD	280.6	79.78	162.4	26.56	2.311	34.56	3.192
#1	-.0000	.0000	-.0000	.0000	-.0000	-.0003	-.0095
#2	.0001	.0001	.0000	.0000	-.0000	-.0002	-.0090

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Avge	.0000	.0000	.0001	-.0000	-.0000	.0013	-.0011
SDev	.0000	.0000	.0001	.0001	.0002	.0000	.0001
%RSD	13.49	320.3	147.9	150.4	808.8	1.437	5.464
#1	.0000	-.0000	-.0000	.0000	-.0002	.0013	-.0011
#2	.0000	.0000	.0001	-.0001	.0001	.0013	-.0011

Elem	Sc3613	1960/1	1960/2	Si2881	Sn1899	Sr4215	Th2837
Avge	78.13	-.0002	.0001	.0016	.0000	.0000	.0000
SDev	1.76	.0001	.0000	.0001	.0000	.0000	.0000
%RSD	2.247	31.54	23.14	6.195	133.6	141.4	38.46
#1	79.38	-.0002	.0001	.0015	.0000	.0000	.0000
#2	76.89	-.0001	.0001	.0017	.0000	.0000	.0000

Elem	Ti3349	Tl1908	U_4090	V_2924	W_2079	Y_3710	Zn2062
Avge	-.0001	-.0002	-.0001	-.0000	.0003	-.0000	.0000
SDev	.0001	.0000	.0004	.0000	.0001	.0000	.0000
%RSD	104.3	13.74	307.6	.0760	33.07	239.8	22.77
#1	-.0000	-.0002	-.0004	-.0000	.0002	-.0000	.0000
#2	-.0001	-.0001	.0001	-.0000	.0004	.0000	.0000

Elem	Zr3496
Avge	.0001
SDev	.0001
%RSD	61.15
#1	.0001
#2	.0001

DL 3-29-04

3/30/04

010104

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	781288	10000	--	--	--	--	--
SDev	17592.11	.0000000	--	--	--	--	--
%RSD	2.251679	.0000000	--	--	--	--	--
#1	793728	10000	--	--	--	--	--
#2	768849	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std4
Run Time: 03/29/04 13:26:39

010105

Elem	Ag3280	As1890	2203/1	2203/2	Sb2068	1960/1	1960/2
Avge	.0803	.1170	.3088	.2632	.1797	.2597	.2606
SDev	.0001	.0002	.0014	.0030	.0000	.0019	.0021
%RSD	.1710	.1420	.4692	1.150	.0014	.7351	.7947
#1	.0804	.1169	.3078	.2653	.1797	.2584	.2620
#2	.0802	.1171	.3099	.2611	.1797	.2611	.2591

Elem	T11908
Avge	.2286
SDev	.0007
%RSD	.3109
#1	.2291
#2	.2281

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	769735	10000	--	--	--	--	--
SDev	11712.52	.0000000	--	--	--	--	--
%RSD	1.521630	.0000000	--	--	--	--	--
#1	761453	10000	--	--	--	--	--
#2	778017	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std1
Run Time: 03/29/04 13:31:36

010106

Elem	Al3082	Ca3179	Fe2714	K_7664	Li6707	Mg2790	Na3302
Avge	.1098	.1908	.0984	.1966	3.247	.0836	.0090
SDev	.0001	.0001	.0001	.0000	.002	.0001	.0001
%RSD	.0813	.0679	.1225	.0053	.0565	.1419	.5174
#1	.1099	.1909	.0985	.1966	3.248	.0837	.0090
#2	.1098	.1907	.0983	.1966	3.246	.0835	.0090

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	763452	10000	--	--	--	--	--
SDev	2300.925	.0000000	--	--	--	--	--
%RSD	.3013844	.0000000	--	--	--	--	--
#1	761825	10000	--	--	--	--	--
#2	765079	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std5
Run Time: 03/29/04 13:35:49

010107

Elem	B 2496	Bi2230	Mo2020	P 1782	Si2881	Sn1899	Sr4215
Avge	.1645	.0346	.3478	.0175	.1677	.1611	2.612
SDev	.0000	.0000	.0013	.0001	.0005	.0001	.002
%RSD	.0142	.0598	.3628	.3199	.3125	.0327	.0877
#1	.1645	.0346	.3470	.0175	.1681	.1611	2.614
#2	.1645	.0346	.3487	.0176	.1673	.1611	2.610

Elem	Ti3349
Avge	2.644
SDev	.002
%RSD	.0786
#1	2.642
#2	2.645

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	768392	10000	--	--	--	--	--
SDev	14709.94	.0000000	--	--	--	--	--
%RSD	1.914381	.0000000	--	--	--	--	--
#1	778793	10000	--	--	--	--	--
#2	757990	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std2
Run Time: 03/29/04 13:40:02

010108

Elem	Ba4934	Be3130	Cr2677	Cu3247	Ni2316
Avge	1.208	1.263	.3936	.3192	.3392
SDev	.001	.003	.0002	.0004	.0001
%RSD	.1089	.2211	.0511	.1417	.0270
#1	1.207	1.261	.3937	.3195	.3393
#2	1.209	1.265	.3934	.3188	.3391

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	804650	10000	--	--	--	--	--
SDev	1204.203	.0000000	--	--	--	--	--
%RSD	.1496554	.0000000	--	--	--	--	--
#1	805502	10000	--	--	--	--	--
#2	803799	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std3
Run Time: 03/29/04 13:43:54

010109

Elem	Cd2265	Co2286	Mn2576	V_2924	Zn2062
Avge	.9498	.2107	.8486	.1911	.2842
SDev	.0013	.0001	.0004	.0000	.0007
%RSD	.1348	.0369	.0425	.0001	.2460
#1	.9489	.2107	.8489	.1911	.2837
#2	.9507	.2106	.8484	.1911	.2847

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	774137	10000	--	--	--	--	--
SDev	3551.090	.0000000	--	--	--	--	--
%RSD	.4587160	.0000000	--	--	--	--	--
#1	776648	10000	--	--	--	--	--
#2	771626	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std6
Run Time: 03/29/04 13:48:07

Elem	La3988	Na5889	Pd3404	S_1820	Th2837	U_4090	W_2079
Avge	.4958	.0758	.2090	.0350	.1125	.0794	.1812
SDev	.0009	.0008	.0004	.0001	.0001	.0000	.0021
%RSD	.1741	1.117	.1878	.1827	.0492	.0127	1.151
#1	.4952	.0764	.2087	.0350	.1124	.0794	.1797
#2	.4964	.0752	.2093	.0349	.1125	.0794	.1827

Elem	Y_3710	Zr3496
Avge	.7953	1.936
SDev	.0006	.000
%RSD	.0770	.0075
#1	.7949	1.937
#2	.7957	1.936

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	747618	10000	--	--	--	--	--
SDev	6662.360	.0000000	--	--	--	--	--
%RSD	.8911449	.0000000	--	--	--	--	--
#1	742907	10000	--	--	--	--	--
#2	752329	10000	--	--	--	--	--

010111

Standardization Report 03/29/04 01:52:31 PM page 1

Method: DAILY2 Slope = Conc(SIR)/IR

Element	Wavelen	High std	Low std	Slope	Y-intercept	Date Standardized
Ag3280	328.068	clp_std4	blk	24.9001	-.000079	03/29/04 01:48:07
Al3082	308.215	clp_std1	blk	456.697	-.166628	03/29/04 01:48:07
As1890	189.042	clp_std4	blk	85.4254	.004468	03/29/04 01:48:07
B_2496	249.678	clp_std5	blk	60.8113	-.002024	03/29/04 01:48:07
Ba4934	493.409	clp_std2	blk	8.27537	.000227	03/29/04 01:48:07
Be3130	313.042	clp_std2	blk	3.95738	.000339	03/29/04 01:48:07
Bi2230	223.061	clp_std5	blk	143.389	-.001658	03/29/04 01:48:07
Ca3179	317.933	clp_std1	blk	262.077	-.004911	03/29/04 01:48:07
Cd2265	226.502	clp_std3	blk	10.5250	.000141	03/29/04 01:48:07
Co2286	228.616	clp_std3	blk	47.4722	.000114	03/29/04 01:48:07
Cr2677	267.716	clp_std2	blk	25.4105	-.000591	03/29/04 01:48:07
Cu3247	324.753	clp_std2	blk	31.3617	-.009578	03/29/04 01:48:07
Fe2714	271.441	clp_std1	blk	508.560	-.003939	03/29/04 01:48:07
K_7664	766.491	clp_std1	blk	254.607	-.051271	03/29/04 01:48:07
La3988	398.853	clp_std6	blk	20.1891	-.000414	03/29/04 01:48:07
Li6707	670.784	clp_std1	blk	3.07993	-.000187	03/29/04 01:48:07
Mg2790	279.078	clp_std1	blk	298.986	-.005068	03/29/04 01:48:07
Mn2576	257.610	clp_std3	blk	11.7845	-.000219	03/29/04 01:48:07
Mo2020	202.030	clp_std5	blk	28.7492	.001140	03/29/04 01:48:07
Na3302	330.232	clp_std1	blk	5423.66	1.12024	03/29/04 01:48:07
Na5889	588.991	clp_std6	blk	11.8241	.109304	03/29/04 01:48:07
Ni2316	231.604	clp_std2	blk	29.4824	-.000509	03/29/04 01:48:07
P_1782	178.287	clp_std5	blk	570.223	-.004543	03/29/04 01:48:07
2203/1	220.351	clp_std4	blk	32.3850	-.001791	03/29/04 01:48:07
2203/2	220.352	clp_std4	blk	37.9892	.001509	03/29/04 01:48:07
Pd3404	340.458	clp_std6	blk	49.1252	.001124	03/29/04 01:48:07
S_1820	182.040	clp_std6	blk	296.914	-.395677	03/29/04 01:48:07
Sb2068	206.838	clp_std4	blk	55.3133	.060990	03/29/04 01:48:07
Sc3613	361.384	blk	dark	1.27984	.000000	03/29/04 01:48:07
1960/1	196.021	clp_std4	blk	38.4769	.007214	03/29/04 01:48:07
1960/2	196.022	clp_std4	blk	38.3895	-.003284	03/29/04 01:48:07
Si2881	288.158	clp_std5	blk	59.9746	-.094985	03/29/04 01:48:07
Pb220	220.353	NONE	NONE	1.00000	.000000	*NOT STANDARDIZED
Se196	196.026	NONE	NONE	1.00000	.000000	*NOT STANDARDIZED
Sn1899	189.989	clp_std5	blk	62.1211	-.001413	03/29/04 01:48:07
Sr4215	421.552	clp_std5	blk	3.82838	-.000035	03/29/04 01:48:07
Th2837	283.730	clp_std6	blk	92.8432	-.002089	03/29/04 01:48:07
Ti3349	334.941	clp_std5	blk	3.78236	.000218	03/29/04 01:48:07
Tl1908	190.864	clp_std4	blk	43.7059	.006926	03/29/04 01:48:07
U_4090	409.014	clp_std6	blk	132.940	.016775	03/29/04 01:48:07
V_2924	292.402	clp_std3	blk	52.3082	.002176	03/29/04 01:48:07
W_2079	207.914	clp_std6	blk	27.6287	-.007951	03/29/04 01:48:07
Y_3710	371.030	clp_std6	blk	12.5715	.000024	03/29/04 01:48:07
Zn2062	206.200	clp_std3	blk	35.1858	-.000382	03/29/04 01:48:07
Zr3496	349.621	clp_std6	blk	5.64490	-.000564	03/29/04 01:48:07

010112

Analysis Report QC Standard 03/29/04 01:57:50 PM page 1

Method: DAILY2 Sample Name: icv/ccv Operator:
Run Time: 03/29/04 13:52:43
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9994	9.723	5.050	4.810	9.965	.9889	4.982
SDev	.0004	.005	.010	.020	.018	.0004	.001
%RSD	.0441	.0539	.1960	.4259	.1771	.0396	.0278
#1	.9990	9.720	5.043	4.796	9.953	.9891	4.983
#2	.9997	9.727	5.057	4.824	9.978	.9886	4.981
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	19.74	.9997	4.950	1.967	2.001	10.12	18.23
SDev	.06	.0010	.011	.000	.006	.02	.10
%RSD	.3074	.0973	.2235	.0056	.3213	.2025	.5455
#1	19.78	1.000	4.958	1.967	1.996	10.10	18.16
#2	19.70	.9990	4.942	1.967	2.005	10.13	18.30
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	20.00	1.000	5.000	2.000	2.000	10.00	20.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.959	4.641	19.74	1.003	4.990	27.24	28.22
SDev	.002	.020	.02	.002	.012	.18	.11
%RSD	.0430	.4353	.1263	.1723	.2476	.6554	.3735
#1	4.958	4.627	19.75	1.004	4.981	27.11	28.14
#2	4.961	4.656	19.72	1.001	4.998	27.37	28.29
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	5.000	5.000	20.00	1.000	5.000	30.00	30.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.902	5.187	4.913	4.928	1.018	1.003	.9840
SDev	.000	.015	.063	.073	.007	.022	.0018
%RSD	.0057	.2942	1.290	1.476	.7028	2.160	.1836
#1	4.902	5.176	4.958	4.877	1.023	1.019	.9827
#2	4.902	5.197	4.868	4.979	1.013	.9880	.9853
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass
Value	5.000	5.000			1.000	1.000	1.000
Range	10.00	10.00			10.00	10.00	10.00

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	95.20	5.157	5.193	4.966	4.923	5.181	4.839
SDev	1.43	.074	.131	.005	.027	.063	.001
%RSD	1.505	1.434	2.519	.1045	.5560	1.208	.0304
#1	94.18	5.210	5.100	4.969	4.904	5.137	4.840
#2	96.21	5.105	5.285	4.962	4.942	5.225	4.837
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				5.000	5.000	5.000	5.000
Range				10.00	10.00	10.00	10.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.034	.9915	4.755	5.255	.9270	4.932	Q1.123
SDev	.007	.0098	.005	.019	.0067	.003	.001
%RSD	.1356	.9897	.1107	.3697	.7281	.0570	.0634
#1	5.029	.9984	4.752	5.241	.9318	4.930	Q1.123
#2	5.038	.9845	4.759	5.269	.9222	4.934	Q1.122
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail
Value	5.000	1.000	5.000	5.000	1.000	5.000	1.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.929	.9950	4.926
SDev	.004	.0041	.003
%RSD	.0800	.4088	.0579
#1	4.932	.9979	4.924
#2	4.926	.9921	4.928
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	743736	10000	--	--	--	--	--
SDev	11245.83	.0000000	--	--	--	--	--
%RSD	1.512072	.0000000	--	--	--	--	--
#1	735784	10000	--	--	--	--	--
#2	751688	10000	--	--	--	--	--

Analysis Report Blank Sample 03/29/04 02:05:32 PM page 1

Method: DAILY2 Sample Name: icb/ccb Operator:
Run Time: 03/29/04 14:00:25
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0016	.0008	.0050	.0002	.0000	L-.0053
SDev	.0005	.0021	.0020	.0013	.0002	.0000	.0017
%RSD	68.66	134.4	257.2	25.01	76.38	96.84	31.18
#1	-.0011	.0001	.0022	.0059	.0003	.0000	L-.0065
#2	-.0004	.0031	-.0006	.0041	.0001	.0000	-.0042
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Low
High	.0050	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0012	.0002	-.0004	.0006	.0006	.0204	.0191
SDev	.0008	.0001	.0001	.0005	.0004	.0064	.0103
%RSD	69.77	50.87	35.68	85.24	70.11	31.35	54.05
#1	.0006	.0002	-.0005	.0009	.0009	.0250	.0118
#2	.0018	.0003	-.0003	.0002	.0003	.0159	.0265
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0003	-.0048	-.0001	.0044	H.2289	-.0055
SDev	.0003	.0000	.0007	.0001	.0009	.1208	.0022
%RSD	1285.	9.246	14.41	93.58	20.54	52.77	40.55
#1	-.0003	.0003	-.0052	-.0000	H.0050	H.1435	-.0070
#2	.0002	.0003	-.0043	-.0001	.0037	H.3143	-.0039
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0020	.0085	.0037	-.0000	H.0056	L-.0128	-.0014
SDev	.0011	.0011	.0049	.0036	.0015	.0015	.0019
%RSD	57.31	12.83	134.2	9559.	25.81	11.47	133.3
#1	-.0028	.0078	.0002	.0025	.0046	L-.0117	-.0028
#2	-.0012	.0093	.0072	-.0026	H.0067	L-.0138	-.0001
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC High	LC Low	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	94.89	.0070	-.0023	.0029	.0012	.0008	-.0018
SDev	.20	.0057	.0035	.0044	.0008	.0042	.0013
%RSD	.2102	80.72	153.9	148.2	64.07	507.1	70.79
#1	95.03	.0111	.0002	-.0001	.0018	.0038	-.0027
#2	94.75	.0030	-.0048	.0060	.0007	-.0022	-.0009
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0011	.0001	.0026	-.0151	.0009	-.0014
SDev	.0000	.0001	.0002	.0023	.0332	.0004	.0004
%RSD	98.42	11.18	272.5	91.35	219.3	49.57	27.80
#1	.0001	.0012	.0002	.0009	-.0386	.0006	-.0017
#2	.0000	.0010	-.0001	.0042	.0083	.0012	-.0011
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0002	-.0000	.0006
SDev	.0001	.0001	.0000
%RSD	52.60	384.1	6.320
#1	.0003	-.0001	.0006
#2	.0001	.0000	.0006
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	741314	10000	--	--	--	--	--
SDev	1576.848	.0000000	--	--	--	--	--
%RSD	.2127099	.0000000	--	--	--	--	--
#1	742429	10000	--	--	--	--	--
#2	740199	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: pbw-C29E1 pg56-116 Operator:
Run Time: 03/29/04 14:05:44
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0010	.0067	.0017	.0039	-.0000	.0000	-.0045
SDev	.0003	.0008	.0029	.0008	.0000	.0000	.0026
%RSD	27.87	11.14	167.1	19.78	238.5	570.3	56.90
#1	-.0008	.0062	.0038	.0045	-.0000	.0000	L-.0063
#2	-.0012	.0073	-.0003	.0034	.0000	-.0000	-.0027
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0043	.0001	-.0005	-.0010	.0005	.0118	.0234
SDev	.0005	.0000	.0003	.0003	.0003	.0035	.0103
%RSD	11.81	21.24	58.77	30.09	58.66	29.88	44.09
#1	.0046	.0001	-.0007	-.0012	.0003	.0093	.0306
#2	.0039	.0002	-.0003	-.0008	.0006	.0143	.0161
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0004	-.0076	-.0001	.0007	H.4215	-.0050
SDev	.0002	.0000	.0057	.0000	.0005	.2448	.0029
%RSD	98.32	7.806	74.76	12.81	68.62	58.08	58.11
#1	-.0001	.0004	-.0036	-.0001	.0011	H.5946	-.0029
#2	-.0003	.0004	-.0116	-.0001	.0004	H.2484	-.0071
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	-.0017	.0053	.0019	.0042	L-.0141	.0019
SDev	.0011	.0154	.0016	.0021	.0006	.0010	.0007
%RSD	177.2	894.1	29.95	113.4	14.22	6.874	38.99
#1	-.0015	.0092	.0042	.0034	.0046	L-.0148	.0024
#2	.0002	L-.0126	.0065	.0004	.0038	L-.0135	.0014
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	90.59	-.0055	.0060	H.0119	H.0030	.0021	-.0028
SDev	.16	.0079	.0001	.0015	.0009	.0027	.0009
%RSD	.1775	144.1	1.642	12.35	28.96	125.7	31.00
#1	90.71	-.0111	.0059	H.0109	H.0037	.0002	-.0022
#2	90.48	.0001	.0060	H.0130	.0024	.0041	-.0034
Errors	NOCHECK	NOCHECK	NOCHECK	LC High	LC High	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0031	-.0002	-.0094	-.0353	.0005	-.0012
SDev	.0000	.0006	.0001	.0030	.0006	.0001	.0006
%RSD	36.61	18.96	29.03	32.50	1.785	29.41	56.06
#1	-.0000	.0026	-.0002	-.0072	-.0348	.0004	-.0007
#2	-.0000	.0035	-.0003	L-.0115	-.0357	.0006	-.0016
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	-.0005	-.0000
SDev	.0002	.0000	.0001
%RSD	157.3	6.859	1578.
#1	-.0000	-.0005	-.0001
#2	.0002	-.0005	.0001
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

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IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	707808	10000	--	--	--	--	--
SDev	1232.487	.0000000	--	--	--	--	--
%RSD	.1741272	.0000000	--	--	--	--	--
#1	708680	10000	--	--	--	--	--
#2	706937	10000	--	--	--	--	--

010121

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Method: DAILY2 Sample Name: lcsw-C29E1 Operator:
Run Time: 03/29/04 14:11:03
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0512	1.938	1.959	.0017	2.055	.0492	-.0018
SDev	.0011	.001	.002	.0003	.002	.0000	.0053
%RSD	2.087	.0718	.0822	19.37	.0909	.0776	296.1
#1	.0520	1.937	1.958	.0019	2.054	.0492	-.0055
#2	.0505	1.939	1.960	.0015	2.057	.0492	.0020

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	22.62	.0495	.4982	.1999	.2533	1.111	18.68
SDev	.01	.0004	.0007	.0008	.0010	.007	.02
%RSD	.0434	.8837	.1353	.3785	.3926	.6207	.1047
#1	22.62	.0498	.4987	.2005	.2526	1.106	18.67
#2	22.61	.0492	.4977	.1994	.2540	1.116	18.70

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	.0007	22.76	.5057	4.087	20.11	20.34
SDev	.0005	.0000	.04	.0002	.019	.08	.08
%RSD	49.97	2.954	.1842	.0352	.4552	.3739	.3697
#1	.0013	.0007	22.73	.5055	4.074	20.06	20.29
#2	.0006	.0007	22.79	.5058	4.100	20.16	20.40

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4924	.0114	.5062	.5102	.0053	-.0057	.4867
SDev	.0005	.0068	.0026	.0041	.0029	.0033	.0036
%RSD	.1017	59.40	.5045	.7951	54.64	58.42	.7440
#1	.4920	.0162	.5080	.5131	.0073	-.0080	.4841
#2	.4928	.0066	.5044	.5073	.0032	-.0033	.4892

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	86.69	1.819	1.891	.0261	.5089	1.867	.0006
SDev	1.29	.007	.012	.0078	.0036	.006	.0026
%RSD	1.484	.3784	.6372	29.74	.6988	.3073	410.0
#1	85.78	1.814	1.899	.0206	.5114	1.871	-.0012
#2	87.60	1.824	1.882	.0316	.5064	1.863	.0024

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	-.0147	-.0003	2.082	.0185	.5007	4.600
SDev	.0000	.0002	.0001	.004	.0212	.0003	.001
%RSD	1.551	1.424	48.47	.1683	114.8	.0593	.0208
#1	.0007	-.0148	-.0002	2.085	.0335	.5009	4.599
#2	.0006	-.0145	-.0003	2.080	.0035	.5004	4.600

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.4944	.0011
SDev	.0000	.0005	.0002
%RSD	28.25	.1078	14.31
#1	-.0000	.4947	.0013
#2	-.0001	.4940	.0010

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	677306	10000	--	--	--	--	--
SDev	10075.56	.0000000	--	--	--	--	--
%RSD	1.487595	.0000000	--	--	--	--	--
#1	670181	10000	--	--	--	--	--
#2	684430	10000	--	--	--	--	--

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0043	-.0003
SDev	.0000	.0001	.0003
%RSD	85.19	1.922	101.6
#1	.0000	.0042	-.0005
#2	.0000	.0043	-.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	709888	10000	--	--	--	--	--
SDev	7201.175	.0000000	--	--	--	--	--
%RSD	1.014410	.0000000	--	--	--	--	--
#1	714980	10000	--	--	--	--	--
#2	704796	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 241723r Operator:
Run Time: 03/29/04 14:16:22
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0011	.0124	.0040	.0045	.0004	-.0000	-.0070
SDev	.0015	.0080	.0011	.0007	.0000	.0000	.0041
%RSD	137.4	64.17	28.64	15.87	.4652	65.31	58.97
#1	-.0022	.0068	.0032	.0050	.0004	-.0000	-.0099
#2	-.0000	.0180	.0048	.0040	.0004	-.0000	-.0041

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0207	-.0000	.0001	.0021	.0048	.0237	33.96
SDev	.0027	.0000	.0006	.0003	.0001	.0058	.18
%RSD	13.17	201.1	458.9	15.48	1.609	24.37	.5179
#1	.0187	.0000	-.0003	.0019	.0049	.0196	33.84
#2	.0226	-.0000	.0005	.0024	.0048	.0278	34.09

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	.0007	-.0040	.0000	.0065	.4418	.0664
SDev	.0015	.0001	.0091	.0001	.0001	.0987	.0008
%RSD	264.4	6.978	224.9	543.8	1.385	22.33	1.218
#1	-.0017	.0007	-.0104	.0001	.0066	.3721	.0659
#2	.0005	.0007	.0024	-.0001	.0064	.5116	.0670

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0073	.0067	.0050	.0013	.0033	-.0121	.0049
SDev	.0009	.0035	.0002	.0006	.0045	.0033	.0001
%RSD	11.80	51.92	4.414	42.25	135.9	27.11	2.035
#1	.0080	.0043	.0051	.0017	.0001	-.0144	.0049
#2	.0067	.0092	.0048	.0009	.0065	-.0098	.0050

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	90.86	-.0027	.0063	.0695	.0026	.0033	-.0001
SDev	.92	.0054	.0041	.0032	.0004	.0045	.0015
%RSD	1.014	200.0	65.76	4.611	17.32	137.7	1208.
#1	91.51	.0011	.0092	.0672	.0029	.0065	-.0012
#2	90.20	-.0065	.0034	.0717	.0022	.0001	.0010

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0019	-.0001	-.0063	-.0292	.0005	.0020
SDev	.0001	.0007	.0000	.0010	.0465	.0005	.0018
%RSD	31.14	34.49	17.33	16.36	159.6	113.6	91.44
#1	.0002	.0024	-.0001	-.0056	-.0621	.0008	.0007
#2	.0003	.0015	-.0001	-.0070	.0038	.0001	.0032

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Method: DAILY2 Sample Name: 241726r Operator:
Run Time: 03/29/04 14:21:40
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0011	.0298	.0019	.0882	.0002	.0000	.0042
SDev	.0001	.0013	.0039	.0001	.0001	.0000	.0068
%RSD	6.071	4.421	206.2	.0995	51.13	4.185	161.9
#1	.0011	.0307	-.0009	.0883	.0002	.0000	-.0006
#2	.0010	.0289	.0046	.0881	.0001	.0000	.0090

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0574	-.0000	.0009	-.0012	.0021	.0104	1154.
SDev	.0042	.0000	.0004	.0012	.0006	.0471	24.
%RSD	7.344	2.254	48.20	105.2	31.53	452.3	2.114
#1	.0604	-.0000	.0012	-.0003	.0025	.0437	1171.
#2	.0545	-.0000	.0006	-.0021	.0016	-.0229	1137.

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	.0064	.0140	-.0001	.0011	.7596	.8894
SDev	.0001	.0011	.0049	.0001	.0000	.4357	.0130
%RSD	22.37	17.17	34.89	46.01	2.377	57.35	1.464
#1	.0005	.0056	.0106	-.0001	.0011	1.068	.8802
#2	.0004	.0071	.0175	-.0002	.0011	.4516	.8986

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0028	.0892	.0118	-.0020	.0016	.0075	-.0054
SDev	.0010	.0099	.0063	.0060	.0114	.0337	.0029
%RSD	36.75	11.11	53.34	308.0	706.9	452.4	54.82
#1	.0035	.0822	.0073	.0023	.0097	.0313	-.0074
#2	.0021	.0962	.0162	-.0062	-.0064	-.0164	-.0033

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	85.45	-.0022	.0014	1.847	.0026	.0002	-.0006
SDev	3.07	.0001	.0013	.004	.0019	.0008	.0027
%RSD	3.591	3.249	94.05	.2271	72.53	406.3	436.7
#1	83.28	-.0022	.0023	1.849	.0040	.0008	-.0026
#2	87.62	-.0021	.0005	1.844	.0013	-.0004	.0013

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	-.0015	-.0005	-.0055	.0172	-.0007	.0015
SDev	.0000	.0004	.0002	.0010	.0055	.0012	.0024
%RSD	.3554	27.68	52.53	18.94	32.02	180.2	159.0
#1	.0002	-.0012	-.0003	-.0062	.0210	.0002	.0032
#2	.0002	-.0018	-.0006	-.0048	.0133	-.0015	-.0002

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0064	-.0001
SDev	.0001	.0002	.0011
%RSD	147.4	2.620	1652.
#1	.0000	.0063	.0007
#2	-.0002	.0065	-.0008

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	667562	10000	--	--	--	--	--
SDev	24015.47	.0000000	--	--	--	--	--
%RSD	3.597491	.0000000	--	--	--	--	--
#1	650580	10000	--	--	--	--	--
#2	684543	10000	--	--	--	--	--

010127

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Method: DAILY2 Sample Name: 241727r Operator:
Run Time: 03/29/04 14:26:59
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0352	-.0000	.0363	.0016	.0000	-.0019
SDev	.0003	.0035	.0021	.0004	.0000	.0000	.0037
%RSD	404.3	9.922	28270.	1.070	.0400	130.7	193.5
#1	.0001	.0376	-.0015	.0366	.0016	.0000	.0007
#2	-.0003	.0327	.0015	.0360	.0016	.0000	-.0045

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0958	.0001	.0008	.0003	.0196	.0374	1180.
SDev	.0032	.0001	.0004	.0003	.0005	.0237	6.
%RSD	3.366	66.64	54.76	98.98	2.534	63.37	.5443
#1	.0981	.0001	.0005	.0001	.0193	.0541	1185.
#2	.0935	.0002	.0011	.0006	.0200	.0206	1176.

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0079	.0193	-.0000	.0006	.9247	.8548
SDev	.0007	.0002	.0036	.0001	.0006	.1020	.0024
%RSD	413.9	2.330	18.83	197.4	115.2	11.03	.2793
#1	.0003	.0078	.0218	.0000	.0010	.9968	.8531
#2	-.0006	.0080	.0167	-.0001	.0001	.8526	.8565

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0141	.0288	.0053	.0023	.0059	.0194	-.0007
SDev	.0001	.0014	.0020	.0043	.0046	.0217	.0008
%RSD	1.091	4.942	38.35	185.5	78.05	111.8	116.3
#1	.0140	.0298	.0067	-.0007	.0091	.0347	-.0012
#2	.0143	.0278	.0039	.0053	.0026	.0041	-.0001

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	85.33	.0001	.0059	1.211	.0033	.0039	-.0014
SDev	.57	.0028	.0012	.002	.0022	.0017	.0021
%RSD	.6662	5124.	21.01	.1541	65.40	44.12	149.9
#1	84.93	-.0019	.0050	1.209	.0018	.0027	.0001
#2	85.73	.0020	.0067	1.212	.0049	.0052	-.0029

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0023	-.0002	-.0028	-.0107	.0005	.0010
SDev	.0000	.0012	.0000	.0015	.0148	.0000	.0002
%RSD	4.594	53.11	9.502	55.27	137.9	.2475	17.65
#1	.0005	.0032	-.0002	-.0039	-.0003	.0005	.0012
#2	.0005	.0015	-.0002	-.0017	-.0211	.0005	.0009

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Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0696	.0004
SDev	.0000	.0001	.0001
%RSD	8.419	.1919	27.78
#1	.0001	.0697	.0003
#2	.0002	.0695	.0005

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	666640	10000	--	--	--	--	--
SDev	4473.865	.0000000	--	--	--	--	--
%RSD	.6711071	.0000000	--	--	--	--	--
#1	663476	10000	--	--	--	--	--
#2	669803	10000	--	--	--	--	--

010129

Analysis Report 03/29/04 02:37:24 PM page 1

Method: DAILY2 Sample Name: 241728r Operator:
Run Time: 03/29/04 14:32:17
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0203	-.0023	.0498	.0003	.0001	-.0049
SDev	.0018	.0122	.0014	.0005	.0000	.0001	.0147
%RSD	787.7	60.12	61.37	.9661	5.616	92.19	302.1
#1	.0015	.0289	-.0013	.0501	.0003	.0000	.0055
#2	-.0011	.0117	-.0033	.0494	.0003	.0001	-.0153

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1321	.0001	.0010	.0001	.0040	.0236	1109.
SDev	.0035	.0007	.0009	.0003	.0001	.0261	8.
%RSD	2.661	807.5	95.72	295.3	1.212	110.6	.7447
#1	.1346	.0006	.0016	.0003	.0040	.0421	1115.
#2	.1296	-.0004	.0003	-.0001	.0040	.0051	1103.

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0071	.0127	.0000	.0017	.9800	1.035
SDev	.0026	.0002	.0142	.0001	.0014	.1795	.002
%RSD	1037.	2.393	112.2	753.9	79.68	18.31	.1874
#1	.0021	.0072	.0227	-.0001	.0026	1.107	1.036
#2	-.0016	.0070	.0026	.0001	.0007	.8531	1.033

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0068	.0164	.0024	.0023	.0051	.0111	-.0009
SDev	.0001	.0061	.0026	.0058	.0052	.0052	.0068
%RSD	1.735	37.55	107.8	258.1	101.8	47.14	716.8
#1	.0068	.0207	.0006	.0064	.0088	.0074	-.0057
#2	.0067	.0120	.0042	-.0019	.0014	.0148	.0038

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	87.40	-.0032	.0025	2.094	.0023	.0006	-.0017
SDev	1.12	.0012	.0039	.014	.0030	.0022	.0009
%RSD	1.285	38.73	157.3	.6680	130.5	362.6	54.69
#1	86.61	-.0041	.0053	2.104	.0045	.0022	-.0011
#2	88.20	-.0023	-.0003	2.084	.0002	-.0010	-.0024

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0039	-.0002	-.0045	.0125	.0006	.0030
SDev	.0001	.0032	.0001	.0054	.0569	.0007	.0014
%RSD	19.29	83.05	53.67	118.4	457.1	114.4	45.86
#1	.0006	.0016	-.0001	-.0007	.0527	.0011	.0040
#2	.0004	.0062	-.0003	-.0083	-.0278	.0001	.0020

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0119	.0008
SDev	.0001	.0003	.0003
%RSD	37.92	2.857	35.21
#1	.0001	.0121	.0009
#2	.0002	.0117	.0006

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	682834	10000	--	--	--	--	--
SDev	8772.367	.0000000	--	--	--	--	--
%RSD	1.284700	.0000000	--	--	--	--	--
#1	676631	10000	--	--	--	--	--
#2	689037	10000	--	--	--	--	--

010131

Analysis Report 03/29/04 02:42:43 PM page 1

Method: DAILY2 Sample Name: 241729r Operator:
Run Time: 03/29/04 14:37:36
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	.0196	.0025	.0685	.0009	.0000	.0003
SDev	.0001	.0064	.0004	.0017	.0001	.0000	.0015
%RSD	21.67	32.77	14.36	2.480	9.848	14.08	448.8
#1	.0007	.0241	.0028	.0697	.0010	.0000	-.0007
#2	.0005	.0150	.0023	.0673	.0008	.0000	.0014

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	13.22	-.0000	.0005	.0001	.0073	.0205	1014.
SDev	.01	.0002	.0001	.0003	.0002	.0058	.
%RSD	.0470	1550.	9.782	504.4	2.622	28.11	.0374
#1	13.22	.0001	.0005	.0002	.0072	.0246	1014.
#2	13.21	-.0001	.0005	-.0001	.0075	.0165	1014.

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0062	.1155	.0037	.0019	.8271	.9647
SDev	.0001	.0004	.0019	.0002	.0001	.0795	.0085
%RSD	68.18	6.426	1.689	5.321	8.155	9.615	.8820
#1	-.0001	.0060	.1169	.0038	.0020	.7708	.9587
#2	-.0002	.0065	.1141	.0035	.0018	.8833	.9707

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0280	.0224	.0024	.0026	.0048	.0084	-.0024
SDev	.0003	.0019	.0022	.0017	.0009	.0155	.0005
%RSD	1.032	8.272	89.66	66.63	18.78	185.7	20.87
#1	.0278	.0237	.0040	.0038	.0042	.0193	-.0021
#2	.0283	.0211	.0009	.0014	.0054	-.0026	-.0028

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	88.00	-.0067	.0047	2.559	.0025	.0009	-.0013
SDev	.33	.0011	.0010	.013	.0019	.0003	.0000
%RSD	.3740	17.05	21.13	.5268	73.75	30.35	.1326
#1	87.77	-.0059	.0040	2.550	.0039	.0007	-.0013
#2	88.23	-.0075	.0054	2.569	.0012	.0011	-.0013

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0127	.0019	.0006	-.0075	-.0116	.0003	-.0013
SDev	.0000	.0000	.0001	.0030	.0065	.0006	.0001
%RSD	.0652	.2059	18.95	39.34	55.56	181.4	11.07
#1	.0127	.0019	.0007	-.0054	-.0071	.0007	-.0014
#2	.0127	.0019	.0005	-.0096	-.0162	-.0001	-.0012

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.1005	-.0000
SDev	.0001	.0002	.0006
%RSD	209.6	.2264	2230.
#1	.0000	.1006	.0004
#2	-.0001	.1003	-.0004

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	687536	10000	--	--	--	--	--
SDev	2536.392	.0000000	--	--	--	--	--
%RSD	.3689102	.0000000	--	--	--	--	--
#1	685743	10000	--	--	--	--	--
#2	689330	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: ccv2 Operator:
Run Time: 03/29/04 14:47:41
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9929	9.681	5.013	4.779	9.931	.9869	4.986
SDev	.0001	.038	.010	.015	.043	.0023	.008
%RSD	.0127	.3876	.1925	.3114	.4368	.2307	.1656
#1	.9928	9.654	5.006	4.768	9.900	.9885	4.980
#2	.9930	9.707	5.020	4.789	9.962	.9853	4.991
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	1.100	11.00	5.500	5.500	11.00	1.100	5.500
Low	.9000	9.000	4.500	4.500	9.000	.9000	4.500

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	19.73	.9976	4.937	1.964	1.998	10.07	L17.89
SDev	.05	.0035	.013	.009	.008	.09	.07
%RSD	.2627	.3549	.2533	.4444	.4178	.8621	.3925
#1	19.77	1.000	4.946	1.970	1.992	10.13	L17.84
#2	19.70	.9951	4.928	1.958	2.004	10.01	L17.94
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Low
High	22.00	1.100	5.500	2.200	2.200	11.00	22.00
Low	18.00	.9000	4.500	1.800	1.800	9.000	18.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.946	4.611	19.67	1.0000	4.975	L26.92	27.99
SDev	.010	.031	.01	.00156	.007	.17	.17
%RSD	.2018	.6760	.0374	.1558	.1350	.6163	.6119
#1	4.939	4.589	19.68	1.001	4.970	27.04	27.87
#2	4.953	4.633	19.67	.9989	4.979	L26.81	28.11
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	LC Pass
High	5.500	5.500	22.00	1.100	5.500	33.00	33.00
Low	4.500	4.500	18.00	.9000	4.500	27.00	27.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.881	5.070	4.966	5.034	1.012	.9910	.9811
SDev	.023	.047	.079	.025	.001	.0081	.0032
%RSD	.4637	.9192	1.595	.4874	.1203	.8158	.3276
#1	4.897	5.037	5.022	5.052	1.013	.9967	.9834
#2	4.865	5.103	4.910	5.017	1.012	.9852	.9788
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	5.500	5.500			1.100	1.100	1.100
Low	4.500	4.500			.9000	.9000	.9000

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.15	5.246	5.323	4.941	5.012	5.297	4.844
SDev	1.03	.067	.027	.005	.043	.040	.017
%RSD	1.066	1.274	.5050	.1062	.8531	.7588	.3416
#1	95.42	5.293	5.342	4.937	5.042	5.326	4.856
#2	96.87	5.199	5.304	4.944	4.981	5.269	4.832
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				5.500	5.500	5.500	5.500
Low				4.500	4.500	4.500	4.500

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.039	.9823	4.748	5.249	.9268	4.917	H1.118
SDev	.010	.0062	.007	.006	.0462	.005	.010
%RSD	.1908	.6286	.1401	.1218	4.981	.1060	.8986
#1	5.032	.9779	4.743	5.245	.9594	4.921	H1.126
#2	5.046	.9867	4.753	5.254	L.8942	4.913	H1.111
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High
High	5.500	1.100	5.500	5.500	1.100	5.500	1.100
Low	4.500	.9000	4.500	4.500	.9000	4.500	.9000

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.925	.9949	4.923
SDev	.005	.0064	.007
%RSD	.0959	.6427	.1350
#1	4.922	.9995	4.918
#2	4.929	.9904	4.928
Errors	LC Pass	LC Pass	LC Pass
High	5.500	1.100	5.500
Low	4.500	.9000	4.500

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	751178	10000	--	--	--	--	--
SDev	8037.683	.0000000	--	--	--	--	--
%RSD	1.070010	.0000000	--	--	--	--	--
#1	745495	10000	--	--	--	--	--
#2	756862	10000	--	--	--	--	--

Analysis Report 03/29/04 03:00:29 PM page 1

Method: DAILY2 Sample Name: ccb2 Operator:
Run Time: 03/29/04 14:55:22
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0009	-.0054	.0016	.0027	.0001	.0000	-.0023
SDev	.0004	.0086	.0019	.0001	.0000	.0000	.0016
%RSD	39.23	159.7	119.6	4.907	5.269	2.728	70.47
#1	-.0012	-.0114	.0030	.0028	.0001	.0000	-.0011
#2	-.0007	.0007	.0002	.0026	.0001	.0000	-.0034
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0001	.0009	-.0005	.0003	-.0013	.0190
SDev	.0008	.0000	.0005	.0012	.0006	.0032	.0126
%RSD	1429.	9.717	62.27	256.0	219.8	240.8	66.02
#1	-.0006	.0001	.0005	-.0013	-.0001	-.0036	.0101
#2	.0005	.0001	.0012	.0004	.0007	.0009	.0279
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0005	-.0076	-.0001	.0031	H.0828	.0044
SDev	.0002	.0000	.0013	.0000	.0005	.3021	.0010
%RSD	34.83	5.747	16.94	17.75	15.49	365.0	22.56
#1	-.0008	.0005	-.0085	-.0001	.0035	L-.1309	.0051
#2	-.0005	.0006	-.0067	-.0001	.0028	H.2964	.0037
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0011	H.0157	.0025	.0007	.0022	L-.0277	.0014
SDev	.0001	.0032	.0000	.0008	.0026	.0064	.0011
%RSD	12.88	20.69	.4916	104.4	118.9	23.02	78.41
#1	-.0010	H.0180	.0025	.0013	.0003	L-.0232	.0021
#2	-.0012	H.0134	.0025	.0002	.0040	L-.0322	.0006
Errors	LC Pass	LC High	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	98.92	.0036	.0006	-.0022	.0013	.0016	-.0004
SDev	1.94	.0007	.0019	.0031	.0005	.0011	.0009
%RSD	1.956	18.59	301.1	141.0	39.11	66.43	263.5
#1	100.3	.0031	.0020	-.0044	.0017	.0024	-.0010
#2	97.55	.0040	-.0007	-.0000	.0010	.0009	.0003
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0013	-.0001	-.0010	-.0261	.0006	-.0042
SDev	.0000	.0003	.0000	.0006	.0028	.0005	.0009
%RSD	149.1	22.40	1.650	62.44	10.69	83.28	21.01
#1	-.0000	.0015	-.0001	-.0014	-.0241	.0003	-.0036
#2	.0000	.0011	-.0001	-.0005	-.0281	.0010	-.0049
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	-.0001	-.0001
SDev	.0001	.0003	.0001
%RSD	72.20	312.2	78.33
#1	.0001	-.0003	-.0002
#2	.0002	.0001	-.0001
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	772890	10000	--	--	--	--	--
SDev	15121.48	.0000000	--	--	--	--	--
%RSD	1.956487	.0000000	--	--	--	--	--
#1	783582	10000	--	--	--	--	--
#2	762197	10000	--	--	--	--	--

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 56 085

010139

CLIENT(S): Div. 20 (Darrell Dunn)
TASK ORDER(S): 040304-12 SDG(S): 241722
PROJECT NO(S): 06002.01.081
METHOD: 3005A ___ 3050B ___ 3050B-7.5 ___ 3010A ___ 3020A ___ 7760A ___ 7740A ___ $HClO_4$ ___ H_2SO_4 Sb ___
Microwave ___ Fusion ___ Teflon ___ Rock ___ OTHER df 33.3
MATRIX: Water ___ Soil ___ Biota ___ Solid ___ Liquid ✓ TCLP Ext ___ OTHER ___
INSTRUMENT: GFAA ___ ICP ✓ ICP-MS ___ IC ___ FLAA ___ HYDRIDE ___ OTHER ___
ACID INORG #: HNO_3# ** HCl# ** H_2SO_4# ___ $HClO_4$# ___ HF# ___
INTERNAL STD: Sc @ 10 PPM ✓ Be @ 10 PPM ___ SOURCE: IV INORG# 4463 EXP: 3/05 AMT: 50µl
Oven/Hotplate ID: N/A Temperature (°C): N/A

SAMPLE IDENTIFICATION	pH	WT (g)	I.V. (mL)	F.V. (mL)	
PBW-C09E1			5 mL	5 mL	
LCSW-C09E1 *			5 mL		
241722		3/9/04	150µl		
23					
23d					
24					
25					
25S *					
26					
27					
28					
29					
~~Pipped~~ KE 3/9/04					
pipettes:					
5 mL — 5000L Adj.					
200C Adj.					
* Spiked 50µl Spike-1 (Spex # 4306, exp. 10/04)					
20µl ICAL-1 (Spex # 4245, exp. 9/04)					
20µl Mo 1000ppm (IV, # 4471, exp. 3/05)					
20µl W 1000ppm (IV, # 4203, exp. 8/04)					
** RLB 02-039-02, exp. 6/9/04.					
PBW and LCSW 5 mL RLB 02-039-02.					
					LOCATION:

PREPARED BY: [signature] DATE: 3-9-04
REVIEWED BY: John Wells DATE: 3-9-04
DISPOSAL INT/DATE/LOC: ___

FRM-191 (Rev 2/Mar 03)

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 56 116

010140

CLIENT(S): Div. 20
TASK ORDER(S): 040304 - 12 SDG(S): 241722
PROJECT NO(S): 06002.01.081
METHOD: 3005A___3050B___3050B-7.5___3010A___3020A___7760A___7740A___$HClO_4$___H_2SO_4 Sb___
Microwave___Fusion___Teflon___Rock___OTHER dilution df 33.3
MATRIX: Water___Soil___Biota___Solid___Liquid___TCLP Ext___OTHER___
INSTRUMENT: GFAA___ICP___ICP-MS___IC___FLAA___HYDRIDE___OTHER___
ACID INORG #: HNO_3# ** HCl# ** H_2SO_4#___ $HClO_4$#___ HF#___
INTERNAL STD: Sc @ 10 PPM ✓ Be @ 10 PPM___ SOURCE: IV INORG# 4463 EXP: 3/05 AMT: 50ml
Oven/Hotplate ID: N/A Temperature (°C):___

SAMPLE IDENTIFICATION	pH	WT (g)	I.V. (mL)	F.V. (mL)	
PBW-C29E1			5mL	5mL	
LCSW-C29E1 *			↓	↓	
241723r			150 ul		
26r			↓	↓	
27r					
28r					
29r					
pipettes:					
Adj. 5000 Lab 27C					
Adj 20					
Lab 30 20ul					
* Spiked 50ul Spike-1 (Spex #4306, exp. 10/04)					
20ul ICAL-1 (Spex #4245, exp. 9/04)					
20ul 1000ppm Mo (IV #4471, exp. 3/05)					
20ul 1000ppm W (IV #4203 exp. 8/04) KE 3/29/04					
** RLB 02-040-01 exp.		6/29/04			
PBW and LCSW 5ml RLB 02-040-01.					
		3/29/04	KE		
					LOCATION:
					N/A

PREPARED BY: [signature] DATE: 3-29-04
REVIEWED BY: COrduna DATE: 3/29/04
DISPOSAL INT/DATE/LOC:___

FRM-191 (Rev 2/Mar 03)

Trace Metals Reagent Logbook 010141

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 02 039

Reagent I.D.:	Preparation Description:	Prep Date:	Exp Date:	Initials:
RLB-02-039-01	1% HNO_3 / 5% HCL	2-26-04	5-26-04	Jee
	to a 500mL Nalgene bottle add			
	400mls di water, add 5mls HNO_3			
	#4427, add 25mls HCL #4454,			
	F.V. to 500mls with di water			
RLB-02-039-02	1% HNO_3 / 5% HCL	3-9-04	6-9-04	KE
	2mL HNO_3 #4432			
	10mL HCL #4455			
	200mL FV.			
RLB-02-039-03	5% Potassium Permanganate	3-12-04	3-12-05	BV
	Add 150G #4485 to 3 Liters			
	bring to mark with reag. WATER			
RLB 02-039-04	5% HNO_3 / 5% HCl	3-18-04	6-18-04	KE
	25mL HNO_3 #4345,			
	25mL HCl #4457			
	dilute to 500ml di-water			
RLB-02-039-05	EFB#1-C23E1 (1311)	3/22/04	6/22/04	KE
	~~74.1ml Acetic Acid~~ KE 3/22/04			
	74.1 mL Acetic Acid			
	33.4g NaOH #4207 dilute			
	to 13L Di-water			
	pH 4.93			

Trace Metals Reagent Logbook 010142

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 02 040

Reagent I.D.:	Preparation Description:	Prep Date:	Exp Date:	Initials:
02-040-01	5% HCL # 4458 5ml	3/29/04	6/29/04	KE
	5% HNO_3 # 4345 5ml			
	dilute to 100ml di/water			
RLB-02-040-02	1% HNO_3 / 5% HCL	4-8-04	7-8-04	JW
	add 100mls di H_2O to a 250mL			
	Nalgene bottle, add 25mls HNO_3 - inorg#			
	4346, add 12.5mls HCL inorg# 4490			
	F.V. to ~~di~~ 250mls w/di water JW 4-8-04			

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010143

SOUTHWEST RESEARCH INSTITUTE®

6220 Culebra Rd
San Antonio, Texas 78228

TJA_2 TRACE ICP DAILY LOG

ANALYST: [signature]

DATE ~~3-2-04~~ 3-22-04

As 189.042 Profile Line

As Intensity: 619.749/514.057

PEAK POSITION -.050056/-.007113

VERNIER POSITION 739 / 740

QC PREP DATE:	
CCV/ICV	04C05
CRI	04C01
ICSA	04C01
ICSAB	04C01

STDs PREP DATE:	
CLP_STD1_SC	04C01
CLP_STD2_SC	04C01
CLP_STD3_SC	04C01
CLP_STD4_SC	04C01
CLP_STD5_SC	04C01
CLP_STD6_SC	04C01
BLK_SC	04C01

COMMENTS	FILE	CLIENT	TO#	PROJECT NO.	METHOD
B403188A	Y04 MAL	Kaiser Hill	040318-8	04758.10.006	6010 56 098
B401144	Y04 MAL	INEEL	040114-4	06355.22.006	6010 NA

[signature] 3-22-04

COMMENTS:

MAINTENANCE: Changed pump tubing

REVIEWED BY: [signature]

DATE: 3/22/04

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SOUTHWEST RESEARCH INSTITUTE®

6220 Culebra Rd
San Antonio, Texas 78228

010144

TJA_2 TRACE ICP DAILY LOG

ANALYST [illegible]

DATE 3-29-04

As 189.042 Profile Line

As Intensity: 501,219

PEAK POSITION .04377

VERNIER POSITION 742

STDs PREP DATE:	
CLP_STD1_SC	04C01
CLP_STD2_SC	04C01
CLP_STD3_SC	04C01
CLP_STD4_SC	04C01
CLP_STD5_SC	04C01
CLP_STD6_SC	04C01
BLK_SC	04C25

QC PREP DATE:	
CCV/ICV	04C25
CRI	04C01
ICSA	04C01
ICSAB	04C01

COMMENTS	FILE	CLIENT	TO#	PROJECT NO.	METHOD
B040329	Y04MAR	Div 01	040310-4	R9431.01.004	SWKI 55 284
B040329	Y04MAR	Div 01	040310-4	R9431.01.004	SWKI 55 285
B040329A	Y04MAR	USEPA	040123-6	06993.01.006	6010B NA
|	|	|	040123-7	|	| |
			040123-8		
B040329A	Y04MAR	USEPA	040123-9	06993.01.006	6010B NA
B040329~~B~~D	Y04MAR	Div 20	040304-12	06002.01.081	SWKI 56116
B040329C	Y04MAR	W.L.Gore	040226-9	01.01446.003	SWKI 55279
B040329C	Y04MAR	W.L.Gore	040316-7	01.01446.003	SWKI 55 288
B403186	Y04MAR1	Ethyl	040318-6	07368.03.006	SWKI 55 293
	Y04MAR1	Ethyl	040318-6	07368.03.006	SWKI 55 290
	Y04MAR1	Ethyl	040318-6	07368.03.006	SWKI 55 291
	Y04MAR1	Ethyl	040322-13	07368.03.006	SWKI 55296

COMMENTS:

MAINTENANCE:

REVIEWED BY: CArduña

DATE: 3/29/04

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SOUTHWEST RESEARCH INSTITUTE

6220 Culebra Rd
San Antonio, Texas 78228

010145

SPECTRO ICP DAILY LOG

ANALYST [illegible]

DATE 3-23-04

POWER: 1200

FLOWS:
Aux 40
Coolant 60
Mass Flow Controller 1054

CURRENT	PROPOSED	
5096	5048	Na
4783	4779	Fe
4948	4949	Sr

CLP_STD1_SC	04C01
CLP_STD2_SC	
CLP_STD3_SC	
CLP_STD4_SC	
CLP_STD5_SC	
BLK_SC	04C01

[illegible] 3-23-04

QC PREP DATE:	
CCV/ICV	04C05
CRI	04C01
ICSA	04C01
ICSAB	04C01

FILE	CLIENT	TO#	PROJECT NO.	METHOD	PREP PAGE
040323	DIV-20	0403A-12	06002.01.081	Li K NA	NA
040323A	INTEC	040119-4	06355.22.006	Si-2	07-166

[illegible] 3-23-04

COMMENTS:

MAINTENANCE:

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

OTHER:

REVIEWED BY: Cordova

DATE: 3/23/04

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 04B19

Date Prepared: 2-19-04 Prepared By: DL

Make up as needed in 1000ml volumetric flask.

010146

Added ✓ 10 ml HNO3 INORG #: 4427

Added ✓ 50 ml HCL INORG #: 4453

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: 4262 INORG #: 10-1-04

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 04C01

Date Prepared: 3-1-04 Prepared By: DL

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4427

Added ✓ 50 ml HCL INORG #: 4454

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: 10-1-04 INORG #: 4262

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 04C25

Date Prepared: 3-25-04 Prepared By: PH

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4345

Added ✓ 50 ml HCL INORG #: 4456

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: 10-1-04 INORG #: 4262

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

010147

CCV- 04C05

Date Prepared: 3-5-04 Prepared By: [illegible]

HNO3 INORG #: 4428 HCl INORG #: 4455

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	4262	10000	10-1-04
B	5	5ml	✓	SPEX	~~4439~~	1000	6-30-04
Li	5	5ml	✓	SPEX	4439	1000	1-30-05
Mo	5	5ml	✓	SPEX	4440	1000	1-30-05
P	5	5ml	✓	SPEX	~~4370~~ 4307	1000	10-30-04
Si	5	5ml	✓	SPEX	4232	1000	8-30-04
Ti	5	5ml	✓	SPEX	4234	1000	8-30-04
Sr	5	5ml	✓	SPEX	4308	1000	10-30-04
Sn	5	5ml	✓	SPEX	4141	1000	6-30-04
Bi	5	5ml	✓	SPEX	4138	1000	6-30-04
La	5	5ml	✓	SPEX	4438	1000	1-30-05
Y	5	5ml	✓	SPEX	4441	1000	1-30-05
Pd	1	1ml	✓	SPEX	4417	1000	1-15-05
S	1	1ml	✓	SPEX	4140	1000	6-30-04
Th	1	1ml	✓	SPEX	4233	1000	8-30-04
U	1	1ml	✓	SPEX	4142	1000	6-30-04
W	1	1ml	✓	SPEX	4212	1000	8-15-04
Zr	5	5ml	✓	SPEX	4213	1000	8-15-04
Na	10	1ml	✓	SPEX	4443	10000	1-30-05
ICV-2A	vary	10ml	✓	SPEX	4328	mix	11-30-04
ICV-2B	vary	1ml	✓	SPEX	4329	mix	11-30-04
ICV-2C	vary	10ml	✓	SPEX	~~44~~ 4330	mix	11-30-04

Expiration Date: 6-30-04

ICP ICV/CCV SOLUTION

010148

CCV- 0AC25

Date Prepared: 3-25-04 Prepared By: [illegible]

HNO3 INORG #: 4345 HCl INORG #: 4458

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	4262	10000	10-1-04
B	5	5ml	✓	SPEX	4139	1000	6-30-04
Li	5	5ml	✓	SPEX	4439	1000	1-30-05
Mo	5	5ml	✓	SPEX	4440	1000	1-30-05
P	5	5ml	✓	SPEX	4370	1000	10-30-05 04
Si	5	5ml	✓	SPEX	4232	1000	8-30-04
Ti	5	5ml	✓	SPEX	4234	1000	8-30-04
Sr	5	5ml	✓	SPEX	4308	1000	10-30-04
Sn	5	5ml	✓	SPEX	4141	1000	6-30-04
Bi	5	5ml	✓	SPEX	4138	1000	6-30-04
La	5	5ml	✓	SPEX	4438	1000	1-30-05
Y	5	5ml	✓	SPEX	4441	1000	1-30-05
Pd	1	1ml	✓	SPEX	4417	1000	1-15-05
S	1	1ml	✓	SPEX	4140	1000	6-30-04
Th	1	1ml	✓	SPEX	4233	1000	8-30-04
U	1	1ml	✓	SPEX	4142	1000	6-30-04
W	1	1ml	✓	SPEX	4212	1000	8-15-04
Zr	5	5ml	✓	SPEX	4213	1000	8-15-04
Na	10	1ml	✓	SPEX	4443	10000	1-30-05
ICV-2A	vary	10ml	✓	SPEX	4328	mix	11-30-04
ICV-2B	vary	1ml	✓	SPEX	4329	mix	11-30-04
ICV-2C	vary	10ml	✓	SPEX	4330	mix	11-30-04

Expiration Date: 6-30-04

ICP Calibration Standards

010149

Date Prepared: 3-1-04 Prepared By: [illegible]

HNO3 INORG #: 4427 HCl INORG #: 4454

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
3-1-04 [illegible] 04C01	STD1- 3-1-04	Al	50	2.50	✓	INORVENT	4220	10000	9-1-04
		Ca	50	2.50	✓	INORVENT	4436	10000	2-1-05
		Fe	50	2.50	✓	INORVENT	4470	10000	3-1-05
		K	50	2.50	✓	INORVENT	4320	10000	12-1-04
		Mg	25	1.25	✓	INORVENT	4204	10000	8-1-04
		Na	50	2.50	✓	INORVENT	4205	10000	8-1-04
		Li	10	5.00	✓	INORVENT	4149	1000	7-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
3-1-04 [illegible] 04C01	STD2- 3-1-04	Ba	10	5.00	✓	INORVENT	4465	1000	3-1-05
		Be	5	2.50	✓	INORVENT	4062	1000	6-1-04
		Cr	10	5.00	✓	INORVENT	4314	1000	12-1-04
		Cu	10	5.00	✓	INORVENT	4469	1000	3-1-05
		Ni	10	5.00	✓	INORVENT	4472	1000	3-1-05
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
					✓				
3-1-04 [illegible] 04C01	STD3- 3-1-04	Cd	10	5.00	✓	INORVENT	4467	1000	3-1-05
		Co	10	5.00	✓	INORVENT	4468	1000	3-1-05
		Mn	10	5.00	✓	INORVENT	4434	1000	2-1-05
		V	10	5.00	✓	INORVENT	4321	1000	12-1-04
		Zn	10	5.00	✓	INORVENT	4319	1000	12-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
3-1-04 [illegible] 04C01	STD4- 3-1-04	Ag	2	1.00	✓	INORVENT	4222	1000	9-1-04
		As	10	5.00	✓	INORVENT	4433	1000	2-1-05
		Pb	10	5.00	✓	INORVENT	4313	1000	11-1-04
		Sb	10	5.00	✓	INORVENT	4464	1000	3-1-05
		Se	10	5.00	✓	INORVENT	4152	1000	7-1-04
		TL	10	5.00	✓	INORVENT	4435	1000	2-1-05
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
3-1-04 [illegible] 04C01	STD5- 3-1-04	B	10	5.00	✓	INORVENT	4466	1000	3-1-05
		Mo	10	5.00	✓	INORVENT	4471	1000	3-1-05
		P	10	5.00	✓	INORVENT	4049	1000	6-1-04
		Si	10	5.00	✓	INORVENT	4153	1000	7-1-04
		Ti	10	5.00	✓	INORVENT	4332	1000	12-1-04
		Sr	10	5.00	✓	INORVENT	4154	1000	7-1-04
		Sn	10	5.00	✓	INORVENT	4026	1000	4-1-04
		Bi	5	2.50	✓	INORVENT	4200	1000	8-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
04C01 [illegible] 3-1-04	STD6- 3-1-04	La	10	5.00	✓	INORVENT	4221	1000	9-1-04
		Na	1	0.05	✓	INORVENT	4205	10000	8-1-04
		Pd	10	5.00	✓	INORVENT	4477	1000	3-1-05
		S	10	5.00	✓	INORVENT	4317	1000	12-1-04
		Th	10	5.00	✓	INORVENT	4283	1000	11-1-04
		U	10	5.00	✓	INORVENT	4473	1000	3-1-05
		W	5	2.50	✓	INORVENT	4203	1000	8-1-04
		Y	10	5.00	✓	INORVENT	4063	1000	6-1-04
		Zr	10	5.00	✓	INORVENT	4474	1000	3-1-05
		SC	10	0.500	✓	INORVENT	4262	10000	10-1-04

Expiration Dates:

STD1: 6-1-04 STD4: 6-1-04

STD2: 6-1-04 STD5: 4-1-04

STD3: 6-1-04 STD6: 6-1-04

010150

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040304-12
SRR: 25612
SDG: 241722
CASE: CNWRA
VTSR: March 04, 2004
PROJECT#: 06002.01.081

Certificates of Analysis

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/31/03
DATE EXPIRED: 10/31/2004 DK
DATE OPENED: 11/3/03
INORG: 4306 PO: F5241

SPEXertificate™

Certificate of Reference Material

010151

Catalog Number: SPIKE-1 **Lot No.:** 25-23AS
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	199.51	3101a	Pb	50	49.98	3128
As	200	199.89	3103a	Sb	50	50.02	3102a
Ba	200	199.68	3104a	V	50	49.95	3165
Se	200	200.10	3149	Zn	50	50.02	3168a
TL	200	200.07	3158	Cu	25	25.34	3114
Fe	100	99.91	3126a	Cr	20	20.04	3112a
Co	50	50.25	3113	Ag	5	5.00	3151
Mn	50	49.98	3132	Be	5	5.00	3105a
Ni	50	50.11	3136	Cd	5	4.99	3108

Spex Reference Multi: Lot #2-61BD, 17-55AS, 19-85ASREF

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.

Date of Certification: OCT - - 2003 Certifying Officer: N. Kocherlakota

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010152

SPEXertificate™

Certificate of Reference Material

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/5/03
DATE EXPIRED: 09/15/2004
DATE OPENED: 09/16/03
INORG: 4345 PO: E5328

Catalog Number: ICAL-1 **Lot No.:** 25-176AS
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	4,984.92	3109a
K	5,000	4,990.26	3141a
Mg	5,000	4,991.82	3131a
Na	5,000	4,998.07	3152a

Spex Reference Multi: Lot #10-100AS, 12-113AS, 5-198VY, 6-28VY-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.

Date of Certification: SEP - - 2003 Certifying Officer: N. Kocherlakota

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010153

FISHER SCIENTIFIC
TRACEMETAL GRADE NITRIC ACID
CERTIFICATE OF ANALYSIS

Catalog No. A509

Lot No: 1103070
Release Date: July, 2003
Expiry Date: July, 2006

Tests	Units	Value
Assay	%	69%
Color	APHA	<10
Aluminum	ppb	<0.2
Antimony	ppb	<0.1
Arsenic	ppb	<0.1
Barium	ppb	<0.1
Beryllium	ppb	<0.1
Bismuth	ppb	<0.1
Boron	ppb	<1
Cadmium	ppb	<0.1
Calcium	ppb	<0.5
Chromium	ppb	<0.1
Cobalt	ppb	<0.1
Copper	ppb	<0.1
Iron	ppb	<0.5
Lead	ppb	<0.1
Lithium	ppb	<0.1
Magnesium	ppb	<0.2
Manganese	ppb	<0.1
Mercury	ppb	<0.2
Molybdenum	ppb	<0.1
Nickel	ppb	<0.1
Potassium	ppb	<0.2
Selenium	ppb	<0.1
Silver	ppb	<0.1
Sodium	ppb	<0.2
Strontium	ppb	<0.1
Thorium	ppb	<0.1
Tin	ppb	<0.1
Titanium	ppb	<0.1
Uranium	ppb	<0.1
Vanadium	ppb	<0.1
Zinc	ppb	<0.2
Zirconium	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.

B McKelvey

Dr. B. McKelvey
QA/QC Manager
Fisher Scientific Chemical Division
Pittsburgh, PA., 15275 Phone (412) 490-8300

Fisher Chemical
A Fisher Scientific Company

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/19/04
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INORG: 4427-4432 PO: 52305

010154

FISHER SCIENTIFIC
TRACEMETAL GRADE NITRIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A509

Lot No: 1103070
Release Date: July, 2003
Expiry Date: July, 2006

Tests	Units	Value
Assay	%	69%
Color	APHA	<10
Aluminum	ppb	<0.2
Antimony	ppb	<0.1
Arsenic	ppb	<0.1
Barium	ppb	<0.1
Beryllium	ppb	<0.1
Bismuth	ppb	<0.1
Boron	ppb	<1
Cadmium	ppb	<0.1
Calcium	ppb	<0.5
Chromium	ppb	<0.1
Cobalt	ppb	<0.1
Copper	ppb	<0.1
Iron	ppb	<0.5
Lead	ppb	<0.1
Lithium	ppb	<0.1
Magnesium	ppb	<0.2
Manganese	ppb	<0.1
Mercury	ppb	<0.2
Molybdenum	ppb	<0.1
Nickel	ppb	<0.1
Potassium	ppb	<0.2
Selenium	ppb	<0.1
Silver	ppb	<0.1
Sodium	ppb	<0.2
Strontium	ppb	<0.1
Thorium	ppb	<0.1
Tin	ppb	<0.1
Titanium	ppb	<0.1
Uranium	ppb	<0.1
Vanadium	ppb	<0.1
Zinc	ppb	<0.2
Zirconium	ppb	<0.1

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/25/03
DATE EXPIRED: 11/25/2013
DATE OPENED: 11/25/03
INORG: 4341-4346 PO: 552279

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.

B McKelvey

Dr. B. McKelvey
QA/QC Manager
Fisher Scientific Chemical Division
Pittsburgh, PA., 15275 Phone (412) 490-8300

Fisher Chemical
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010155

FISHER SCIENTIFIC
TRACEMETAL GRADE HYDROCHLORIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A508

Lot No: 4103100
Release Date: October, 2003
Expiry Date: October, 2006

Tests	Units	Value
Assay	%	37%
Color	APHA	<10
Aluminum	ppb	<0.5
Antimony	ppb	<0.1
Arsenic	ppb	<0.1
Barium	ppb	<0.1
Beryllium	ppb	<0.1
Bismuth	ppb	<0.1
Boron	ppb	<1
Cadmium	ppb	<0.1
Calcium	ppb	<0.5
Chromium	ppb	<0.1
Cobalt	ppb	<0.1
Copper	ppb	<0.1
Iron	ppb	<0.5
Lead	ppb	<0.1
Lithium	ppb	<0.1
Magnesium	ppb	<0.5
Manganese	ppb	<0.1
Mercury	ppb	<0.2
Molybdenum	ppb	<0.1
Nickel	ppb	<0.1
Potassium	ppb	<0.1
Selenium	ppb	<0.1
Silver	ppb	<0.1
Sodium	ppb	<0.5
Strontium	ppb	<0.1
Thorium	ppb	<0.1
Tin	ppb	<0.1
Titanium	ppb	<0.1
Uranium	ppb	<0.1
Vanadium	ppb	<0.1
Zinc	ppb	<0.5
Zirconium	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.

B McKelvey

Dr. B. McKelvey
QA/QC Manager

Fisher Scientific Chemical Division
Pittsburgh, PA., 15275 Phone (412) 490-8300

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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 02/11/04
DATE EXPIRED: 02/11/2014
DATE OPENED: 02/11/04
INORG: 4453-4458 PO: F52017

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

010156

certificate of analysis

CUSTOM-GRADE SOLUTION 10,000 µg/mL Scandium IN 5% HNO_3 (abs)

Catalog Number: CGSC10-1and CGSC10-5

Lot Number: **T-SC02053**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/24/03
DATE EXPIRED: 10/01/2004
DATE OPENED: 09/24/03
INORG: 4262 PO: F52232

Starting Material:	Sc_2O_3
Starting Material Purity:	99.999%
Starting Material Lot No:	632-5721

CERTIFIED CONCENTRATION: 10,047 ± 29 µg/mL

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:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 10,047 ± 29 µg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 9994 ± 41 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3148a.

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.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm .

O	Al	<0.070	M	Dy	<0.0060	M	Li	<0.010	M	Pr	<0.00030	M	Te	<0.030
M	Sb	<0.00050	M	Er	<0.0050	M	Lu	<0.00040	M	Re	<0.0010	M	Tb	<0.00030
M	As	<0.010	M	Eu	<0.0030	M	Mg	<0.030	M	Rh	<0.0010	M	Tl	<0.0010
M	Ba	<0.010	M	Gd	<0.0010	M	Mn	<0.0040	M	Rb	<0.0010	M	Th	0.028
M	Be	<0.00050	M	Ga	<0.0010	i	Hg		M	Ru	<0.0020	M	Tm	<0.00040
M	Bi	0.043	M	Ge	<0.0060	M	Mo	<0.0020	M	Sm	<0.0010	M	Sn	<0.0050
O	B	<0.034	M	Au	<0.0030	M	Nd	<0.0020	s	Sc		n	Ti	
M	Cd	<0.0030	M	Hf	0.030	O	Ni	<0.084	O	Se	<0.67	M	W	<0.010
O	Ca	0.17	M	Ho	<0.00050	M	Nb	<0.00050	O	Si	<0.034	M	U	<0.0020
M	Ce	<0.0050	M	In	<0.0010	n	Os		M	Ag	0.0050	M	V	<0.0020
M	Cs	<0.00030	M	Ir	<0.0050	M	Pd	<0.0050	O	Na	<0.16	M	Yb	<0.0010
M	Cr	<0.0050	O	Fe	<0.16	i	P		M	Sr	<0.00050	M	Y	<0.040
M	Co	<0.0030	M	La	<0.00050	M	Pt	<0.0020	n	S		M	Zn	0.075
M	Cu	<0.0060	M	Pb	0.0050	O	K	<5.01	M	Ta	<0.0070	M	Zr	0.32

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.073 g/mL

(over)

QA:KL Rev.021203DN

Paul R. Haines
Quality Assurance Manager

Expires: EXPIRES 01/2004

SPEXertificate™

Certificate of Reference Material

010157

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/09/03
DATE EXPIRED: 06/30/2004
DATE OPENED: 06/23/03
INORG: 4139 PO: 52370

Catalog Number: PLB9-2X/2Y/2T **Lot No.** 9-143B

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 relevent to the certified properties listed below.

Certified Value: 999.5 mg/L

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

Certified Value is Traceable to: NIST SRM 3107

The CRM is prepared gravimetrically using high purity (NH4)2(B4O7)-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.

Instrumentation Analysis By ICP spectrometer: 998 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	0.06	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
Be	<0.001	K	<0.01	Sb	<0.001
Bi	<0.001	Li	<0.001	Sn	<0.001
Cd	<0.001	Mn	<0.001	Ti	<0.001
Co	<0.001	Mo	<0.001	Tl	<0.001
Ca	0.003	Mg	<0.001	V	0.004
Cr	<0.003	Na	0.026	Zr	<0.001
		Ni	<0.001	Zn	<0.007

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: JUN '03 Certifying Officer: N. Kocherlakota

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Certificate of Reference Material

Catalog Number: PLLI2-2X/2Y **Lot No.** 10-12LI

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 relevent to the certified properties listed below.

Certified Value: 997.5 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3129a

The CRM is prepared gravimetrically using high purity Lithium Carconate 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: 997 mg/L

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

Instrumentation Analysis By ICP spectrometer: 998 mg/L

Uncertified Properties:

Density: 1.014 @ 22.2 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.001	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.007	Re	<0.001
Ag	<0.003	Ga	<0.001	Rb	<0.001
B	<0.008	In	<0.001	Sr	<0.001
Ba	0.001	K	0.20	Sb	<0.001
Be	<0.001	Mn	<0.001	Si	0.007
Bi	<0.001	Mo	<0.001	Ti	<0.001
Ca	0.017	Mg	<0.001	Tl	<0.001
Cr	<0.001	Na	0.01	V	<0.001
Cd	0.008	Ni	<0.001	Zr	<0.001
Co	<0.001			Zn	0.035

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 '04 Certifying Officer: N. Kocherlakota

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DATE OPENED: 01/23/04
INORG: 4439 PO: F52306

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Certificate of Reference Material

Catalog Number: PLMO9-2X/2Y/2T **Lot No.** 10-74MO

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: 998 mg/ L

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

Certified Value is Traceable to: NIST SRM #3134

The CRM is prepared gravimetrically using high purity (NH4)6Mo7(O)24 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: 998 mg/L

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

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 0.9989 @ 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	0.002	Cu	0.003	Pb	0.002
As	0.04	Fe	<0.10	Re	0.03
Ag	<0.001	Ga	<0.001	Rb	<0.001
B	<0.006	In	<0.001	Sr	<0.001
Ba	0.001	K	0.01	Sb	0.005
Be	<0.01	Li	<0.001	Si	<0.50
Bi	<0.001	Mg	0.10	Ti	0.004
Ca	0.01	Mn	0.001	Tl	<0.001
Cr	<0.002	Na	0.007	V	0.003
Cd	<0.10	Ni	<0.001	Zr	<0.001
Co	0.002			Zn	0.009

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 '04 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/23/04
DATE EXPIRED: 01/30/2005
DATE OPENED: 01/23/04
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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 12/3/03
DATE EXPIRED: 12/3/2004 DK
DATE OPENED: 11/3/03
INORG: 4307 PO: F53261

SPEXertificate™ 010160

Certificate of Reference Material

Catalog Number: PLP9-2X/2Y/2T **Lot No.** 9-150P
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 relevent to the certified properties listed below.

Certified Value: 1002.5 mg/L
Uncertainty Associated with Measurement: +/- 3 mg/L
Certified Value is Traceable to: NIST SRM 3139a

The CRM is prepared gravimetrically using high purity (NH4)H2(PO4) Lot# W1002B. 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 Magnesia Mixture. Filter, ignite, and weigh as Mg2P2O7.

Instrumentation Analysis By ICP spectrometer: 1002 mg/L
Uncertified Properties:

Density: 0.9996 @ 24.0 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	<0.001	Rb	<0.001
Ag	<0.002	Ga	<0.001	Re	<0.001
B	<0.002	In	<0.001	Sn	<0.001
Ba	<0.001	K	0.006	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	0.004
Bi	<0.001	Mg	<0.001	Ti	0.004
Ca	0.004	Mn	<0.001	Tl	<0.001
Cr	<0.008	Mo	<0.001	V	<0.006
Cd	<0.001	Na	0.003	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	0.07

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 -- 2003 Certifying Officer: N. Kocherlakota

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SPEXertificate™ 010161

Certificate of Reference Material

Catalog Number: PLSI9-2X/2Y/2T **Lot No.** 10-07SI

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 relevent to the certified properties listed below.

Certified Value: 998.5 mg/L

Uncertainty Associated with Measurement: +/- 3 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: 997 mg/L

Method: Precipitation using Ammonium Molybdate and 8-Hydroxy Quinoline. Filter, dry, and weigh as (C9H7ON)4(H4)[Si(Mo12O40)]

Instrumentation Analysis By ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.010 @ 26.5 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	0.020	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.003	In	<0.001	Sr	<0.001
Ba	<0.001	K	<0.010	Sb	0.03
Be	<0.001	Li	<0.001	Ti	<0.001
Bi	<0.001	Mg	<0.001	Tl	<0.001
Ca	0.018	Mn	<0.001	V	<0.001
Cr	<0.002	Mo	<0.001	Zr	0.05
Cd	<0.001	Na	0.02	Zn	0.06
Co	<0.001	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: AUG '03 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/05/03
DATE EXPIRED: 08/30/2004
DATE OPENED: 09/05/03
INORG: 4232 PO: 55225

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010162

Certificate of Reference Material

Catalog Number: PLTI9-2X/2Y/2T **Lot No.** 10-38TI

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 relevent to the certified properties listed below.

Certified Value: 1001 mg/L

Uncertainty Associated with Measurement: 3.0mg/L

Certified Value is Traceable to: NIST SRM #3162a

The CRM is prepared gravimetrically using high purity (NH4)2TiF6 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: 1003 mg/L

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

Instrumentation Analysis By ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.001 @ 22.5 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.006	Cu	<0.10	Pb	<0.001
As	<0.001	Fe	<0.01	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	0.003	In	<0.001	Si	0.52
Ba	<0.001	K	<0.01	Sr	0.001
Be	<0.001	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	<0.001	Tl	<0.001
Ca	0.013	Mn	<0.001	V	<0.001
Cr	<0.003	Mo	<0.001	Zr	0.01
Cd	<0.001	Na	0.02	Zn	0.03
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: AUG '03 Certifying Officer: N. Kochertakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/05/03
DATE EXPIRED: 08/30/2004
DATE OPENED: 09/05/03
INORG: 4234 PO: 53225

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SPEXertificate™

Certificate of Reference Material

Catalog Number: PLSR2-2X/2Y/2T **Lot No.** 9-166SR

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 relevent to the certified properties listed below.

Certified Value: 1002.5 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3153a

The CRM is prepared gravimetrically using high purity Strontium Carbonate Lot# 02001B. 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: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against Pb(NO3)2 NIST SRM #928.

Instrumentation Analysis By ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 1.010 @ 22.7 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.02	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.001	Rb	<0.001
Ag	<0.002	Ga	<0.001	Re	<0.001
B	<0.003	In	<0.001	Si	0.043
Ba	0.008	K	0.10	Sb	<0.001
Be	<0.001	Li	0.007	Ti	<0.002
Bi	<0.001	Mg	<0.003	Tl	<0.001
Ca	0.014	Mn	<0.001	V	<0.001
Cr	0.001	Mo	<0.001	Zr	<0.001
Cd	<0.001	Na	0.01	Zn	0.04
Co	<0.001	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: OCT -- 2003 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/31/03
DATE EXPIRED: 10/30/2004
DATE OPENED: 11/3/03
INORG: 4308 PO: F50061

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Certificate of Reference Material

Catalog Number: PLSN5-2X/2Y/2T **Lot No.** 9-62SN

Description: 1000 mg/L Tin

Matrix: 20% 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 relevent to the certified properties listed below.

Certified Value: 1000 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3161a

The CRM is prepared gravimetrically using high purity Tin Metal Lot# 02891N. 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 SnO_2.

Instrumentation Analysis By ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.034 @ 24.8 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.007	Cu	<0.001	Pb	0.001
As	0.01	Fe	0.02	Rb	<0.001
Ag	0.002	Ga	<0.001	Re	<0.001
B	<0.03	In	<0.001	Sr	<0.001
Ba	<0.001	K	0.10	Sb	0.002
Be	<0.001	Li	<0.001	Ti	<0.001
Bi	<0.001	Mg	<0.001	Tl	<0.001
Ca	0.004	Mn	<0.001	V	<0.001
Cr	<0.005	Mo	<0.001	Zr	<0.001
Cd	<0.001	Na	0.02	Zn	0.03
Co	0.008	Ni	<0.01		

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: JUN '03 Certifying Officer: N. Kocherlakota

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Catalog Number: PLBI4-2X/2Y **Lot No.** 9-36BI

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 relevent to the certified properties listed below.

Certified Value: 1001 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3106

The CRM is prepared gravimetrically using high purity Bismuth Metal Lot# 04941B. 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.

Instrumentation Analysis By ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.052 @ 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	0.002	Cu	0.034	Pb	0.006
As	<0.001	Fe	0.001	Re	<0.001
Ag	0.002	Ga	<0.001	Rb	<0.001
B	<0.04	In	<0.001	Sr	<0.001
Ba	<0.001	K	0.001	Sb	<0.001
Be	<0.001	Li	<0.001	Sn	<0.001
Cd	<0.001	Mn	<0.001	Ti	<0.001
Co	<0.001	Mo	<0.001	Tl	<0.001
Ca	0.006	Mg	<0.001	V	<0.002
Cr	<0.005	Na	0.005	Zr	<0.001
		Ni	<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.

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Certificate of Reference Material

Catalog Number: PLLA2-2X/2Y **Lot No.** 10-27LA

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 relevent to the certified properties listed below.

Certified Value: 1000 mg/L

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

Certified Value is Traceable to: NIST SRM #3127a

The CRM is prepared gravimetrically using high purity La(NO3)3-6H2O Lot# 03951B. 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.

Instrumentation Analysis By ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.010 @ 22.3 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Ce	0.02	Lu	<0.001	Th	<0.001
Ca	0.029	Mn	<0.001	Tm	<0.001
Dy	<0.001	Mo	<0.001	Ti	<0.001
Er	<0.001	Nd	<0.001	Tb	<0.001
Eu	<0.001	Ni	<0.001	Ta	<0.001
Fe	0.005	Na	0.01	Tl	<0.001
Gd	<0.001	Pr	<0.001	V	<0.001
Ga	<0.001	Rb	<0.001	W	<0.001
Hf	<0.001	Sc	0.002	Y	<0.001
Ho	<0.001	Sm	<0.001	Yb	<0.001
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.

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Catalog Number: PLY2-2X/2Y/2T **Lot No.** 9-152Y

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 relevent to the certified properties listed below.

Certified Value: 1001.5 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3167a.

The CRM is prepared gravimetrically using high purity Yttrium Oxide Lot# 08001A. 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: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against Pb(NO3)2 NIST SRM #928.

Instrumentation Analysis By ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.010 @ 24.8 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Ce	<0.001	La	<0.001	Tb	<0.001
Ca	0.007	Lu	<0.001	Tm	<0.001
Dy	<0.001	Mn	<0.001	Tl	<0.001
Er	<0.001	Mo	<0.001	Th	<0.001
Eu	<0.001	Nd	<0.001	Ta	<0.001
Fe	0.003	Ni	<0.001	Ti	<0.001
Gd	<0.001	Na	0.005	V	<0.001
Ga	<0.001	Pr	<0.001	W	<0.001
Hf	<0.001	Rb	<0.001	Yb	<0.001
Ho	<0.001	Sc	<0.001	Zr	0.003
In	<0.001	Sm	<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: JAN '04 Certifying Officer: N. Kocherlakota

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Catalog Number: PLPD3-2X/2Y **Lot No.** 10-108PD

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: 1002.5 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3138

The CRM is prepared gravimetrically using high purity Palladium Powder Lot# 01021A. 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: Precipitation using Glyoxime. Filter, dry, and weigh as Pd(C4H7O2N2)2

Instrumental Analysis by ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 1.017 @ 23.6 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.01	Fe	0.024	Re	<0.001
Au	0.003	Ga	<0.001	Rh	0.001
Ag	0.005	Ir	<0.001	Rb	<0.001
B	<0.002	In	<0.001	Ru	<0.001
Be	<0.003	Mg	0.008	Sn	0.007
Bi	<0.001	Mn	<0.001	Te	<0.002
Ca	0.014	Na	0.02	Ti	<0.001
Cd	<0.001	Ni	<0.001	W	<0.001
Co	0.004	Pb	0.002	Zr	<0.001
Cr	<0.003	Pt	<0.001	Zn	1.0
Cu	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: JAN '04 Certifying Officer: N. Kocherlakota

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Catalog Number: PLS9-2X/2Y/2T **Lot No.** 8-74S
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 relevent to the certified properties listed below.

Certified Value: 1003 mg/L
Uncertainty Associated with Measurement: +/- 3 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 BaS04.

Instrumentation Analysis By ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 1.007 @ 23.6 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	<0.001	Pb	0.002
As	<0.001	Fe	0.008	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.004	In	<0.001	Sn	<0.001
Ba	<0.001	K	<0.001	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	0.005	Ti	<0.002
Ca	0.009	Mn	<0.001	Tl	<0.001
Cr	<0.004	Mo	<0.001	V	<0.001
Cd	<0.001	Na	0.02	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	0.0075

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.

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Catalog Number: PLTH2-2X/2Y **Lot No.** 10-24TH
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 relevent 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 #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: 1000 mg/L

Method: EDTA titration using Xylenol Orange as indicator. EDTA syandardized against Pb(NO3)2 NIST SRM #928.

Instrumentation Analysis By ICP spectrometer: 998 mg/L

Uncertified Properties:

Density: 1.010 @ 22.0 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Ce	0.01	La	0.003	Tb	<0.001
Ca	0.27	Lu	<0.001	Tm	<0.001
Dy	<0.001	Mn	<0.001	Ti	<0.002
Er	<0.001	Mo	<0.001	Ta	<0.001
Eu	<0.001	Nd	0.003	Tl	<0.001
Fe	<0.01	Ni	<0.001	V	<0.001
Gd	<0.001	Na	0.04	W	<0.001
Ga	<0.001	Pr	<0.001	Y	0.002
Hf	<0.001	Rb	<0.001	Yb	<0.001
Ho	<0.001	Sc	<0.03	Zr	<0.001
In	<0.001	Sm	<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.

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Certificate of Reference Material

Catalog Number: PLU2-2X/2Y **Lot No.** 9-179U

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 relevent to the certified properties listed below.

Certified Value: 999.5 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3164.

The CRM is prepared gravimetrically using high purity Uranium Oxide 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: 999 mg/L

Method: Evaporate to dryness. Ignite and weigh as U3O8.

Instrumentation Analysis By ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.010 @ 23.6 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.005	Cu	0.02	Pb	0.004
As	0.06	Fe	0.011	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.005	In	<0.001	Si	<0.10
Ba	0.004	K	0.008	Sr	0.003
Be	<0.001	Li	<0.001	Sb	0.003
Bi	<0.001	Mg	0.003	Ti	<0.001
Ca	0.012	Mn	0.003	Tl	<0.001
Cr	<0.010	Mo	0.006	V	<0.003
Cd	<0.001	Na	0.10	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	0.008

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: JUN '03 Certifying Officer: N. Kocherlakota

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Catalog Number: PLW9-2X/2Y **Lot No.** 9-177W

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 relevent to the certified properties listed below.

Certified Value: 1,000 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3163

The CRM is prepared gravimetrically using high purity Ammonium Tungstate Lot# 02001H. 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: Fume with Sulfuric Acid to dryness. Ignite and weigh as WO3.

Instrumentation Analysis By ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 0.9979 @ 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	0.002	Cu	<0.001	Pb	<0.001
As	0.01	Fe	<0.01	Rb	<0.001
Ag	<0.003	Ga	<0.001	Re	0.004
B	<0.005	In	<0.001	Si	.56
Ba	<0.001	K	0.05	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	0.001
Bi	<0.001	Mg	<0.001	Ti	<0.001
Ca	0.009	Mn	<0.001	Tl	<0.001
Cr	<0.001	Mo	0.005	V	0.001
Cd	<0.001	Na	0.03	Zr	<0.001
Co	0.001	Ni	<0.001	Zn	0.01

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.

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Catalog Number: PLZR2-2X/2Y/2T **Lot No.** 10-05ZR

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 relevent 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 3169

The CRM is prepared gravimetrically using high purity Zirconyl Nitrate Lot# 11011C. 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 Sulfuric Acid. Ignite and weigh as ZrO2.

Instrumentation Analysis By ICP spectrometer: 997 mg/L

Uncertified Properties:

Density: 1.010 @ 23.6 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.03	Cu	0.002	Pb	0.002
As	<0.001	Fe	0.017	Rb	<0.001
Ag	<0.05	Ga	<0.001	Re	<0.001
B	<0.004	In	<0.001	Si	0.10
Ba	<0.001	K	0.10	Sr	<0.001
Be	<0.001	Li	0.002	Sb	<0.001
Bi	<0.001	Mg	0.003	Ti	<0.001
Ca	0.11	Mn	<0.001	Tl	<0.001
Cr	<0.009	Mo	<0.001	V	<0.001
Cd	0.004	Na	0.04	Zn	0.02
Co	<0.001	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: AUG '03 Certifying Officer: N. Kocherlakota

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Certificate of Reference Material

Catalog Number: PLNA2-3X/3Y **Lot No.** U8-128NA

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 relevent to the certified properties listed below.

Certified Value: 9998 mg/L

Uncertainty Associated with Measurement: +/- 30 mg/L

Certified Value is Traceable to: NIST SRM 3152a.

The CRM is prepared gravimetrically using high purity Sodium Carbonate Lot# 02021A. 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: 9998 mg/L

Method: Evaporate to dryness. Fume with Sulfuric Acid. Ignite and weigh as Na2SO4.

Instrumentation Analysis By ICP spectrometer: 9998 mg/L

Uncertified Properties:

Density: 1.049 @ 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	0.02	Cu	0.003	Pb	<0.001
As	<0.003	Fe	0.03	Re	<0.001
Ag	<0.03	Ga	<0.001	Rb	<0.001
B	<0.03	In	<0.001	Sr	<0.002
Ba	0.03	K	0.14	Sb	<0.001
Be	<0.02	Li	<0.002	Sn	<0.001
Bi	<0.001	Mg	0.30	Ti	<0.004
Ca	0.52	Mn	0.008	Tl	<0.001
Cr	<0.004	Mo	<0.001	V	<0.001
Cd	<0.001	Ni	<0.002	Zr	<0.001
Co	<0.001			Zn	<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: JAN '04 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/29/04
DATE EXPIRED: 01/30/2005
DATE OPENED: 01/29/04
INORG: 4443 PO: F52308

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SPEXertificate™

Certificate of Reference Material

010175

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/20/03
DATE EXPIRED: 11/30/2004
DATE OPENED: 11/21/03
INORG: 4328 PO: F59278

Catalog Number: ICV-2A **Lot No.:** 24-84AS
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	Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
Ca	2,000	2,005.40	3109a	Ni	500	500.58	3136
K	2,000	1,997.89	3141a	V	500	504.23	3165
Mg	2,000	1,992.26	3131a	Cr	200	203.21	3112a
Na	2,000	1,992.99	3152a	Cu	200	199.75	3114
Al	1,000	1,005.90	3101a	Ag	100	100.46	3151
Ba	1,000	1,001.51	3104a	Be	100	100.04	3105a
Fe	1,000	1,003.17	3126a	Mn	100	100.64	3132
Co	500	505.10	3113	Zn	100	100.52	3168a

Spex Reference Multi: Lot #4-63BD, 14-125AS

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.

Date of Certification: NOV -- 2003 Certifying Officer: N. Kocherlakota

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SPEXertificate™ 010176

Certificate of Reference Material

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/20/03
DATE EXPIRED: 11/30/2004
DATE OPENED: 11/21/03
INORG: 4329 PO: F58278

Catalog Number: PLSB7-2X/2Y/2T **Lot No.** 10-43SB
Description: 1000 mg/L Antimony
Matrix: H2O/0.6Tart.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: 1004 mg/ L
Uncertainty Associated with Measurement: +/-3.0mg/L
Certified Value is Traceable to: NIST SRM 3102a

The CRM is prepared gravimetrically using high purity Antimony Metal Lot# 04021A. 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: 1005 mg/L

Method: Evaporate to dryness. Fume with Nitric Acid. Ignite and weigh as Sb2O4.

Instrumental Analysis by ICP spectrometer: 1002 mg/ L

Uncertified Properties:

Density: 1.046 @ 25.5 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.03	Cu	0.002	Pb	0.009
As	<0.001	Fe	0.03	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.004	In	<0.001	Sr	<0.001
Ba	<0.001	K	0.01	Si	<0.01
Be	<0.001	Li	<0.001	Ti	<0.003
Bi	0.002	Mg	0.005	Tl	<0.001
Ca	0.14	Mn	<0.001	V	<0.001
Cr	<0.002	Mo	<0.001	Zr	<0.001
Cd	<0.001	Na	0.005	Zn	0.02
Co	<0.001	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: NOV -- 2003 Certifying Officer: N. Kocherlakota

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SPEXertificate™

Certificate of Reference Material

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/20/03
DATE EXPIRED: 11/30/2004
DATE OPENED: 11/21/03
INORG: 4330 PO: 52278

Catalog Number: ICV-2C **Lot No.:** 24-85AS
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	497.85	3103a
Pb	500	495.41	3128
Se	500	501.98	3149
TL	500	501.89	3158
Cd	100	99.77	3108

Spex Reference Multi: Lot #4-51BDREF, 15-39AS, 11-173AS

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.

Date of Certification: NOV -- 2003 Certifying Officer: N. Kocherlakota

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inorganic ventures / iv labs

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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 Statisical Principles."

010178

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Aluminum in 5% (abs) HNO_3**

Catalog Number:	CGAL10-1 and CGAL10-5
Lot Number:	**W-AL04008**
Starting Material:	Al metal
Starting Material Purity (%):	99.998460
Starting Material Lot No	607116
Matrix:	5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004
DATE OPENED: 08/26/03
INORG: 4220 PO: F52224

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10070 ± 31 µg/mL

Certified Density: 1.059 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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** **10006 ± 55 µg/mL**
ICP Assay NIST SRM 3101a Lot Number: 992003

Assay Method #2 **10070 ± 31 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

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.

S	Al		M	Dy	< 0.02695	O	Li	0.00011	M	Pr	< 0.00135	M	Te	< 0.13473
M	Sb	< 0.00225	M	Er	< 0.02245	M	Lu	< 0.00180	M	Re	< 0.00449	M	Tb	< 0.00135
M	As	< 0.04491	M	Eu	< 0.01347	O	Mg	0.00470	M	Rh	< 0.00449	M	Tl	< 0.00449
M	Ba	< 0.04491	M	Gd	< 0.00449	M	Mn	< 0.01796	M	Rb	< 0.00449	M	Th	< 0.00449
O	Be	< 0.00017	M	Ga	< 0.00449	O	Hg	< 0.00700	M	Ru	< 0.00898	M	Tm	< 0.00180
M	Bi	< 0.00180	M	Ge	< 0.02695	M	Mo	< 0.00898	M	Sm	< 0.00449	M	Sn	< 0.02245
O	B	0.01164	M	Au	< 0.01347	M	Nd	< 0.00898	M	Sc	< 0.04491	M	Ti	< 0.22454
M	Cd	< 0.01347	M	Hf	< 0.00898	O	Ni	< 0.00600	M	Se	< 0.03593	M	W	< 0.04491
O	Ca	0.01903	M	Ho	< 0.00225	M	Nb	< 0.00225	O	Si	0.07389	M	U	< 0.00898
M	Ce	< 0.02245	O	In	< 0.03000	n	Os		M	Ag	< 0.00898	M	V	< 0.00898
M	Cs	< 0.00135	M	Ir	< 0.02245	M	Pd	< 0.02245	O	Na	0.03359	M	Yb	< 0.00449
O	Cr	0.00336	O	Fe	0.00493	O	P	< 0.03000	M	Sr	< 0.00225	M	Y	< 0.17963
M	Co	< 0.01347	M	La	< 0.00225	M	Pt	< 0.00898	O	S	< 0.10000	M	Zn	< 0.08982
M	Cu	< 0.02695	M	Pb	< 0.01347	O	K	0.02911	M	Ta	< 0.03144	M	Zr	< 0.02245

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010180

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°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; $Al(H_2O)_6^{+3}$

Chemical Compatibility - Soluble in HCl, HNO_3, HF and H_2SO_4. Avoid neutral media. Soluble in strongly basic NaOH forming the $Al(OH)_4(H_2O)_2^{-}$ 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[5]); γ- Al_2O_3 (Soluble in acids such as HCl); Ores (Carbonate fusion in Pt[5] 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 ≥50ppm conc.)
ICP-OES 394.401 nm	0.05 / 0.006 µg/mL	1	atom	U, Ce
ICP-OES 396.152 nm	0.03 / 0.006 µg/mL	1	atom	Mo, Zr, Ce
ICP-OES 167.078 nm	0.1 / 0.009 µg/mL	1	ion	Fe
ICP-MS 27 amu	30 ppt	n/a	M[+]	$^{12}C^{15}N$, $^{13}C^{14}N$, $^{1}H^{12}C^{14}N$, $^{11}B^{16}O$, $^{54}Cr^{2+}$, $^{54}Fe^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004
DATE OPENED: 08/26/03
INORG: 4220 PO: F52224

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010181

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: February 13, 2003

Expiration Date:

EXPIRES
1 SEP 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

inorganic ventures / iv labs

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010182

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 Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Calcium in 1.4% (abs) HNO_3**

Catalog Number:	CGCA10-1, CGCA10-2, and CGCA10-5
Lot Number:	**W-CA03022**
Starting Material:	CaO
Starting Material Purity (%):	99.999389
Starting Material Lot No	C27L01
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005
DATE OPENED: 01/20/04
INORG: 4436 PO: F52303

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 9968 ± 18 µg/mL

Certified Density: 1.038 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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** **9968 ± 18 µg/mL**
ICP Assay NIST SRM 3109a Lot Number: 000622

Assay Method #2 **9973 ± 25 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

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.

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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.

O	Al	0.00013	M	Dy	< 0.03067	O	Li	0.00011	M	Pr	< 0.00153	M	Te	< 0.15333
M	Sb	< 0.00256	M	Er	< 0.02556	M	Lu	< 0.00204	M	Re	< 0.00511	M	Tb	< 0.00153
M	As	< 0.05111	M	Eu	< 0.01533	O	Mg	0.03453	M	Rh	< 0.00511	M	Tl	< 0.00511
O	Ba	0.00063	M	Gd	< 0.00511	O	Mn	< 0.00030	M	Rb	< 0.00511	M	Th	< 0.00511
O	Be	< 0.00009	M	Ga	< 0.00511	O	Hg	< 0.01100	M	Ru	< 0.01022	M	Tm	< 0.00204
M	Bi	< 0.00204	M	Ge	< 0.03067	M	Mo	< 0.01022	M	Sm	< 0.00511	M	Sn	< 0.02556
O	B	< 0.00054	M	Au	< 0.01533	M	Nd	< 0.01022	O	Sc	< 0.00002	M	Ti	< 0.25555
O	Cd	< 0.00450	M	Hf	< 0.01022	O	Ni	< 0.00230	O	Se	< 0.00620	M	W	< 0.05111
S	Ca		M	Ho	< 0.00256	M	Nb	< 0.00256	O	Si	0.00253	M	U	< 0.01022
M	Ce	< 0.02556	O	In	< 0.00200	n	Os		M	Ag	< 0.01022	O	V	< 0.00090
M	Cs	< 0.00153	M	Ir	< 0.02556	M	Pd	< 0.02556	O	Na	< 0.00010	M	Yb	< 0.00511
O	Cr	0.00183	O	Fe	< 0.00110	O	P	< 0.00480	O	Sr	0.02021	M	Y	< 0.20444
O	Co	< 0.00120	M	La	< 0.00256	M	Pt	< 0.01022	O	S	0.01053	O	Zn	0.02232
O	Cu	< 0.00400	M	Pb	< 0.01533	O	K	< 0.00170	M	Ta	< 0.03578	M	Zr	< 0.02556

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010184

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°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; $Ca(H_2O)_6^{+2}$
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 Pt^6 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 50 ncs.)
ICP-OES	393.366 nm	0.0002 / 0.00004 µg/mL	1	ion	U, Ce
ICP-OES	396.847 nm	0.0005 / 0.00006 µg/mL	1	ion	Th
ICP-OES	422.673 nm	0.01 / 0.001 µg/mL	1	atom	Ge
ICP-MS	44 amu	1200 ppt	n/a	M+	$^{16}O_2$, ^{12}C, $^{28}Si^{16}O$, $^{88}Sr^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005
DATE OPENED: 01/20/04
INORG: 4436 PO: F52303

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010185

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 23, 2003

Expiration Date: EXPIRES 1 FEB 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

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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 Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Iron in 3.5% (abs) HNO_3**

Catalog Number:	CGFE10-1, CGFE10-2, and CGFE10-5
Lot Number:	**W-FE03030**
Starting Material:	Fe metal
Starting Material Purity (%):	99.999569
Starting Material Lot No	23166
Matrix:	3.5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4470 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,016 ± 25 µg/mL

Certified Density: 1.050 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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** **10,031 ± 33 µg/mL**
ICP Assay NIST SRM 3126a Lot Number: 000606

Assay Method #2 **10,016 ± 25 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

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.

010187

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.

O Al < 0.00270	M Dy < 0.02413	O Li < 0.00003	M Pr < 0.00121	M Te < 0.12066
M Sb < 0.00201	M Er < 0.02011	M Lu < 0.00161	M Re < 0.00402	M Tb < 0.00121
M As < 0.04022	M Eu < 0.01207	O Mg < 0.00006	M Rh < 0.00402	M Tl < 0.00402
M Ba < 0.04022	M Gd < 0.00402	O Mn < 0.02000	M Rb < 0.00402	M Th < 0.00402
O Be < 0.00005	M Ga < 0.00402	O Hg < 0.01100	M Ru < 0.00804	M Tm < 0.00161
M Bi < 0.00161	i Ge	M Mo < 0.00804	M Sm < 0.00402	M Sn < 0.02011
O B < 0.00090	M Au < 0.01207	M Nd < 0.00804	M Sc < 0.04022	M Ti < 0.20109
M Cd < 0.01207	M Hf < 0.00804	O Ni < 0.05000	M Se < 0.03218	M W < 0.04022
O Ca 0.00291	M Ho < 0.00201	M Nb < 0.00201	O Si < 0.01000	M U < 0.00804
M Ce < 0.02011	M In < 0.04022	n Os	M Ag < 0.00804	M V < 0.00804
M Cs < 0.00121	M Ir < 0.02011	M Pd < 0.02011	O Na 0.00776	M Yb < 0.00402
M Cr < 0.02011	s Fe	i P	M Sr < 0.00201	M Y < 0.16087
O Co < 0.00110	M La < 0.00201	M Pt < 0.00804	O S < 0.07200	M Zn 0.04876
M Cu < 0.02413	M Pb < 0.01207	O K < 0.00170	M Ta < 0.02815	M Zr < 0.02011

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010188

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°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; $Fe(H_2O)_6^{3+}$

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^0 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 ≤10ppm.)
ICP-OES	238.204 nm	0.005 / 0.001 µg/mL	1	ion	Ru, Co
ICP-OES	239.562 nm	0.005 / 0.001 µg/mL	1	ion	Co, W, Cr
ICP-OES	259.940 nm	0.006 / 0.001 µg/mL	1	ion	Hf, Nb
ICP-MS	56 amu	970 ppt	n/a	M'	$^{40}Ar^{15}N^1H$, $^{40}Ar^{16}O$, $^{38}Ar^{17}O^1H$, $^{38}Ar^{18}O$, $^{37}Cl^{18}O^1H$, $^{40}Ca^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4470 PO: F52323

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010189

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: March 20, 2003

Expiration Date:

EXPIRES
1 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010190

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 Statisical Principles."

2.0 DESCRIPTION OF CRM

Custom-Grade **10000 µg/mL Potassium in 1.4% (abs) HNO_3**

Catalog Number:	CGK10-1, CGK10-2, and CGK10-5
Lot Number:	**W-K02111**
Starting Material:	KNO3
Starting Material Purity (%):	99.997230
Starting Material Lot No	K18J19
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS 1 of 2
DATE RECEIVED: 11/5/03
DATE EXPIRED: 12/1/2004 DP
DATE OPENED: 11/5/03
INORG: 4320 PO: FS2256

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 9930 ± 9 µg/mL

Certified Density: 1.024 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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** **9926 ± 62 µg/mL**
ICP Assay NIST SRM 3141a Lot Number: 891312

Assay Method #2 **9930 ± 9 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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.

O	Al	< 0.00090	M	Dy	< 0.02400	O	Li	< 0.00003	M	Pr	< 0.00120	M	Te	< 0.11998
M	Sb	< 0.00200	M	Er	< 0.02000	M	Lu	< 0.00160	M	Re	< 0.00400	M	Tb	< 0.00120
M	As	< 0.03999	M	Eu	< 0.01200	O	Mg	0.00100	M	Rh	< 0.00400	M	Tl	< 0.00400
M	Ba	< 0.03999	M	Gd	< 0.00400	O	Mn	< 0.00003	M	Rb	0.49948	M	Th	< 0.00400
O	Be	< 0.00020	M	Ga	< 0.00400	O	Hg	< 0.01500	M	Ru	< 0.00800	M	Tm	< 0.00160
M	Bi	< 0.00160	O	Ge	< 0.00150	M	Mo	< 0.00800	M	Sm	< 0.00400	M	Sn	< 0.02000
O	B	< 0.00060	O	Au	< 0.00300	M	Nd	< 0.00800	O	Sc	< 0.00002	O	Ti	< 0.00070
M	Cd	< 0.01200	M	Hf	< 0.00800	O	Ni	< 0.00230	O	Se	< 0.05000	M	W	< 0.03999
O	Ca	0.00075	M	Ho	< 0.00200	M	Nb	< 0.00200	O	Si	< 0.00340	M	U	< 0.00800
M	Ce	< 0.02000	M	In	< 0.03999	n	Os		M	Ag	< 0.00800	O	V	< 0.00090
M	Cs	< 0.00120	M	Ir	< 0.02000	M	Pd	< 0.02000	O	Na	0.21730	M	Yb	< 0.00400
M	Cr	< 0.02000	O	Fe	0.00212	O	P	< 0.00250	M	Sr	< 0.00200	M	Y	< 0.15998
M	Co	< 0.01200	M	La	< 0.00200	M	Pt	< 0.00800	O	S	< 0.07200	O	Zn	0.00050
M	Cu	< 0.02400	M	Pb	< 0.01200	S	K		M	Ta	< 0.02800	M	Zr	< 0.02000

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

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 ± 4°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); $K^+(aq)$
(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):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤50ppm conc.)
ICP-OES	766.490 nm	0.4 / 0.001 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	771.531 nm	1.0 / 0.03 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	404.721 nm	1.1 / 0.05 µg/mL	1	atom	U, Ce,
ICP-MS	39 amu	10 ppt	n/a	M+	$^{38}ArH^+$, $^{23}Na^{16}O^+$, $^{78}Se^{12}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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.

010192

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

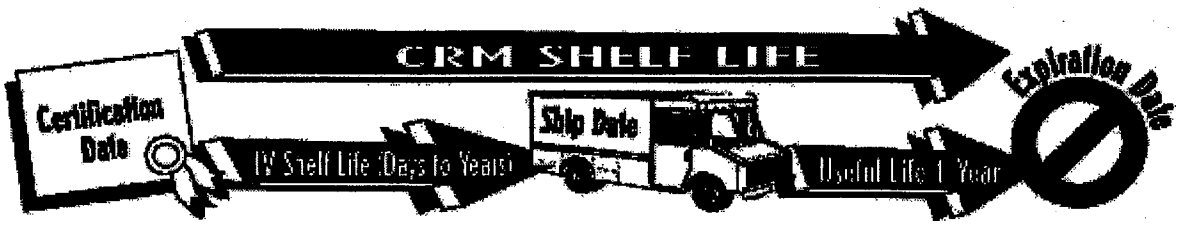
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), 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.

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 2 of 2
DATE EXPIRED: 12/1/2004 DR
DATE OPENED: 11/5/03
INORG: 4326 PO: P52258

Certification Date: January 30, 2003

Expiration Date:

EXPIRES
12/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010193

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

U10194

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 Statisical Principles."*

2.0 DESCRIPTION OF CRM Custom-Grade **10000 µg/mL Magnesium in 1.4% (abs) HNO_3**

Catalog Number:	CGMG10-1 and CGMG10-5
Lot Number:	**T-MG03006**
Starting Material:	Mg metal
Starting Material Purity (%):	99.9968
Starting Material Lot No	RML91191
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4204 PO: F52391

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 9921 ± 20 µg/mL

Certified Density: 1.050 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
$\sum S$ = 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 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** **9998 ± 20 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **9921 ± 20 µg/mL**
ICP Assay NIST SRM 3131a Lot Number: 991107

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.

O	Al		0.02454	M	Dy	<	0.02455	O	Li		0.00797	M	Pr	<	0.00123	M	Te	<	0.12275
M	Sb		0.00306	M	Er	<	0.02046	M	Lu	<	0.00164	M	Re	<	0.00409	M	Tb	<	0.00123
M	As	<	0.04092	M	Eu	<	0.01228	S	Mg			M	Rh	<	0.00409	M	Tl	<	0.00409
M	Ba	<	0.04092	M	Gd	<	0.00409	M	Mn	<	0.01637	M	Rb	<	0.00409	M	Th	<	0.00409
O	Be	<	0.00017	M	Ga	<	0.00409	O	Hg	<	0.00900	M	Ru	<	0.00818	M	Tm	<	0.00164
M	Bi	<	0.00164	M	Ge	<	0.02455	M	Mo	<	0.00818	M	Sm	<	0.00409	M	Sn	<	0.02046
O	B		0.00871	M	Au	<	0.01228	M	Nd	<	0.00818	M	Sc	<	0.04092	O	Ti		0.10206
M	Cd	<	0.01228	M	Hf	<	0.00818	O	Ni		0.01404	M	Se	<	0.03273	M	W	<	0.04092
O	Ca		0.01070	M	Ho	<	0.00205	M	Nb	<	0.00205	O	Si		0.03186	M	U	<	0.00818
M	Ce	<	0.02046	M	In	<	0.04092	n	Os			M	Ag	<	0.00818	M	V	<	0.00818
M	Cs	<	0.00123	M	Ir	<	0.02046	M	Pd	<	0.02046	O	Na		0.01817	M	Yb	<	0.00409
O	Cr		0.02315	O	Fe		0.02467	O	P	<	0.01600	M	Sr	<	0.00205	M	Y	<	0.16367
M	Co	<	0.01228	M	La	<	0.00205	M	Pt	<	0.00818	n	S			O	Zn		0.01892
O	Cu		0.00672	O	Pb		0.03236	O	K	<	0.05000	M	Ta	<	0.02864	M	Zr	<	0.02046

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010196

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°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; $Mg(H_2O)_6^{+2}$

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° 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 ≈ concs.)
ICP-OES	279.553 nm	0.0002 / 0.00003 µg/mL	1	ion	Th
ICP-OES	280.270 nm	0.0003 / 0.00005 µg/mL	1	ion	U, V
ICP-OES	285.213 nm	0.002 / 0.00003 µg/mL	1	atom	U, Hf, Cr, Zr
ICP-MS	24 amu	42 ppt	n/a	M'	$^{7}Li^{16}O$, $^{48}Ti^{+2}$, $^{48}Ca^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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

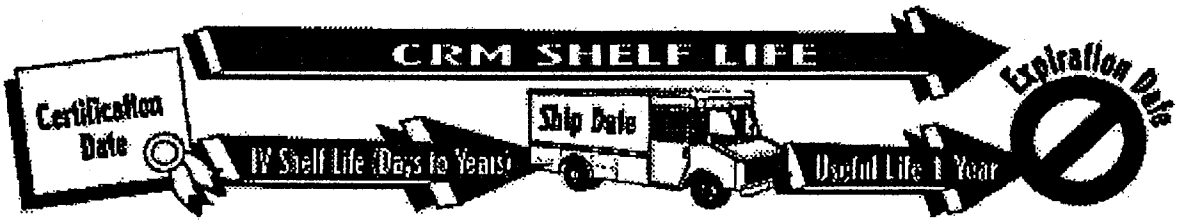
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

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

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4204 PO: E52391

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010197



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: August 28, 2002

Expiration Date: EXPIRES 01 02 004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Debbie Newman, QA Administrator	Debbie Newman
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R 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

010198

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 Statisical Principles."*

2.0 DESCRIPTION OF CRM

Custom-Grade **10000 µg/mL Sodium in 1.4% (abs) HNO_3**

Catalog Number:	CGNA10-1, CGNA10-2, and CGNA10-5
Lot Number:	**T-NA03006**
Starting Material:	Na2CO3
Starting Material Purity (%):	99.999936
Starting Material Lot No	42095
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4205 PO: F52391

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10,005 ± 7 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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** **10,067 ± 75 µg/mL**
ICP Assay NIST SRM 3152a Lot Number: 990907

Assay Method #2 **10,005 ± 7 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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. 010199

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.

O Al < 0.00090	M Dy < 0.02499	O Li < 0.00003	M Pr < 0.00125	M Te < 0.12494
M Sb < 0.00208	M Er < 0.02082	M Lu < 0.00167	M Re < 0.00417	M Tb < 0.00125
M As < 0.04165	M Eu < 0.01249	O Mg 0.00015	M Rh < 0.00417	M Tl < 0.00417
M Ba < 0.04165	M Gd < 0.00417	O Mn < 0.00003	M Rb < 0.00417	M Th < 0.00417
O Be < 0.00020	M Ga < 0.00417	O Hg < 0.01500	M Ru < 0.00833	M Tm < 0.00167
M Bi < 0.00167	O Ge < 0.00150	M Mo < 0.00833	M Sm < 0.00417	M Sn < 0.02082
O B < 0.00060	O Au < 0.00300	M Nd < 0.00833	O Sc < 0.00002	O Ti < 0.00070
M Cd < 0.01249	M Hf < 0.00833	O Ni < 0.00230	O Se < 0.05000	M W < 0.04165
O Ca 0.00160	M Ho < 0.00208	M Nb < 0.00208	O Si < 0.00340	M U < 0.00833
M Ce < 0.02082	M In < 0.04165	n Os	M Ag < 0.00833	O V < 0.00090
M Cs 0.00104	M Ir < 0.02082	M Pd < 0.02082	S Na	M Yb < 0.00417
M Cr < 0.02082	O Fe < 0.00110	O P < 0.04000	M Sr < 0.00208	M Y < 0.16658
M Co < 0.01249	M La < 0.00208	M Pt < 0.00833	O S < 0.07200	O Zn 0.00130
O Cu < 0.00140	M Pb < 0.01249	O K 0.00873	M Ta < 0.02915	M Zr < 0.02082

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

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 ± 4°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); $Na^{+}(aq)$ 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 at ≤10ppm conc.)
ICP-OES	589.595 nm	0.07 / 0.00009 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	588.995 nm	0.03 / 0.006 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	330.237 nm	2.0 / 0.09 µg/mL	1	atom	Pd, Zn
ICP-MS	23 amu	310 ppt	n/a	M+	$^{46}Ti^{+2}$, $^{46}Ca^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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

010200

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: January 24, 2003
Expiration Date: EXPIRES 01 02 2004

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4205 PO: F52391

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010201

Certificate Prepared By:	Debbie Newman, LIMS Administrator	Debbie Newman
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010202

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Lithium in 0.1% HNO_3 (abs)

Catalog Number: CGLI1-1, CGLI1-2 and CGLI1-5

Lot Number: **W-LI02066**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004
DATE OPENED: 06/23/03
INORG: 4149 PO: F52370

Starting Material:	Li_2CO_3
Starting Material Purity:	99.999%
Starting Material Lot No:	1053

CERTIFIED CONCENTRATION: 998 ± 2 μg/mL

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:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 998 ± 2 μg/mL
Method: Gravimetric as the Sulfate vs NIST weights #822/254143-94.

Instrument Analysis: 1000 ± 4 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3129a.

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.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm.

O	Al	<0.010	M	Dy	<0.00060	s	Li		M	Pr	<0.000030	O	Te	<0.0090
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
O	As	<0.044	M	Eu	<0.00030	O	Mg	<0.00010	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	O	Mn	<0.00020	M	Rb	<0.00010	M	Th	<0.00010
O	Be	<0.000050	M	Ga	<0.00010	O	Hg	<0.0070	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
O	B	<0.0060	O	Au	<0.010	M	Nd	<0.00020	M	Sc	<0.0010	O	Ti	<0.00030
O	Cd	<0.0018	M	Hf	<0.00020	O	Ni	<0.0040	O	Se	<0.020	M	W	<0.0010
O	Ca	0.051	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	0.023	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.030	n	Os		O	Ag	<0.0040	O	V	<0.0010
M	Cs	0.0018	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.10	M	Yb	<0.00010
O	Cr	<0.0020	O	Fe	<0.0020	O	P	<0.030	O	Sr	<0.0010	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	O	S	<0.050	O	Zn	<0.030
M	Cu	<0.00060	M	Pb	<0.00030	O	K	0.0070	M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.004 g/mL **(over)**

QA:KL Rev.022403DN

Paul P. Haines
Quality Assurance Manager

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

EXPIRES 01/2004

010203

inorganic ventures / iv labs

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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 Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Barium in 0.1% (abs) HNO_3**

Catalog Number:	CGBA1-1, CGBA1-2, and CGBA1-5
Lot Number:	**W-BA02023**
Starting Material:	Ba(NO3)2
Starting Material Purity (%):	99.999730
Starting Material Lot No	21879
Matrix:	0.1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg-1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4465 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1001 ± 1 µg/mL

Certified Density: 0.999 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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** **998 ± 4 µg/mL**
ICP Assay NIST SRM 3104a Lot Number: 992907

Assay Method #2 **1001 ± 1 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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.

O	Al	0.00011	M	Dy	< 0.01269	O	Li	< 0.00400	M	Pr	< 0.00063	M	Te	< 0.06343
M	Sb	< 0.00106	M	Er	< 0.01057	M	Lu	< 0.00085	M	Re	< 0.00211	O	Tb	< 0.00390
M	As	< 0.02114	O	Eu	< 0.00040	O	Mg	0.00009	M	Rh	< 0.00211	M	Tl	< 0.00211
s	Ba		O	Gd	< 0.00052	M	Mn	< 0.00846	M	Rb	< 0.00211	M	Th	< 0.00211
M	Be	< 0.00106	M	Ga	< 0.00211	O	Hg	< 0.01200	M	Ru	< 0.00423	M	Tm	< 0.00085
M	Bi	< 0.00085	M	Ge	< 0.01269	M	Mo	< 0.00423	O	Sm	< 0.00071	M	Sn	< 0.01057
M	B	< 0.14800	M	Au	< 0.00634	O	Nd	< 0.00330	M	Sc	< 0.02114	M	Ti	< 0.10571
M	Cd	< 0.00634	M	Hf	< 0.00423	M	Ni	< 0.01691	M	Se	< 0.01691	M	W	< 0.02114
O	Ca	0.00072	M	Ho	< 0.00106	M	Nb	< 0.00106	O	Si	< 0.00340	M	U	< 0.00423
M	Ce	< 0.01057	M	In	< 0.02114	n	Os		M	Ag	< 0.00423	M	V	< 0.00423
M	Cs	< 0.00063	M	Ir	< 0.01057	M	Pd	< 0.01057	M	Na	< 0.21142	M	Yb	< 0.00211
M	Cr	< 0.01057	O	Fe	0.00062	O	P	< 0.00260	O	Sr	0.00379	O	Y	0.00040
M	Co	< 0.00634	M	La	< 0.00106	M	Pt	< 0.00423	O	S	< 0.02500	O	Zn	< 0.00039
M	Cu	< 0.01269	M	Pb	0.00020	O	K	< 0.00180	O	Ta	< 0.00690	M	Zr	< 0.01057

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010205

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 137.33; +2; 6; $Ba(H_2O)_6^{+2}$

Chemical Compatibility - Soluble in HCl, and HNO_3. Avoid H_2SO_4, HF and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate, iodate, molybdate, sulfite and tungstate in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1 -10,000 ppm solutions chemically stable for years in 1-3.5% HNO_3 / LDPE container.

Ba Containing Samples (Preparation and Solution) - Metal(is best dissolved in diluted HNO_3); Ores(Carbonate fusion in Pt[a] followed by HCl dissolution. If sulfate is present dissolve the fusate using HCl /tartaric acid to prevent $BaSO_4$ precipitate); Organic Matrices (dry ash and dissolve in dilute HCl.)

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ppm conc.)
ICP-OES 455.403 nm	0.002 / 0.0001 µg/mL	1	ion	Zr, U
ICP-OES 233.527 nm	0.004 / 0.0003 µg/mL	1	ion	
ICP-OES 230.424 nm	0.004 / 0.0005 µg/mL	1	ion	Mo, Ir, Co
ICP-MS 138 amu	1 ppt	n/a	M[+]	$^{122}Sn^{16}O$, $^{122}Te^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4465 PO: F52323

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010206

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 28, 2003

Expiration Date: EXPIRES 1 JAN 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010207

inorganic ventures / iv labs

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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 Statisical Principles."*

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Beryllium in 2% (abs) HNO_3**

Catalog Number:	CGBE1-1, CGBE1-2, and CGBE1-5
Lot Number:	**W-BE01100**
Starting Material:	Be(OOCCH3)2
Starting Material Purity (%):	99.999897
Starting Material Lot No	01-10-01
Matrix:	2% (abs) HNO_3

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 991 ± 3 µg/mL

Certified Density: 1.022 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:

Certified Value (□) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

(□) = mean
x_i = individual results
n = number of measurements
■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.)

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** **991 ± 3 µg/mL (Avg 2 runs)**

ICP Assay NIST SRM 3105a Lot Number: 892707

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 05/09/03
DATE EXPIRED: 06/01/2004
DATE OPENED: 05/12/03
INORG: 40062 PO: F52181

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.

O Al < 0.00800	M Dy < 0.01305	O Li < 0.00002	M Pr < 0.00065	M Te < 0.06525
M Sb < 0.00109	M Er < 0.01087	M Lu < 0.00087	M Re < 0.00218	M Tb < 0.00065
M As < 0.02175	M Eu < 0.00652	O Mg < 0.00003	M Rh < 0.00218	M Tl < 0.00218
M Ba < 0.02175	M Gd < 0.00218	O Mn < 0.00002	M Rb < 0.00218	M Th < 0.00218
s Be	M Ga < 0.00218	O Hg < 0.01500	M Ru < 0.00435	M Tm < 0.00087
M Bi < 0.00087	M Ge < 0.01305	M Mo < 0.00435	M Sm < 0.00218	M Sn < 0.01087
O B < 0.01200	M Au < 0.00652	M Nd < 0.00435	O Sc < 0.00009	M Ti < 0.10874
M Cd < 0.00652	M Hf < 0.00435	M Ni < 0.65245	M Se < 0.01740	M W < 0.02175
O Ca 0.00164	M Ho < 0.00109	M Nb < 0.00109	O Si 0.00649	M U < 0.00435
M Ce < 0.01087	M In < 0.02175	n Os	M Ag < 0.00435	M V < 0.00435
M Cs < 0.00065	M Ir < 0.01087	M Pd < 0.01087	O Na 0.00368	M Yb < 0.00218
O Cr < 0.00900	O Fe 0.00268	n P	M Sr < 0.00109	M Y < 0.08699
M Co < 0.00652	M La < 0.00109	M Pt < 0.00435	i S	M Zn < 0.04350
M Cu < 0.01305	M Pb < 0.00652	O K < 0.10000	M Ta < 0.01522	M Zr < 0.01087

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

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 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 9.01218; +2; 4; $Be'(H_2O)_4^{+2}$
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 5-10 % HNO_3 / LDPE container.
Be Containing Samples (Preparation and Solution) - Metal (is best dissolved in diluted H_2SO_4); BeO (boiling nitric, hydrochloric, or sulfuric acids or $KHSO_4$ fusion); Ores (H_2SO_4/HF digestion or carbonate fusion in Pt°); Organic Matrices (sulfuric/peroxide digestion or nitric/sulfuric/perchloric acid decomposition, or dry ash and dissolution according to the BeO procedure above).
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 ≤ 10 ppm)
ICP-OES 313.042 nm	0.0003 / 0.00009 µg/mL	1	ion	V, Ce, U
ICP-OES 234.861 nm	0.0003 / 0.00016 µg/mL	1	atom	Fe, Ta, Mo
ICP-OES 313.107 nm	0.0007 / 0.0005 µg/mL	1	ion	Ce, Th, Tm
ICP-MS 9 amu	4 ppt	n/a	M'	

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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

010209

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

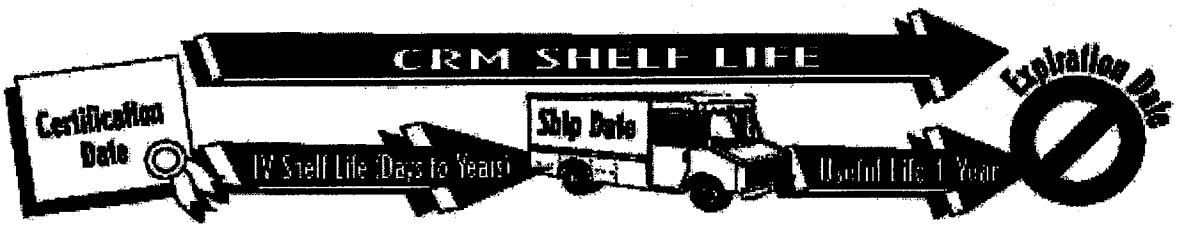
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), 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: April 14, 2003

Expiration Date: EXPIRES 1 JAN 2004

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 05/09/03
DATE EXPIRED: 06/01/2004
DATE OPENED: 05/12/03
INORG: 4062 PO: F52181

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin 010210
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010211

certificate of analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Chromium^{+3} in 1.4% HNO_3 (abs)

Catalog Number: CGCR(3)1-1, CGCR(3)1-2 and CGCR(3)1-5

Lot Number: **W-QCR02033**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03
DATE EXPIRED: 12/1/2004 DK
DATE OPENED: 11/5/03
INORG: 4318 PO: F52258

Starting Material:	Chromium Metal
Starting Material Purity:	99.995%
Starting Material Lot No:	F16I22

CERTIFIED CONCENTRATION: 995 ± 3 µg/mL

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Instrument Analysis: 995 ± 3 µg/mL (Avg of 3 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3112a.

Calculated Value: 1002 µg/mL
Method: Calculated, based on starting material.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room**. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.0028	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	O	Mg	<0.010	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	O	Mn	<0.050	M	Rb	0.0066	M	Th	<0.00010
M	Be	<0.000050	M	Ga	0.00070	O	Hg	<0.10	M	Ru	0.017	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.10	i	Se		M	W	<0.0010
O	Ca	0.0011	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.10	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.10	n	Os		M	Ag	0.00070	i	V	
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	0.016	M	Yb	<0.00010
s	Cr		O	Fe	<0.10	i	P		M	Sr	<0.000050	M	Y	<0.0040
O	Co	<0.10	M	La	<0.000050	M	Pt	<0.00020	n	S		O	Zn	<0.10
M	Cu	<0.00060	M	Pb	0.00039	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.010 g/mL

(over)

QA:KSL Rev.090403JTS

Paul R. Haines
Quality Assurance Manager

Expires: EXPIRES 1 DEC 2004

010212

inorganic ventures / iv labs

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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 Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Copper in 2% (abs) HNO_3**

Catalog Number:	CGCU1-1, CGCU1-2, and CGCU1-5
Lot Number:	**W-CU02064**
Starting Material:	Cu shot
Starting Material Purity (%):	99.999437
Starting Material Lot No	K09C13
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4469 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1005 ± 2 µg/mL

Certified Density: 1.014 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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** **1005 ± 2 µg/mL**
ICP Assay NIST SRM 3114 Lot Number: 891811

Assay Method #2 **1005 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

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.

O	Al	< 0.00090	M	Dy	< 0.03027	O	Li	< 0.00002	M	Pr	< 0.00151	M	Te	< 0.15134
M	Sb	< 0.00252	M	Er	< 0.02522	M	Lu	< 0.00202	M	Re	< 0.00504	M	Tb	< 0.00151
M	As	< 0.05045	M	Eu	< 0.01513	O	Mg	0.00001	M	Rh	< 0.00504	M	Tl	< 0.00504
M	Ba	< 0.05045	M	Gd	< 0.00504	M	Mn	< 0.02018	M	Rb	< 0.00504	M	Th	< 0.00504
M	Be	< 0.00252	M	Ga	< 0.00504	O	Hg	< 0.01500	M	Ru	< 0.01009	M	Tm	< 0.00202
M	Bi	< 0.00202	M	Ge	< 0.03027	M	Mo	< 0.01009	M	Sm	< 0.00504	O	Sn	0.00439
M	B	< 0.35312	M	Au	< 0.01513	M	Nd	< 0.01009	M	Sc	< 0.05045	M	Ti	< 0.25223
M	Cd	< 0.01513	M	Hf	< 0.01009	M	Ni	< 0.04036	M	Se	< 0.04036	M	W	< 0.05045
O	Ca	0.00011	M	Ho	< 0.00252	M	Nb	< 0.00252	O	Si	< 0.00340	M	U	< 0.01009
M	Ce	< 0.02522	M	In	< 0.05045	n	Os		M	Ag	< 0.01009	O	V	< 0.00300
M	Cs	< 0.00151	M	Ir	< 0.02522	M	Pd	< 0.02522	O	Na	0.00044	M	Yb	< 0.00504
M	Cr	< 0.02522	O	Fe	0.00054	O	P	< 0.00260	M	Sr	< 0.00252	M	Y	< 0.20178
M	Co	< 0.01513	M	La	< 0.00252	M	Pt	< 0.01009	n	S		M	Zn	< 0.10089
s	Cu		M	Pb	0.00050	O	K	< 0.00180	M	Ta	< 0.03531	M	Zr	< 0.02522

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010214

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 63.546; +2; 6; $Cu(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, 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.
Cu Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).
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 ≈ 5 ppm conc.)
ICP-OES	324.754 nm	0.06/.001 µg/mL	1	atom	Nb, U, Th, Mo, Hf
ICP-OES	224.700 nm	0.01/.001 µg/mL	1	ion	Pb, Ir, Ni, W
ICP-OES	219.958 nm	0.01/.002 µg/mL	1	atom	Th, Ta, Nb, U, Hf
ICP-MS	63 amu	10 ppt	n/a	M'	$^{40}Ar^{23}Na$ $^{47}Ti^{16}O$, $^{14}N^{12}C^{37}Cl$, $^{18}O^{12}C^{35}Cl$, $^{44}Ca^{16}O$, $^{23}Na^{40}Ca$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4469 PO: F52323

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010215

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: May 02, 2003

Expiration Date:

EXPIRES
1/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010216

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 Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Nickel in 1.4% (abs) HNO_3**

Catalog Number:	CGNI1-1, CGNI1-2, and CGNI1-5
Lot Number:	**W-NI02030**
Starting Material:	Ni pieces
Starting Material Purity (%):	99.999371
Starting Material Lot No	L06L02
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4472 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 2 µg/mL

Certified Density: 1.011 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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** **999 ± 5 µg/mL**
ICP Assay NIST SRM 3136 Lot Number: 000612

Assay Method #2 **1002 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

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. 010217

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.

O	Al	< 0.00938	M	Dy	< 0.06577	O	Li	< 0.00006	M	Pr	< 0.00329	M	Te	< 0.32886
M	Sb	< 0.00548	M	Er	< 0.05481	M	Lu	< 0.00439	M	Re	< 0.01096	M	Tb	< 0.00329
O	As	< 0.01689	M	Eu	< 0.03289	O	Mg	0.00002	M	Rh	< 0.01096	M	Tl	< 0.01096
M	Ba	< 0.10962	M	Gd	< 0.01096	M	Mn	< 0.04385	M	Rb	< 0.01096	M	Th	< 0.01096
O	Be	< 0.00626	M	Ga	< 0.01096	O	Hg	< 0.03441	M	Ru	< 0.02192	M	Tm	< 0.00439
M	Bi	< 0.00439	M	Ge	< 0.06577	M	Mo	< 0.02192	M	Sm	< 0.01096	M	Sn	< 0.05481
O	B	< 0.03097	M	Au	< 0.03289	M	Nd	< 0.02192	M	Sc	< 0.10962	M	Ti	< 0.54811
M	Cd	< 0.03289	M	Hf	< 0.02192	S	Ni		O	Se	< 0.01877	M	W	< 0.10962
O	Ca	< 0.01157	M	Ho	< 0.00548	M	Nb	< 0.00548	O	Si	0.00188	M	U	< 0.02192
M	Ce	< 0.05481	M	In	< 0.10962	n	Os		M	Ag	< 0.02192	M	V	< 0.02192
M	Cs	< 0.00329	M	Ir	< 0.05481	M	Pd	< 0.05481	O	Na	0.00102	M	Yb	< 0.01096
M	Cr	< 0.05481	O	Fe	0.00156	O	P	< 0.31280	M	Sr	< 0.00548	M	Y	< 0.43849
O	Co	0.00182	M	La	< 0.00548	M	Pt	< 0.02192	O	S	< 0.07820	M	Zn	0.00189
M	Cu	< 0.06577	M	Pb	< 0.03289	O	K	0.00043	M	Ta	< 0.07674	M	Zr	< 0.05481

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

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 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.69; +2; 6; $Ni(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, 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.
Ni Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).
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 ≤ppm conc.)
ICP-OES	221.647 nm	0.01 / 0.0009 µg/mL	1	ion	Si
ICP-OES	232.003 nm	0.02 / 0.006 µg/mL	1	atom	Cr, Re, Os, Nb, Ag, Pt, Fe
ICP-OES	231.604 nm	0.02 / 0.002 µg/mL	1	ion	Sb, Ta, Co
ICP-MS	60 amu	100 ppt	n/a	M+	$^{43}Ca^{16}O^{1}H$, $^{44}Ca^{16}O$, $^{23}Na^{37}Cl$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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

010218

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

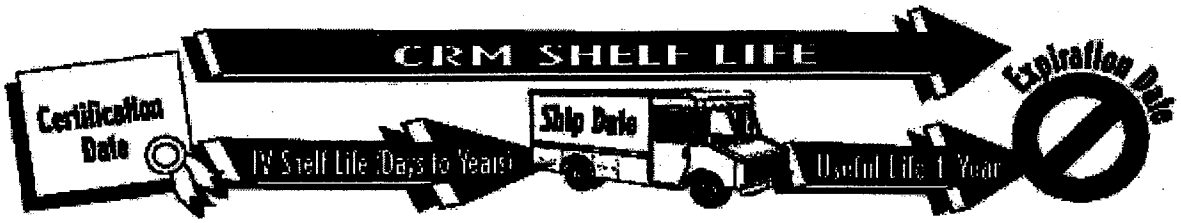
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), 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 23, 2003

Expiration Date:

EXPIRES
1 M 2005

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4472 PO: F52323

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines 010219

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010220

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 Statisical Principles."

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Cadmium in 2% (abs) HNO_3**

Catalog Number:	CGCD1-1, CGCD1-2, and CGCD1-5
Lot Number:	**W-CD01127**
Starting Material:	Cd shot
Starting Material Purity (%):	99.998904
Starting Material Lot No	C14M30
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4467 PO: F52323

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1007 ± 2 µg/mL

Certified Density: 1.014 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **1005 ± 5 µg/mL**
ICP Assay NIST SRM 3108 Lot Number: 890312

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. 010221

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.

O	Al	< 0.00090	M	Dy	< 0.01191	O	Li	< 0.00002	M	Pr	< 0.00060	O	Te	< 0.00700
M	Sb	0.00039	M	Er	< 0.00993	M	Lu	< 0.00079	M	Re	< 0.00199	M	Tb	< 0.00060
M	As	< 0.01985	M	Eu	< 0.00596	O	Mg	0.00002	M	Rh	< 0.00199	M	Tl	< 0.00199
M	Ba	< 0.01985	M	Gd	< 0.00199	M	Mn	< 0.00794	M	Rb	< 0.00199	M	Th	< 0.00199
M	Be	< 0.00099	M	Ga	< 0.00199	O	Hg	< 0.01200	M	Ru	< 0.00397	M	Tm	< 0.00079
M	Bi	< 0.00079	M	Ge	< 0.01191	M	Mo	< 0.00397	M	Sm	< 0.00199	M	Sn	< 0.00993
O	B	< 0.00900	M	Au	< 0.00596	M	Nd	< 0.00397	M	Sc	< 0.01985	M	Ti	< 0.09925
s	Cd		M	Hf	< 0.00397	O	Ni	< 0.00300	M	Se	< 0.01588	M	W	< 0.01985
O	Ca	0.00378	M	Ho	< 0.00099	M	Nb	< 0.00099	O	Si	< 0.00340	M	U	< 0.00397
M	Ce	< 0.00993	O	In	< 0.00200	n	Os		M	Ag	< 0.00397	M	V	< 0.00397
M	Cs	< 0.00060	M	Ir	< 0.00993	M	Pd	0.00691	M	Na	< 0.19849	M	Yb	< 0.00199
M	Cr	< 0.00993	O	Fe	< 0.00110	O	P	< 0.00300	M	Sr	< 0.00099	M	Y	< 0.07940
M	Co	< 0.00596	M	La	< 0.00099	M	Pt	< 0.00397	O	S	< 0.03000	O	Zn	0.00040
M	Cu	< 0.01191	M	Pb	< 0.00596	O	K	0.00015	M	Ta	< 0.01389	M	Zr	< 0.00993

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

010222

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 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 112.41; +2; 4; $Cd_2(OH)(aq)^{3+}$ and $Cd(OH)(aq)^{+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, and HF. Avoid basic media forming insoluble carbonate and hydroxide. Stable with most metals and inorganic anions in acidic media. The sulfide, carbonate, oxalate, phosphate, and cyanide are insoluble in water and soluble in HCl, HNO_3 and NH_4OH. The chloride, bromide and iodide are soluble in water. CdI_2 us one of the few iodides soluble in ethanol. All compounds of Cd are soluble in excess NaI, due to the formation of the complex ion, CdI_4^{2-}.
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.
Cd Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HCl or HNO_3); Ores (Dissolve in HCl / HNO_3 then take to fumes with H_2SO_4. The silica and lead sulfate are filtered off after addition of water.); Organic based (dry ash at 450°C and dissolve ash in HCl) (sulfuric/peroxide acid digestion).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈5 ppm)
ICP-OES	214.438 nm	0.003 / 0.0003 µg/mL	1	ion	Pt, Ir
ICP-OES	228.802 nm	0.003 / 0.0003 µg/mL	1	atom	Co, Ir, As, Pt
ICP-OES	226.502 nm	0.003 / 0.0003 µg/mL	1	ion	Ir
ICP-MS	111 amu	11 ppt	n/a	M^+	$^{95}Mo^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4467 PO: F52323

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010223

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 24, 2003

Expiration Date: EXPIRES 1 MAR 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010224

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 Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Cobalt in 2% (abs) HNO_3**

Catalog Number:	CGCO1-1, CGCO1-2, and CGCO1-5
Lot Number:	**W-QCO01114**
Starting Material:	Co powder
Starting Material Purity (%):	99.995670
Starting Material Lot No	22897
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4468 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 3 µg/mL

Certified Density: 1.016 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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** **998 ± 4 µg/mL**
ICP Assay NIST SRM 3181 Lot Number: 000630

Assay Method #2 **1002 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

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.

010225

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.

O	Al	0.00025	M	Dy	< 0.02419	O	Li	0.00001	M	Pr	< 0.00121	M	Te	< 0.12097
M	Sb	< 0.00202	M	Er	< 0.02016	M	Lu	< 0.00161	M	Re	< 0.00403	M	Tb	< 0.00121
O	As	< 0.10000	M	Eu	< 0.01210	O	Mg	0.00045	M	Rh	< 0.00403	M	Tl	< 0.00403
M	Ba	< 0.04032	M	Gd	< 0.00403	O	Mn	0.00003	M	Rb	< 0.00403	M	Th	< 0.00403
M	Be	< 0.00202	M	Ga	< 0.00403	O	Hg	< 0.05000	M	Ru	< 0.00807	M	Tm	< 0.00161
M	Bi	< 0.00161	M	Ge	< 0.02419	M	Mo	< 0.00807	M	Sm	< 0.00403	M	Sn	< 0.02016
O	B	< 0.04000	M	Au	< 0.01210	M	Nd	< 0.00807	M	Sc	< 0.04032	M	Ti	< 0.20162
M	Cd	< 0.01210	M	Hf	< 0.00807	O	Ni	< 0.02000	M	Se	< 0.03226	M	W	< 0.04032
O	Ca	0.00325	M	Ho	< 0.00202	M	Nb	< 0.00202	O	Si	< 0.00400	M	U	< 0.00807
M	Ce	< 0.02016	M	In	< 0.04032	n	Os		M	Ag	< 0.00807	M	V	< 0.00807
M	Cs	< 0.00121	M	Ir	< 0.02016	M	Pd	< 0.02016	O	Na	0.00138	M	Yb	< 0.00403
M	Cr	< 0.02016	O	Fe	0.00875	n	P		M	Sr	< 0.00202	M	Y	< 0.16129
s	Co		M	La	< 0.00202	M	Pt	< 0.00807	n	S		M	Zn	< 0.08065
M	Cu	< 0.02419	M	Pb	< 0.01210	O	K	0.03000	M	Ta	< 0.02823	M	Zr	< 0.02016

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

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 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.9332; +2; 6; $Co(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, 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.
Co Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).
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 ≤ 5 µg/mL conc.)
ICP-OES	238.892 nm	0.01/.002 µg/mL	1	ion	Fe, W, Ta
ICP-OES	228.616 nm	0.01/.001 µg/mL	1	ion	
ICP-OES	237.862 nm	0.01/.002 µg/mL	1	ion	W, Re, Al, Ta
ICP-MS	59 amu	2 ppt	n/a	M+	$^{43}Ca^{16}O^{1}H$, $^{40}Ar^{18}O^{1}H$, $^{40}Ar^{23}Na$, $^{43}Ca^{16}O$, $^{24}Mg^{35}Cl$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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

010226

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

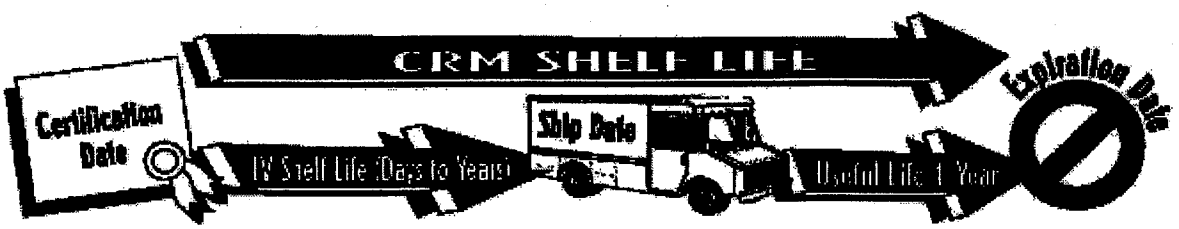
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), 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: August 28, 2003

Expiration Date:

EXPIRES
1 MAR 2005

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4468 PO: F52323

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin 010227
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010228

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 Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Manganese in 2% (abs) HNO_3**

Catalog Number:	CGMN1-1, CGMN1-2, and CGMN1-5
Lot Number:	**W-MN02036**
Starting Material:	Mn pieces
Starting Material Purity (%):	99.995300
Starting Material Lot No	21563
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005
DATE OPENED: 01/20/04
INORG: 4434 PO: F52301

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1000 ± 2 µg/mL

Certified Density: 1.014 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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** **1000 ± 2 µg/mL**
ICP Assay NIST SRM 3132 Lot Number: 890903

Assay Method #2 **1003 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

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. 010229

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.

O	Al		0.00221	M	Dy	<	0.02471	O	Li		0.00020	M	Pr	<	0.00124	M	Te	<	0.12355
M	Sb	<	0.00206	M	Er	<	0.02059	M	Lu	<	0.00165	M	Re	<	0.00412	M	Tb	<	0.00124
M	As	<	0.04118	M	Eu	<	0.01236	O	Mg		0.03350	M	Rh	<	0.00412	M	Tl	<	0.00412
M	Ba	<	0.04118	M	Gd	<	0.00412	s	Mn			M	Rb	<	0.00412	M	Th	<	0.00412
M	Be	<	0.00206	O	Ga	<	0.05000	i	Hg			M	Ru	<	0.00824	M	Tm	<	0.00165
M	Bi	<	0.00165	O	Ge	<	0.00300	M	Mo	<	0.00824	M	Sm	<	0.00412	M	Sn	<	0.02059
O	B		0.00295	M	Au	<	0.01236	M	Nd	<	0.00824	M	Sc	<	0.04118	M	Ti	<	0.20592
M	Cd	<	0.01236	M	Hf	<	0.00824	M	Ni	<	0.03295	M	Se	<	0.03295	M	W	<	0.04118
O	Ca		0.00340	M	Ho	<	0.00206	M	Nb	<	0.00206	O	Si		0.00275	M	U	<	0.00824
M	Ce	<	0.02059	M	In	<	0.04118	n	Os			M	Ag	<	0.00824	M	V	<	0.00824
M	Cs	<	0.00124	M	Ir	<	0.02059	M	Pd	<	0.02059	O	Na		0.00225	M	Yb	<	0.00412
M	Cr	<	0.02059	O	Fe	<	0.01000	i	P			M	Sr	<	0.00206	M	Y	<	0.16474
M	Co	<	0.01236	M	La	<	0.00206	M	Pt	<	0.00824	i	S			O	Zn		0.00250
M	Cu	<	0.02471	M	Pb	<	0.01236	O	K		0.00105	M	Ta	<	0.02883	M	Zr	<	0.02059

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010230

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 54.9380; +2; 6; $Mn(H_2O)_6^{2+}$

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, 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.

Mn Containing Samples (Preparation and Solution) - Metal (Soluble in dilute acids); Oxides (Soluble in dilute acids); Ores (Dissolve with HCl. If silica is present add HF and then fume off silica by adding H_2SO_4 and heat to SO_3 fumes - dense white fumes).

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 isotopes.)
ICP-OES	257.610nm	0.0014 / 0.00002 µg/mL	1	ion	Ce, W, Re
ICP-OES	259.373 nm	0.0016 / 0.00002 µg/mL	1	ion	U, Ta, Mo, Fe, Nb
ICP-OES	260.569 nm	0.0021 / 0.00002 µg/mL	1	ion	Co
ICP-MS	55 amu	10 ppt	n/a	M'	$^{40}Ar^{14}N^{1}H$, $^{39}K^{16}O$, $^{37}Cl^{18}O$, $^{40}Ar^{15}N$, $^{38}Ar^{17}O$, $^{38}Ar^{16}O^{1}H$, $^{38}Ar^{15}O^{1}H$, $^{37}Cl^{17}O^{1}H$, $^{23}Na^{32}S$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005
DATE OPENED: 01/20/04
INORG: 4434 PO: F52301

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010231

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: August 04, 2003

Expiration Date: EXPIRES 1 E 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

010232

CUSTOM-GRADE SOLUTION 1000 µg/mL Vanadium in 1.4% HNO_3 (abs)

Catalog Number: CGV1-1, CGV1-2 and CGV1-5

Lot Number: **T-V02032**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03
DATE EXPIRED: 12/1/2004 DR
DATE OPENED: 11/5/03
INORG: 4321 PO: F52258

Starting Material:	Vanadium Pentoxide
Starting Material Purity:	99.999%
Starting Material Lot No:	46

CERTIFIED CONCENTRATION: 990 ± 2 µg/mL

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:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 993 ± 4 µg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 990 ± 2 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3165.

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.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Al	0.0095	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	0.042	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	0.0089	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	i	Mn		M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	i	Hg		M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	0.016	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	0.00055
O	Ca	<0.010	M	Ho	<0.000050	M	Nb	0.00024	O	Si	<0.030	M	U	0.0011
M	Ce	<0.00050	O	In	<0.070	n	Os		M	Ag	0.00044	s	V	
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
O	Cr	<0.020	O	Fe	<0.050	i	P		M	Sr	<0.000050	M	Y	<0.0040
O	Co	<0.050	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	0.0041
M	Cu	<0.00060	M	Pb	<0.00030	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.015 g/mL

(over)

QA:KL Rev.082202DN

Paul R. Gaines
Quality Assurance Manager

Expires: EXPIRES 12/2004

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010233

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 Statisical Principles."

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Zinc in 1.4% (abs) HNO_3**

Catalog Number:	CGZN1-1, CGZN1-2, and CGZN1-5
Lot Number:	**W-ZN02018**
Starting Material:	Zn shot
Starting Material Purity (%):	99.999889
Starting Material Lot No	J17L26
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 162
DATE EXPIRED: 12/1/2004
DATE OPENED: 11/5/03
INORG: 4319 PO: F52258

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1006 ± 3 µg/mL

Certified Density: 1.011 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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** **1002 ± 6 µg/mL**
ICP Assay NIST SRM 3168a Lot Number: 001402

Assay Method #2 **1006 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

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. 010234

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.

O	Al	< 0.00200	M	Dy	< 0.02440	O	Li	0.00001	M	Pr	< 0.00122	M	Te	< 0.12198
M	Sb	< 0.00203	M	Er	< 0.02033	M	Lu	< 0.00163	M	Re	< 0.00407	M	Tb	< 0.00122
M	As	< 0.04066	M	Eu	< 0.01220	O	Mg	0.00011	M	Rh	< 0.00407	M	Tl	< 0.00407
M	Ba	< 0.04066	M	Gd	< 0.00407	M	Mn	< 0.01626	M	Rb	< 0.00407	M	Th	< 0.00407
M	Be	< 0.00203	M	Ga	< 0.00407	O	Hg	< 0.01000	M	Ru	< 0.00813	M	Tm	< 0.00163
M	Bi	< 0.00163	M	Ge	< 0.02440	M	Mo	< 0.00813	M	Sm	< 0.00407	M	Sn	< 0.02033
O	B	0.00015	M	Au	< 0.01220	M	Nd	< 0.00813	M	Sc	< 0.04066	M	Ti	< 0.20331
M	Cd	< 0.01220	M	Hf	< 0.00813	O	Ni	0.00009	M	Se	< 0.03253	M	W	< 0.04066
O	Ca	0.00022	M	Ho	< 0.00203	M	Nb	< 0.00203	O	Si	< 0.00400	M	U	< 0.00813
M	Ce	< 0.02033	M	In	< 0.04066	n	Os		M	Ag	< 0.00813	M	V	< 0.00813
M	Cs	< 0.00122	M	Ir	< 0.02033	M	Pd	< 0.02033	O	Na	0.00055	M	Yb	< 0.00407
O	Cr	< 0.00100	O	Fe	0.00005	O	P	< 0.00300	M	Sr	< 0.00203	M	Y	< 0.16264
M	Co	< 0.01220	M	La	< 0.00203	M	Pt	< 0.00813	O	S	< 0.02000	s	Zn	
O	Cu	< 0.00050	M	Pb	< 0.01220	O	K	0.00018	M	Ta	< 0.02846	M	Zr	< 0.02033

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

010235

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 65.39; +2; 4; Zn(OH)(aq)''

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media that promotes the formation of insoluble carbonate and hydroxide. 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.

Zn Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl /HNO_3); Organic based (Dry ash at 450°C and dissolve ash in HCl) (Sulfuric/peroxide acid digestion)

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

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at 50 ppm concs.)
ICP-OES	213.856 nm	0.002 / 0.0004 µg/mL	1	atom	Ni, Cu, V
ICP-OES	202.548 nm	0.004 / 0.0002 µg/mL	1	ion	Nb, Cu, Co, Hf
ICP-OES	206.200 nm	0.006 / 0.0006 µg/mL	1	ion	Sb, Ta, Bi, Os
ICP-MS	66 amu	7 ppt	n/a	M'	$^{56}Ti^{16}O$, $^{56}Cr^{16}O$, $^{56}V^{16}O$, $^{34}S^{16}O_2$, $^{32}S^{16}O^{18}O$, $^{32}S^{17}O_2$, $^{32}S^{16}O^{17}O$, $^{32}S^{34}S$, $^{32}S_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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)

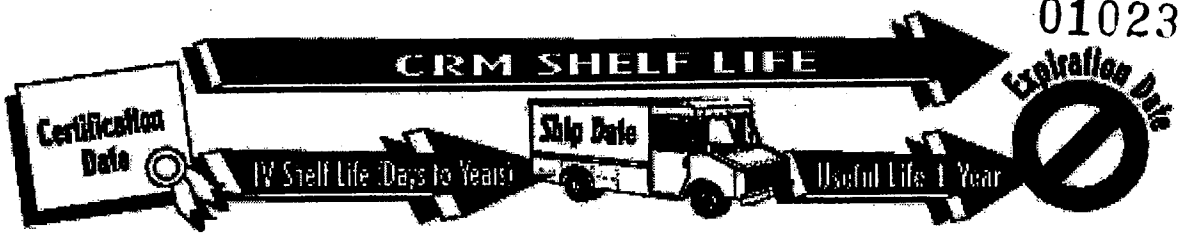
10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

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

010236



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: May 02, 2003

Expiration Date:

EXPIRES
12/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 2 of 2
DATE EXPIRED: 12/1/2004 PR
DATE OPENED: 11/5/03
INORG: 4319 PO: F52258

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

CUSTOM-GRADE SOLUTION 1000 µg/mL Silver in 3.5% HNO_3 (abs)

010237

Catalog Number: CGAG1-1, CGAG1-2 and CGAG1-5

Lot Number: **T-AG02015**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004
DATE OPENED: 08/26/03
INORG: 4222 PO: F52224

Starting Material:	Silver Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	F15102

CERTIFIED CONCENTRATION: 1001 ± 2 µg/mL

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:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1004 ± 3 µg/mL
Method: Volhard Titration vs NIST SRM 999a Potassium Chloride

Instrument Analysis: 1001 ± 2 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3151.

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.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room**. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	<0.00010	M	Dy	<0.00060	O	Li	<0.000030	M	Pr	<0.000030	O	Te	<0.030			
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030			
O	As	<0.0050	M	Eu	<0.00030	O	Mg	<0.000040	M	Rh	<0.00010	M	Tl	<0.00010			
M	Ba	<0.0010	M	Gd	<0.00010	O	Mn	<0.00030	M	Rb	<0.00010	M	Th	<0.00010			
O	Be	<0.00050	M	Ga	<0.00010	O	Hg	0.00090	M	Ru	<0.00020	M	Tm	<0.000040			
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050			
O	B	<0.0020	O	Au	<0.012	M	Nd	<0.00020	M	Sc	<0.0010	O	Ti	<0.00070			
O	Cd	<0.0020	M	Hf	<0.00020	O	Ni	<0.0070	O	Se	<0.036	M	W	<0.0010			
O	Ca	<0.000050	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.0030	M	U	<0.00020			
M	Ce	<0.00050	O	In	<0.020	n	Os		s	Ag		M	V	<0.00020			
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010			
O	Cr	<0.0020	O	Fe	<0.00070	O	P	<0.030	M	Sr	<0.000050	M	Y	<0.0040			
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	O	S	<0.020	O	Zn	<0.0010			
M	Cu	<0.00060	M	Pb	<0.00030	O	K	<0.0060	M	Ta	<0.00070	M	Zr	<0.00050			

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.024 g/mL

QA:KL Rev.082102DN

Paul R. Haines
Quality Assurance Manager

Expires:

EXPIRES
1 SEP 2004

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

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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 Statisical Principles."

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Arsenic in 1.4% (abs) HNO_3**

Catalog Number:	CGAS1-1, CGAS1-2, and CGAS1-5
Lot Number:	**W-AS02022**
Starting Material:	POLYCRYSTALINE LUMP
Starting Material Purity (%):	99.998994
Starting Material Lot No	23115
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005
DATE OPENED: 01/20/04
INORG: 4433 PO: F52301

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1014 ± 3 µg/mL

Certified Density: 1.012 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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 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** **1014 ± 3 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3103a Lot Number: 891003

Assay Method #2 **1008 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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. 010239

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.

O	Al	0.00038	M	Dy	< 0.01596	O	Li	0.00009	M	Pr	< 0.00080	M	Te	< 0.07978
O	Sb	< 0.01000	M	Er	< 0.01330	M	Lu	< 0.00106	O	Re	< 0.01000	M	Tb	< 0.00080
s	As		M	Eu	< 0.00798	O	Mg	0.00009	M	Rh	< 0.00266	M	Tl	< 0.00266
M	Ba	< 0.02660	M	Gd	< 0.00266	O	Mn	< 0.00003	M	Rb	< 0.00266	M	Th	< 0.00266
M	Be	< 0.00133	M	Ga	< 0.00266	O	Hg	< 0.01200	M	Ru	< 0.00532	M	Tm	< 0.00106
M	Bi	< 0.00106	M	Ge	< 0.01596	M	Mo	< 0.00532	M	Sm	< 0.00266	O	Sn	0.00049
O	B	< 0.01200	M	Au	< 0.00798	M	Nd	< 0.00532	M	Sc	< 0.02660	M	Ti	< 0.13297
M	Cd	< 0.00798	M	Hf	< 0.00532	M	Ni	< 0.02128	M	Se	< 0.02128	M	W	< 0.02660
O	Ca	0.00189	M	Ho	< 0.00133	O	Nb	< 0.00200	O	Si	0.00415	M	U	< 0.00532
M	Ce	< 0.01330	M	In	< 0.02660	n	Os		M	Ag	< 0.00532	M	V	< 0.00532
M	Cs	< 0.00080	M	Ir	< 0.01330	M	Pd	< 0.01330	O	Na	0.00159	M	Yb	< 0.00266
M	Cr	< 0.01330	O	Fe	< 0.00110	O	P	< 0.00260	M	Sr	< 0.00133	M	Y	< 0.10638
M	Co	< 0.00798	M	La	< 0.00133	M	Pt	< 0.00532	O	S	< 0.02500	O	Zn	0.00057
M	Cu	< 0.01596	M	Pb	< 0.00798	O	K	0.00132	M	Ta	< 0.01862	M	Zr	< 0.01330

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 74.9216; mix of +3 and +5; 6; H_3AsO_4 and $HAsO_2$

Chemical Compatibility - Arsenic has no cationic chemistry. It is soluble in HCl, HNO_3, H_3PO_4, H_2SO_4 and HF aqueous matrices water and NH_4OH . It is stable with most inorganic anions (forms arsenate when boiled with chromate) but many cationic metals form the insoluble arsenates under pH neutral conditions. When fluorinated and / or under acidic conditions arsenate formation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

As Containing Samples (Preparation and Solution) - As^0 (soluble in 1:1 H_2O / HNO_3); Oxides (the oxide exists in crystalline and amorphous forms where the amorphoric form is more water soluble. The oxides typically dissolve in dilute acidic solutions when boiled); Minerals (One gram of powered sample is fused in a Ni^0 crucible with 10 grams of a 1:1 mix of K_2CO_3 and KNO_3 and the melt extracted with hot water); Organic Matrices (0.2 to 0.5 grams of the sample are fused with 15 grams of a 1:1 Na_2CO_3 / Na_2O_2 mix in a Ni^0 crucible. The fuseate is extracted with water and acidified with HNO_3)

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 ppm conc.)
ICP-OES 189.042 nm	0.05 / 0.005 µg/mL	1	atom	Cr
ICP-OES 193.696 nm	0.1 / 0.01 µg/mL	1	atom	V, Ge
ICP-OES 228.812 nm	0.1 / 0.01 µg/mL	1	atom	Cd, Pt, Ir, Co
ICP-MS 75 amu	20 ppt	n/a	M'	$^{40}Ar^{35}Cl$, $^{59}Co^{16}O$, $^{38}Ar^{36}Ar^{1}H$, $^{38}Ar^{37}Cl$, $^{38}Ar^{40}K$, $^{150}Nd^{2+}$, $^{150}Sm^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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

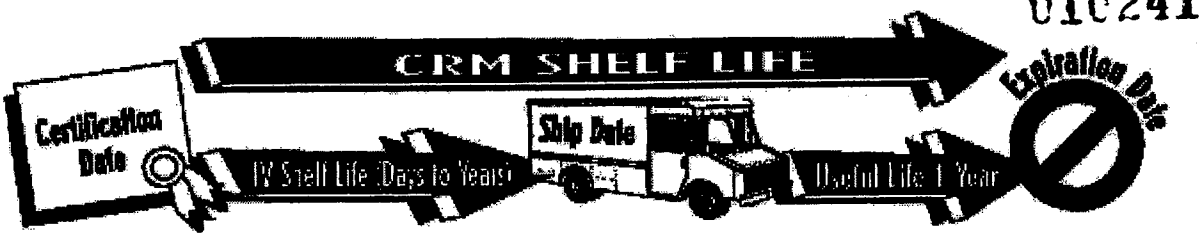
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

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

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005
DATE OPENED: 01/20/04
INORG: 4433 PO: F52301

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010241



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: May 01, 2003

Expiration Date: EXPIRES 1 5 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

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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 Statisical Principles."

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/3/03
DATE EXPIRED: 11/1/04 DR
DATE OPENED: 11/3/03
INORG: 4313 PO: F52258

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Lead in 0.35% (abs) HNO_3**

Catalog Number:	CGPB1-1, CGPB1-2, and CGPB1-5
Lot Number:	**W-PB02114**
Starting Material:	Pb(NO3)2
Starting Material Purity (%):	99.999974
Starting Material Lot No	22150
Matrix:	0.35% (abs) HNO_3

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1006 ± 2 µg/mL

Certified Density: 1.002 g/mL (measured at 22° C)

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

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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** **1005 ± 2 µg/mL**
ICP Assay NIST SRM 3128 Lot Number: 991504

Assay Method #2 **1006 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

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. 010243

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.

O Al < 0.00270	M Dy < 0.01193	O Li < 0.00002	M Pr < 0.00060	M Te < 0.05965
M Sb < 0.00099	M Er < 0.00994	M Lu < 0.00080	M Re < 0.00199	M Tb < 0.00060
M As < 0.01989	M Eu < 0.00597	O Mg 0.00008	O Rh < 0.00900	O Tl 0.00130
M Ba < 0.01989	M Gd < 0.00199	M Mn < 0.00795	M Rb < 0.00199	M Th < 0.00199
M Be < 0.00099	M Ga < 0.00199	O Hg < 0.01500	M Ru < 0.00398	M Tm < 0.00080
O Bi < 0.02000	M Ge < 0.01193	M Mo < 0.00398	M Sm < 0.00199	M Sn < 0.00994
O B < 0.04000	M Au < 0.00597	M Nd < 0.00398	M Sc < 0.01989	M Ti < 0.09942
M Cd < 0.00597	M Hf < 0.00398	M Ni < 0.01591	M Se < 0.01591	M W < 0.01989
O Ca 0.00009	M Ho < 0.00099	M Nb < 0.00099	O Si < 0.00340	M U < 0.00398
M Ce < 0.00994	M In < 0.01989	n Os	M Ag < 0.00398	M V < 0.00398
M Cs < 0.00060	M Ir < 0.00994	M Pd < 0.00994	O Na < 0.00600	M Yb < 0.00199
M Cr < 0.00994	O Fe 0.00011	O P < 0.00500	M Sr < 0.00099	M Y < 0.07954
M Co < 0.00597	M La < 0.00099	M Pt < 0.00398	O S < 0.10000	M Zn < 0.03977
M Cu < 0.01193	s Pb	O K < 0.00180	M Ta < 0.01392	M Zr < 0.00994

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 207.2; +2; 6; $Pb(H_2O)_6^{+2}$

Chemical Compatibility - Soluble in HCl, HF and HNO_3. Avoid H_2SO_4. Stable with most metals and inorganic anions forming insoluble carbonate, borate, sulfate, sulfite, sulfide, phosphate, oxalate, chromate, tannate, iodate, and cyanide in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

Pb Containing Samples (Preparation and Solution) - Metal (Best dissolved in 1:1 H_2O / HNO_3); Oxides (The many different Pb oxides are soluble in HNO_3 with the exception of PbO_2 which is soluble in HCl or HF); Ores and Alloys (Best attacked using 1:1 H_2O / HNO_3); Organic Matrices (Dry ash and dissolve in dilute HCl.).

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

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ 50 ncs.)
ICP-OES	168.215 nm	0.03 / 0.003 µg/mL	1	ion	Co
ICP-OES	220.353 nm	0.04 / 0.006 µg/mL	1	ion	Bi, Nb
ICP-OES	217.000 nm	0.09 / 0.03 µg/mL	1	atom	W, Ir, Hf, Sb, Th
ICP-MS	208 amu	5 ppt	n/a	M'	$^{192}Pt^{16}O$, $^{192}Os^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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

010245

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.

INORGANIC LABS/RADCHEM LABS 2 of 2
DATE RECEIVED: 11/3/03
DATE EXPIRED: 11/1/04 DR
DATE OPENED: 11/3/03
INORG: 4313 PO: E52258

Certification Date: January 23, 2003

Expiration Date: EXPIRES NOV 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

inorganic ventures / iv labs

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certificate of analysis

010248

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 Statisical Principles."

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Antimony in 0.7% (abs) HNO_3 / 3% Tartaric Acid**

Catalog Number:	CGSB1-1, CGSB1-2 and CGSB1-5
Lot Number:	**W-SB02078**
Starting Material:	Sb shot
Starting Material Purity (%):	99.989188
Starting Material Lot No	D17L24
Matrix:	0.7% (abs) HNO_3 / 3% Tartaric Acid

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1005 ± 2 µg/mL

Certified Density: 1.019 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:

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

Uncertainty $(\pm) = \frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
Σs_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 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** **1005 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3102a Lot Number: 990707

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4464 PO: F52323

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. 010247

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.

O	Al		0.04519	M	Dy	<	0.00597	O	Li		0.00004	M	Pr	<	0.00030	M	Te	<	0.02983
S	Sb			M	Er	<	0.00497	M	Lu	<	0.00040	M	Re	<	0.00099	M	Tb	<	0.00030
M	As	<	0.00994	M	Eu	<	0.00298	O	Mg		0.00171	M	Rh	<	0.00099	M	Tl		0.00040
O	Ba		0.00003	M	Gd	<	0.00099	O	Mn		0.00321	M	Rb	<	0.00099	M	Th	<	0.00099
O	Be	<	0.00001	M	Ga	<	0.00099	O	Hg	<	0.01500	M	Ru	<	0.00199	M	Tm	<	0.00040
M	Bi		0.00170	M	Ge	<	0.00597	M	Mo	<	0.00199	M	Sm	<	0.00099	M	Sn		0.00050
O	B		0.00100	M	Au	<	0.00298	M	Nd	<	0.00199	O	Sc	<	0.00016	O	Ti		0.00131
M	Cd	<	0.00298	M	Hf	<	0.00199	O	Ni		0.00100	M	Se	<	0.49711	M	W	<	0.00994
O	Ca		0.00884	M	Ho	<	0.00050	M	Nb	<	0.00050	O	Si		0.00502	M	U	<	0.00199
O	Ce	<	0.00300	M	In	<	0.00994	n	Os			M	Ag	<	0.00199	M	V	<	0.00199
M	Cs	<	0.00030	M	Ir	<	0.00497	M	Pd	<	0.00497	O	Na		0.00362	M	Yb	<	0.00099
O	Cr		0.00954	O	Fe		0.01306	O	P	<	0.04000	M	Sr	<	0.00050	M	Y	<	0.03977
M	Co	<	0.00298	O	La	<	0.00120	M	Pt	<	0.00199	i	S			O	Zn		0.00141
O	Cu		0.00321	M	Pb		0.00060	O	K		0.01004	M	Ta	<	0.00696	M	Zr	<	0.00497

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

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 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 121.75; +3 ; 6; $Sb(O)C_4H_4O_6^{-1}$
Chemical Compatibility - Stable in concentrated HCl, dilute or concentrated HF. Stable in dilute HNO_3 as the fluoride or tartrate complex. Avoid basic media. Stable with most metals and inorganic anions in acidic media as the tartrate provided the acidity is not too high or the acid is oxidizing causing loss of the stabilizing tartrate ion. The fluoride complex of antimony is stable in strong acid but you should only mix with other metals that are fluorinated.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-2% HNO_3 / LDPE container.
Sb Containing Samples (Preparation and Solution) - Metal and alloys (Soluble in H_2O / HF / HNO_3 mixture); Oxides (Soluble in HCl and tartaric acid or H_2O / HF / HNO_3 mixtures); Ores (Fusion with Na_2CO_3 in Pt^0 followed by dissolving the fuseate in a H_2O / HF / HNO_3 mixture); Organic based (Sulfuric acid / hydrogen peroxide digestion)
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at [illegible] concs.)
ICP-OES	206.833 nm	0.03 / 0.003 µg/mL	1	atom	Ta, Cr, Ge, Hf
ICP-OES	217.581 nm	0.05 / 0.005 µg/mL	1	atom	Nb, W, Re, Fe,
ICP-OES	231.147 nm	0.06 / 0.006 µg/mL	1	atom	Ni, Co ,Pt
ICP-MS	121 amu	5 ppt	n/a	M'	$^{105}Pd^{16}O$, $^{89}Y^{16}O_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4464 PO: F52323

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010249

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 23, 2003

Expiration Date: EXPIRES 1M2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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inorganic ventures / iv labs

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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 Statisical Principles."*

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Selenium in 1.4% (abs) HNO_3**

Catalog Number:	CGSE1-1, CGSE1-2, and CGSE1-5
Lot Number:	**T-SE01102**
Starting Material:	Se shot
Starting Material Purity (%):	99.9971
Starting Material Lot No	C09L08
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004
DATE OPENED: 06/23/03
INORG: 4152 PO: 752370

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 995 ± 3 µg/mL

Certified Density: 1.010 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:

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
Σs = 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 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** **995 ± 3 µg/mL (Avg. 2 runs)**
ICP Assay NIST SRM 3149 Lot Number: 992106

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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.

O	Al	0.00017	M	Dy	< 0.01196	O	Li	< 0.00003	M	Pr	< 0.00060	M	Te	< 0.05981
M	Sb	0.00160	M	Er	< 0.00997	M	Lu	< 0.00080	O	Re	< 0.00900	M	Tb	< 0.00060
O	As	< 0.00500	M	Eu	< 0.00598	O	Mg	< 0.00003	M	Rh	< 0.00199	M	Tl	< 0.00199
M	Ba	< 0.01994	M	Gd	< 0.00199	M	Mn	< 0.00798	M	Rb	< 0.00199	M	Th	< 0.00199
O	Be	< 0.00009	M	Ga	< 0.00199	O	Hg	0.01950	O	Ru	0.00220	M	Tm	< 0.00080
M	Bi	< 0.00080	M	Ge	< 0.01196	O	Mo	< 0.00400	M	Sm	< 0.00199	M	Sn	< 0.00997
O	B	< 0.00006	M	Au	< 0.00598	M	Nd	< 0.00399	M	Sc	< 0.01994	M	Ti	< 0.09969
M	Cd	< 0.00598	M	Hf	< 0.00399	O	Ni	< 0.00090	S	Se		M	W	< 0.01994
O	Ca	0.00200	M	Ho	< 0.00100	O	Nb	< 0.00400	O	Si	0.00055	M	U	< 0.00399
M	Ce	< 0.00997	M	In	< 0.01994	n	Os		M	Ag	0.00070	M	V	< 0.00399
M	Cs	< 0.00060	M	Ir	< 0.00997	M	Pd	< 0.00997	O	Na	0.00355	M	Yb	< 0.00199
M	Cr	< 0.00997	O	Fe	0.00060	O	P	< 0.00300	M	Sr	< 0.00100	M	Y	< 0.07975
M	Co	< 0.00598	M	La	< 0.00100	M	Pt	< 0.00399	O	S	0.00500	M	Zn	< 0.03988
M	Cu	< 0.01196	M	Pb	< 0.00598	O	K	0.00070	M	Ta	< 0.01396	O	Zr	< 0.00040

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010252

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 78.96; +4; 6; H_2SeO_3

Chemical Compatibility - Soluble in HCl, HNO_3, H_3PO_4, H_2SO_4 and HF aqueous matrices and water. It is stable with most inorganic anions but many cationic metals form the insoluble selenites under pH neutral conditions. When fluorinated and/or under acidic conditions precipitation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels - stable for months alone or mixed with other elements at equivalent levels - in 1 % HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Se Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Readily soluble in water); Minerals and alloys (Acid digestion with HNO_3 or HNO_3 / HF); Organic Matrices (Acid digestion with hot concentrated H_2SO_4 accompanied by the careful dropwise addition of H_2O_2 until clear)

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 ≤10ppm conc.)
ICP-OES 196.026 nm	0.08 / 0.006 µg/mL	1	atom	Fe
ICP-OES 203.985 nm	0.2 / 0.05 µg/mL	1	atom	Sb, Ir, Cr, Ta
ICP-OES 206.279 nm	0.3 / 0.16 µg/mL	1	atom	Cr, Pt
ICP-MS 82 amu	200 ppt	n/a	M⁺	$^{12}C^{35}Cl_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004
DATE OPENED: 06/23/03
INORG: 4152 PO: F52370

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010253

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: November 27, 2002

Expiration Date: EXPIRES 01/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Debbie Newman, QA Administrator

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

010254

inorganic ventures / iv labs

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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 Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Thallium in 0.5% (abs) HNO_3**

Catalog Number:	CGTL1-1, CGTL1-2, and CGTL1-5
Lot Number:	**W-QTL01094**
Starting Material:	TLNO3
Starting Material Purity (%):	99.996539
Starting Material Lot No	22928
Matrix:	0.5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005
DATE OPENED: 01/20/04
INORG: 4435 PO: F52301

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1001 ± 4 µg/mL

Certified Density: 1.002 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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 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** **1001 ± 4 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3158 Lot Number: 993012

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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.

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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.

M	Al	<	0.01000	M	Dy	<	0.00600	O	Li	<	0.00002	M	Pr	<	0.00030	M	Te	<	0.03000
M	Sb	<	0.00050	M	Er	<	0.00500	M	Lu	<	0.00040	M	Re	<	0.00100	M	Tb	<	0.00030
M	As	<	0.01000	M	Eu	<	0.00300	O	Mg		0.00012	M	Rh	<	0.00100	s	Tl		
M	Ba	<	0.01000	M	Gd	<	0.00100	M	Mn	<	0.00400	M	Rb	<	0.00100	M	Th	<	0.00100
M	Be	<	0.00050	M	Ga	<	0.00100	O	Hg	<	0.01200	M	Ru	<	0.00200	M	Tm	<	0.00040
M	Bi	<	0.00040	M	Ge	<	0.00600	M	Mo	<	0.00200	M	Sm	<	0.00100	M	Sn	<	0.00500
O	B	<	0.00140	M	Au	<	0.00300	M	Nd	<	0.00200	M	Sc	<	0.01000	M	Ti	<	0.05000
O	Cd		0.00150	M	Hf	<	0.00200	M	Ni	<	0.00800	M	Se	<	0.00800	M	W	<	0.01000
O	Ca		0.00085	M	Ho	<	0.00050	M	Nb	<	0.00050	O	Si	<	0.00340	M	U	<	0.00200
M	Ce	<	0.00500	M	In	<	0.01000	n	Os			M	Ag		0.04000	M	V	<	0.00200
M	Cs	<	0.00030	M	Ir	<	0.00500	M	Pd	<	0.00500	O	Na		0.00050	M	Yb	<	0.00100
M	Cr	<	0.00500	O	Fe		0.00030	O	P	<	0.00260	M	Sr	<	0.00050	M	Y	<	0.04000
M	Co	<	0.00300	M	La	<	0.00050	M	Pt	<	0.00200	O	S	<	0.03000	O	Zn		0.00110
M	Cu	<	0.00600	M	Pb		0.00210	O	K	<	0.00180	M	Ta	<	0.00700	M	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 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 204.383; +1; 6; $Tl(H_2O)_6^{1+}$

Chemical Compatibility - Soluble in HCl, HNO_3, and H_2SO_4. Stable with most metals and inorganic anions. The sulfite, thiocyanate and oxalate are moderately soluble; the phosphate and arsenite are slightly soluble and the sulfide is insoluble.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

Tl Containing Samples (Preparation and Solution) - Metal (Best dissolved in HNO_3 which forms chiefly the Tl^{1+} ion.); Oxide (The thallous oxide is readily soluble in water. The thallic oxide requires high levels of acid); Ores (Carbonate fusion in Pt^{6} followed by HCl dissolution); Organic Matrices (Sulfuric/peroxide digestion or dry ash and dissolution in HCl).

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

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at [illegible] concs.)
ICP-OES	190.864 nm	0.04 / 0.004 µg/mL	1	ion	V, Ti
ICP-OES	276.787 nm	0.1 / 0.01 µg/mL	1	atom	Ta, V, Fe, Cr
ICP-OES	351.924 nm	0.2 / 0.02 µg/mL	1	atom	Th, Ce, Zr
ICP-MS	205 amu	2 ppt	n/a	M'	$^{189}Os^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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

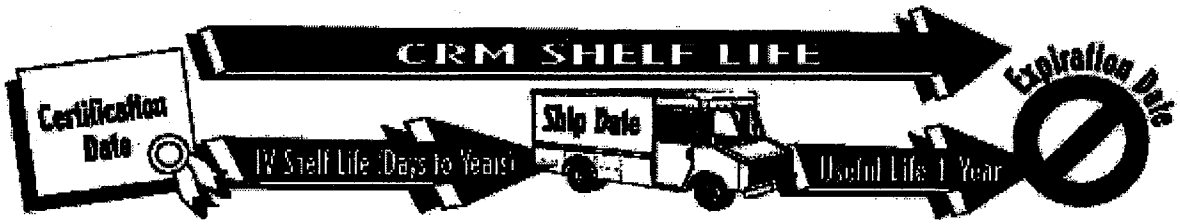
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

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

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005
DATE OPENED: 01/20/04
INORG: 4435 PO: F52301

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010257



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 09, 2003

Expiration Date: EXPIRES 12/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Debbie Newman, Production Manager	Debbie Newman
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

inorganic ventures / iv labs

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01C258

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 Statisical Principles."

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Boron in H_2O**

Catalog Number:	CGB1-1, CGB1-2, and CGB1-5
Lot Number:	**W-B02042**
Starting Material:	H3BO3
Starting Material Purity (%):	99.999998
Starting Material Lot No	OV0133
Matrix:	H_2O

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4466 PO: F52323

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 999 ± 2 µg/mL

Certified Density: 1.001 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:

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
Σs_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 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 ± 2 µg/mL (Avg 2 runs)**

ICP Assay NIST SRM 3107 Lot Number: 991907

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. 010259

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.

O Al < 0.00090	M Dy < 0.00600	O Li < 0.00002	M Pr < 0.00030	M Te < 0.03000
M Sb < 0.00050	M Er < 0.00500	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
M As < 0.01000	M Eu < 0.00300	O Mg < 0.00006	M Rh < 0.00100	M Tl < 0.00100
O Ba < 0.00010	M Gd < 0.00100	O Mn < 0.00002	M Rb < 0.00100	M Th < 0.00100
O Be < 0.00017	O Ga < 0.00160	O Hg < 0.01500	M Ru < 0.00200	M Tm < 0.00040
M Bi < 0.00040	M Ge < 0.00600	M Mo < 0.00200	M Sm < 0.00100	M Sn < 0.00500
s B	M Au < 0.00300	M Nd < 0.00200	O Sc < 0.00002	M Ti < 0.05000
M Cd < 0.00300	M Hf < 0.00200	O Ni < 0.00230	O Se < 0.00620	M W < 0.01000
O Ca < 0.00007	M Ho < 0.00050	M Nb < 0.00050	O Si 0.00067	M U < 0.00200
O Ce < 0.00300	M In < 0.01000	n Os	M Ag < 0.00200	O V < 0.00083
M Cs < 0.00030	M Ir < 0.00500	M Pd < 0.00500	O Na < 0.00010	M Yb < 0.00100
M Cr < 0.00500	O Fe < 0.00110	O P < 0.00250	M Sr < 0.00050	M Y < 0.04000
O Co < 0.00110	M La < 0.00050	M Pt < 0.00200	O S < 0.10000	O Zn < 0.00019
M Cu < 0.00600	M Pb < 0.00300	O K < 0.00300	M Ta < 0.00700	M 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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010260

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 10.811; +3; 4; $B(OH)_3$ and $B(OH)_4^-$

Chemical Compatibility - Moderately soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices and very soluble in NH_4OH. Stable with all metals and inorganic anions at low to moderate ppm levels.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-1,000 ppm solutions chemically stable for years in 1% HNO_3 / LDPE container. 1000 -10,000 ppm stable for years in dilute NH_4OH / LDPE container.

B Containing Samples (Preparation and Solution) - Metal (Crystalline form is scarcely attacked by acids or alkaline solutions; amorphous form is soluble in conc. HNO_3 or H_2SO_4); $B(OH)_3$ (water soluble); Ores(avoid acid digestions and use caustic fusions in Pt-ware); Organic Matrices (dry ash mixed with Na_2CO_3 in Pt-ware at 450-°C then increase heat to 1000-°C to fuse; or perform a Na_2O_2 fusion in a Ni-crucible / Parr bomb).

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 100ppm conc.)
ICP-OES	249.773 nm	0.003 / 0.001 µg/mL	1	atom	W, Ce, Co, Th, Ta, Mn, Mo, Fe
ICP-OES	249.678 nm	0.004 / 0.003 µg/mL	1	atom	Os, W, Co, Cr, Hf
ICP-OES	208.959 nm	0.007 / 0.0005 µg/mL	1	atom	Mo
ICP-MS	11 amu	700 ppt	n/a	M'	

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4466 PO: F52323

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010261

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: March 21, 2003

Expiration Date: EXPIRES 1/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

inorganic ventures / iv labs

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010262

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 Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Molybdenum in H_2O tr. NH_4OH**

Catalog Number:	CGMO1-1, CGMO1-2, and CGMO1-5
Lot Number:	**W-MO01132**
Starting Material:	$(NH_4)_6Mo_7O_{24}xH_2O$
Starting Material Purity (%):	99.995947
Starting Material Lot No	21410
Matrix:	H_2O tr. NH_4OH

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4471 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1004 ± 2 µg/mL

Certified Density: 0.998 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:

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

Uncertainty $(\pm) = \frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
Σs_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 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** **1004 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3134 Lot Number: 891307

Assay Method #2 **1008 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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. 010263

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.

O	Al	<	0.05000	M	Dy	<	0.01198	O	Li	<	0.01000	O	Pr	<	0.10000	i	Te		
M	Sb		0.00939	M	Er	<	0.00998	M	Lu	<	0.00080	M	Re	<	0.00200	M	Tb	<	0.00060
M	As	<	0.01997	M	Eu	<	0.00599	O	Mg	<	0.05000	M	Rh	<	0.00200	M	Tl	<	0.00200
M	Ba	<	0.01997	M	Gd	<	0.00200	M	Mn	<	0.00799	M	Rb		0.02445	M	Th	<	0.00200
M	Be	<	0.00100	M	Ga	<	0.00200	i	Hg			M	Ru	<	0.00399	M	Tm	<	0.00080
M	Bi	<	0.00080	M	Ge	<	0.01198	s	Mo			M	Sm	<	0.00200	M	Sn	<	0.00998
O	B	<	0.50000	M	Au	<	0.00599	O	Nd	<	0.05000	O	Sc	<	0.05000	O	Ti	<	0.00500
O	Cd	<	0.50000	M	Hf	<	0.00399	M	Ni	<	0.01597	M	Se	<	0.01597	M	W		0.05576
O	Ca		0.00026	M	Ho	<	0.00100	O	Nb	<	0.10000	O	Si	<	0.10000	M	U	<	0.00399
O	Ce	<	0.05000	M	In		0.00235	n	Os			M	Ag	<	0.00399	M	V	<	0.00399
M	Cs	<	0.00060	M	Ir	<	0.00998	M	Pd	<	0.00998	O	Na	<	0.10000	M	Yb	<	0.00200
M	Cr	<	0.00998	O	Fe	<	0.50000	i	P			M	Sr	<	0.00100	M	Y	<	0.07987
M	Co	<	0.00599	M	La	<	0.00100	M	Pt	<	0.00399	i	S			M	Zn	<	0.03993
M	Cu	<	0.01198	M	Pb	<	0.00599	O	K		0.00980	M	Ta	<	0.01398	M	Zr	<	0.00998

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010264

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 95.94; +6; 6,7,8,9; $[MoO_4]^{-2}$ (chemical form as received)
Chemical Compatibility - Mo is received in a NH_4OH matrix giving the operator the option of using HCl or HF to stabilize acidic solutions. The $[MoO_4]^{-2}$ is soluble in concentrated HCl $[MoOCl_5]^{-2}$, dilute HF / HNO_3 $[MoOF_5]^{-2}$ and basic media $[MoO_4]^{-2}$. Stable at ppm levels with some metals provided it is fluorinated. Do not mix with Alkaline or Rare Earths when HF is present. Stable with most inorganic anions provided it is in the $[MoO_4]^{-2}$ chemical form.
Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the $[MoOF_5]^{-2}$ for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $[MoO_4]^{-2}$ chemically stable for years in 1% NH_4OH in a LDPE container.
Mo Containing Samples (Preparation and Solution) - Metal (Soluble in HF / HNO_3 or hot dilute HCl); Oxide (soluble in HF or NH_4OH); Organic Matrices (Dry ash at 450°C in Pt^{5} and dissolve oxide with HF or HCl).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at [illegible]oncs.)
ICP-OES	202.030 nm	0.008 / 0.0002 µg/mL	1	ion	Os, Hf
ICP-OES	203.844 nm	0.012 / 0.002 µg/mL	1	ion	
ICP-OES	204.598 nm	0.012 / 0.001 µg/mL	1	ion	Ir, Ta
ICP-MS	95 amu	3 ppt	n/a	M^+	$^{86}Ar^{19}K^{16}O$, $^{79}Br^{16}O$, $^{196}Os^{2+}$, $^{196}Pt^{2+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4471 PO: F52323

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010265

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 23, 2003

Expiration Date:

EXPIRES
1 X 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010266

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Phosphorus in H_2O

Catalog Number: CGP1-1, CGP1-2 and CGP1-5

Lot Number: **T-P01118**

Starting Material:	Phosphoric Acid
Starting Material Purity:	99.999%
Starting Material Lot No:	J18804

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 05/01/03
DATE EXPIRED: 06/01/2004
DATE OPENED: 05/01/03
INORG: 4049 PO: F52180

CERTIFIED CONCENTRATION: 1004 ± 2 μg/mL

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:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1004 ± 2 μg/mL
Method: Acidimetric Titration vs NIST SRM 84k KHP.

Instrument Analysis: 1000 ± 3 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3139a.

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.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.**
An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm.

O	Al	<0.040	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	0.012	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	<0.0030	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	M	Mn	<0.00040	M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	0.00070	O	Hg	<0.020	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	n	Sc		n	Ti	
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	<0.0010
O	Ca	<0.010	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.020	M	U	<0.00020
M	Ce	<0.00050	M	In	<0.030	n	Os		M	Ag	<0.00020	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.050	s	P		M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	0.0035
M	Cu	0.080	M	Pb	<0.00030	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 0.999 g/mL

(over)

QA:KL Rev.122002DN

Paul R. Gaines

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EXPIRES 01 JUL 2004

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010267

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 Statisical Principles."*

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Silicon in H_2O tr. HNO_3 tr. HF**

Catalog Number:	CGSI1-1, CGSI1-2, and CGSI1-5
Lot Number:	**W-SI02082**
Starting Material:	SiO2
Starting Material Purity (%):	99.996367
Starting Material Lot No	C05310C
Matrix:	H_2O tr. HNO_3 tr. HF

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004
DATE OPENED: 06/23/03
INORG: 4153 PO: F52370

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1000 ± 5 µg/mL

Certified Density: 1.002 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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 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** **1000 ± 5 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3150 Lot Number: 991108

Assay Method #2 **1001 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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. 010268

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.

O	Al		0.02730	M	Dy	<	0.01358	O	Li	<	0.00009	M	Pr	<	0.00068	M	Te	<	0.06791
M	Sb	<	0.00113	M	Er	<	0.01132	M	Lu	<	0.00091	M	Re	<	0.00226	M	Tb	<	0.00068
M	As	<	0.02264	M	Eu	<	0.00679	O	Mg	<	0.04991	M	Rh	<	0.00226	M	Tl	<	0.00226
M	Ba	<	0.02264	M	Gd	<	0.00226	M	Mn	<	0.00906	M	Rb	<	0.00226	M	Th	<	0.00226
O	Be	<	0.00091	M	Ga	<	0.00226	O	Hg	<	0.04991	M	Ru	<	0.00453	M	Tm	<	0.00091
M	Bi	<	0.00091	M	Ge	<	0.01358	M	Mo	<	0.00453	M	Sm	<	0.00226	M	Sn	<	0.01132
O	B		0.02409	M	Au	<	0.00679	M	Nd	<	0.00453	O	Sc	<	0.00091	O	Ti		0.01325
M	Cd	<	0.00679	M	Hf	<	0.00453	O	Ni	<	0.01044	M	Se	<	0.01811	M	W	<	0.02264
O	Ca		0.00135	M	Ho	<	0.00113	M	Nb	<	0.00113	s	Si			M	U	<	0.00453
M	Ce	<	0.01132	M	In	<	0.02264	n	Os			M	Ag	<	0.00453	O	V	<	0.00408
M	Cs	<	0.00068	M	Ir	<	0.01132	M	Pd	<	0.01132	O	Na		0.02008	M	Yb	<	0.00226
O	Cr	<	0.00681	O	Fe	<	0.00499	O	P	<	0.02269	O	Sr	<	0.00032	M	Y	<	0.09055
M	Co	<	0.00679	M	La	<	0.00113	M	Pt	<	0.00453	O	S	<	0.11342	M	Zn	<	0.04528
O	Cu	<	0.00454	M	Pb	<	0.00679	O	K	<	0.00771	M	Ta		0.00200	M	Zr	<	0.01132

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

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 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 28.0855; +4; 6; $Si(OH)_x(F)_y^{2-}$

Chemical Compatibility - Soluble in HCl, HF, H_3PO_4, H_2SO_4 and HNO_3 as the $Si(OH)_x(F)_y^{2-}$. Avoid neutral to basic media. Unstable at ppm levels with metals that would pull F^- away (i.e. Do not mix with Alkaline or Rare Earths, or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions with a tendency to hydrolyze forming silicic acid (silicic acid is soluble up to ~100 ppm in water) in all dilute acids except HF.

Stability - 2-100 ppb levels - stability unknown - (alone or mixed with all other metals) as the $Si(OH)_x(F)_y^{2-}$. 1-10,000 ppm single element solutions as the $Si(OH)_x(F)_y^{2-}$ chemically stable for years in 2-5 % HNO_3 / trace HF in a LDPE container.

Si Containing Samples (Preparation and Solution) - Metal (Soluble in 1:1:1 H_2O / HF / HNO_3); Oxide - SiO_2, amorphic (Dissolve by heating in 1:1:1 H_2O / HF / HNO_3); Oxide - quartz (Fuse in Pt° with Na_2CO_3); Geological Samples (Fuse in Pt° with Na_2CO_3 followed by HCl solution of the fuseate); Organic Matrices containing silicates and non volatile silicon compounds (Dry ash at 450°C in Pt° and dissolve by gently warming with 1:1:1 H_2O / HF / H_2SO_4 or fuse / ash with Na_2CO_3 and dissolve fuseate with HCl / H_2O); Silicone Oils - dimethyl silicones depolymerize to form volatile monomer units when heated (Measure directly in alcoholic KOH / xylene mixture where sample is treated first with the KOH at 60-100 °C to "unzip" the Si-O-Si polymeric structure or digest with concentrated H_2SO_4/H_2O_2 followed by cooling and dissolution of the dehydrated silica with HF.) Note that the direct analysis of silicone oils in an organic solvent will result in false high results due to high vapor pressure of volatile monomer units like hexamethylcyclotrisiloxane. The KOH forms the $K_2'Si(CH_3)_2O^-$ salt which is not volatile at room temperature.

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 1000 ppm)
ICP-OES	251.611 nm	0.012 / 0.003 µg/mL	1	ion	Ta, U, Zn, Th
ICP-OES	212.412 nm	0.02 / 0.01 µg/mL	1	ion	Hf, Os, Mo, Ta
ICP-OES	288.158 nm	0.03 / 0.004 µg/mL	1	ion	Ta, Ce, Cr, Cd, Th
ICP-MS	28 amu	4000 - 8000 ppt	n/a	M'	$^{14}N_2$, $^{12}C^{16}O$

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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

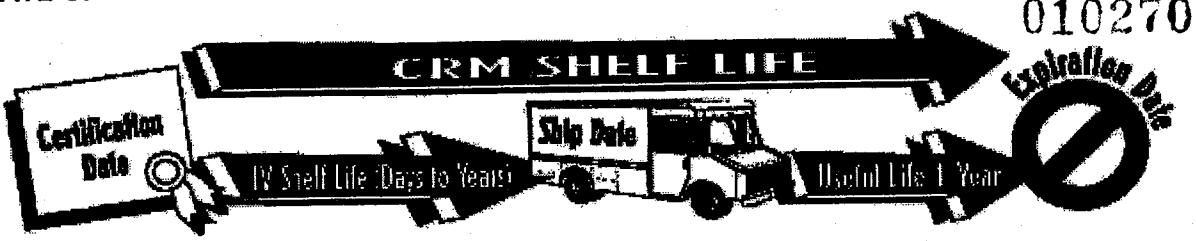
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

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

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004
DATE OPENED: 06/23/03
INORG: 4153 PO: F52370

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010270



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: February 24, 2003

Expiration Date: EXPIRES 01/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
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010271

certificate of analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Titanium in 1.4% HNO_3 (abs) tr. HF

Catalog Number: CGTI1-1, CGTI1-2 and CGTI1-5

This standard should **not** be prepared or stored in glass.

Lot Number: **T-TI02039**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/24/03
DATE EXPIRED: 12/01/2004
DATE OPENED: 11/25/03
INORG: 4332 PO: F52279

Starting Material:	Titanium Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	F29I14

CERTIFIED CONCENTRATION: 1010 ± 3 μg/mL

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:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Calculated Value: 1002 μg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 1010 ± 3 μg/mL (Average of 3 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3162a.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm.

O	Al	<0.010	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	O	Mg	< 0.020	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	M	Mn	0.0020	M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	O	Hg	<0.050	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
O	B	<0.050	M	Au	<0.00030	M	Nd	<0.00020	O	Sc	<0.0020	s	Ti	
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	<0.0010
O	Ca	<0.010	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.010	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.020	n	Os		M	Ag	<0.00020	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	0.12	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.010	i	P		M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	i	S		M	Zn	0.19
O	Cu	<0.040	M	Pb	<0.00030	n	K	0.23	M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.011 g/mL

QA:KL Rev.060502DN

(over)

Paul R. Haines
Quality Assurance Manager

Expires:

EXPIRES 12/2004

inorganic ventures / iv labs

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010272

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 Statisical Principles."*

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Strontium in 0.1% (abs) HNO_3**

Catalog Number:	CGSR1-1, CGSR1-2, and CGSR1-5
Lot Number:	**T-SR01123**
Starting Material:	$SrCO_3$
Starting Material Purity (%):	99.9951
Starting Material Lot No	22593
Matrix:	0.1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004
DATE OPENED: 06/23/03
INORG: 4154 PO: F52370

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 998 ± 2 µg/mL

Certified Density: 1.000 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:

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S$ = 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** **998 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **1002 ± 8 µg/mL**
ICP Assay NIST SRM 3153a Lot Number: 990906

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.

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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.

O Al < 0.00090	M Dy < 0.00600	O Li < 0.00003	M Pr < 0.00030	O Te < 0.10000
M Sb < 0.00050	M Er < 0.00500	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
O As < 0.00500	M Eu < 0.00300	O Mg 0.00037	O Rh < 0.00600	M Tl < 0.00100
M Ba 0.04001	M Gd < 0.00100	O Mn 0.00018	i Rb	M Th < 0.00100
O Be < 0.00009	M Ga < 0.00100	O Hg < 0.01500	O Ru < 0.00300	M Tm < 0.00040
M Bi < 0.00040	M Ge < 0.00600	M Mo < 0.00200	M Sm < 0.00100	M Sn < 0.00500
O B < 0.00060	M Au < 0.00300	M Nd < 0.00200	M Sc < 0.01000	M Ti < 0.05001
M Cd < 0.00300	M Hf < 0.00200	O Ni < 0.00300	O Se < 0.05000	M W < 0.01000
O Ca 0.03600	M Ho < 0.00050	M Nb < 0.00050	O Si 0.00056	M U < 0.00200
M Ce < 0.00500	O In < 0.00200	n Os	M Ag < 0.00200	M V < 0.00200
M Cs < 0.00030	M Ir < 0.00500	O Pd < 0.00400	O Na 0.00520	M Yb < 0.00100
O Cr < 0.00080	O Fe 0.00080	O P < 0.00480	s Sr	O Y < 0.00004
M Co < 0.00300	M La < 0.00050	M Pt < 0.00200	n S	M Zn < 0.02000
O Cu < 0.00140	M Pb < 0.00300	O K < 0.00170	M Ta < 0.00700	M 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

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 ± 4° C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 87.62; +2; 6; $Sr(H_2O)_6^{+2}$
Chemical Compatibility - Soluble in HCl, and HNO_3. Avoid H_2SO_4, HF 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 - 3.5% HNO_3 / LDPE container.
Sr Containing Samples (Preparation and Solution) - Metal (Best dissolved in diluted HNO_3); Ores (Carbonate fusion in Pt^0 followed by HCl dissolution); Organic Matrices (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 ≈ concs.)
ICP-OES 407.771 nm	0.0004 / 0.00006 µg/mL	1	ion	U, Ce
ICP-OES 421.552 nm	0.0008 / 0.00004 µg/mL	1	ion	Rb
ICP-OES 460.733 nm	0.07 / 0.003 µg/mL	1	atom	Ce
ICP-MS 88 amu	1200 ppt	n/a	M^+	$^{72}Ge^{16}O$, $^{176}Yb^{+2}$, $^{176}Lu^{+2}$, $^{176}Hf^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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

010274

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

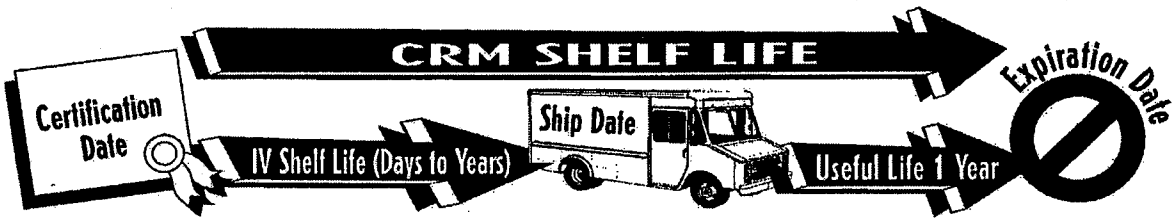
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), 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: October 31, 2002

Expiration Date: EXPIRES 01/2004

INORGANIC LABS/RADCHEM LABS pg. 2 of 2
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004
DATE OPENED: 06/23/03
INORG: 4154 PO: E52370

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Debbie Newman, QA Administrator

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

010275

inorganic ventures / iv labs

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010276

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 Statisical Principles."*

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Tin in H_2O tr HNO_3 tr HF**

Catalog Number:	CGSN1-1, CGSN1-2, and CGSN1-5
Lot Number:	**T-SN01110**
Starting Material:	#1, #2 SN SHOT
Starting Material Purity (%):	99.9969
Starting Material Lot No	AAJM H12H17, A23F09
Matrix:	H_2O tr HNO_3 tr HF

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 3/26/03
DATE EXPIRED: 4/01/2004
DATE OPENED: 3/28/03
INORG: 4026 PO: F52167

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1003 ± 5 µg/mL

Certified Density: 1.000 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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 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** **1003 ± 5 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3161a Lot Number: 993107

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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. 010277

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.

O	Al	0.00100	M	Dy	< 0.01217	O	Li	< 0.00002	M	Pr	< 0.00061	M	Te	< 0.06087
O	Sb	< 0.01000	M	Er	< 0.01014	M	Lu	< 0.00081	M	Re	< 0.00203	M	Tb	< 0.00061
M	As	< 0.02029	M	Eu	< 0.00609	O	Mg	< 0.00003	M	Rh	< 0.00203	M	Tl	< 0.00203
O	Ba	< 0.00070	M	Gd	< 0.00203	M	Mn	< 0.00812	M	Rb	< 0.00203	M	Th	< 0.00203
M	Be	< 0.00101	M	Ga	< 0.00203	O	Hg	< 0.01500	M	Ru	< 0.00406	M	Tm	< 0.00081
M	Bi	< 0.00081	M	Ge	< 0.01217	M	Mo	< 0.00406	M	Sm	< 0.00203	S	Sn	
O	B	< 0.01200	M	Au	< 0.00609	M	Nd	< 0.00406	M	Sc	< 0.02029	M	Ti	< 0.10144
O	Cd	< 0.00500	M	Hf	< 0.00406	O	Ni	< 0.01000	M	Se	< 0.01623	M	W	< 0.02029
O	Ca	< 0.00150	M	Ho	< 0.00101	M	Nb	< 0.00101	O	Si	0.02700	M	U	< 0.00406
M	Ce	< 0.01014	M	In	< 0.02029	n	Os		M	Ag	< 0.00406	M	V	< 0.00406
M	Cs	< 0.00061	M	Ir	< 0.01014	M	Pd	< 0.01014	O	Na	0.00325	M	Yb	< 0.00203
M	Cr	< 0.01014	O	Fe	< 0.00110	O	P	< 0.00500	M	Sr	< 0.00101	M	Y	< 0.08115
O	Co	< 0.00200	M	La	< 0.00101	M	Pt	< 0.00406	N	S		M	Zn	< 0.04058
M	Cu	< 0.01217	M	Pb	< 0.00609	O	K	< 0.00200	M	Ta	< 0.01420	M	Zr	< 0.01014

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010278

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 118.710; +4; 4,5, 6,7,8 $Sn(OH)_3F_3^{2-}$
Chemical Compatibility - Soluble in HCl and dilute HF / HNO_3. Avoid neutral to basic media. Unstable at ppm levels with metals that would pull F^- away. (i.e. Do not mix with Alkaline or Rare Earths or high levels of transition elements unless they are fluorinated.) Stable with most inorganic anions provided it is in the chemical form shown above.
Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the $Sn(OH)_3F_3^{2-}$ for 1 year in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $Sn(OH)_3F_3^{2-}$ chemically stable for years in 2-5% HNO_3 / trace HF in a LDPE container.
Sn Containing Samples (Preparation and Solution) - Metal (Soluble in HF / HNO_3 or HCl); Oxides - SnO (soluble in HCl), SnO_2 -very resistant to all acids including HF(Fusion with equal parts of Na_2CO_3 and S. It is then soluble in water or dilute acids as the thiostannate.); Alloys (Treat first 0.1 g with 10 mL conc. H_2SO_4 to boiling until the alloy disintegrates and nearly all of the sulfuric acid is expelled. Then add 100 mL O_2 free water and 50 mL of conc HCl or transfer to a plastic container and add 1 mL HF in either case warming gently to bring about solution.); Organic Matrices (Volatility and precipitation of the insoluble stannic oxide are problems. Consultation of the literature should be made for individual matrices / Sn compounds.)
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 [illegible] concs.)
ICP-OES	189.989 nm	0.03 / 0.003 µg/mL	1	ion	
ICP-OES	242.949 nm	0.1 / 0.01 µg/mL	1	atom	W, Mo, Rh, Ta, Co
ICP-MS	120 amu	5 ppt	n/a	M^+	^{126}Te, $^{104}Ru^{16}O$, $^{104}Pd^{16}O$

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 3/26/03
DATE EXPIRED: 4/01/2004
DATE OPENED: 3/28/03
INORG: 4026 PO: F52167

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010279

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 17, 2002

Expiration Date: EXPIRES 1 APR 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Debbie Newman, QA Administrator

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010280

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 Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Bismuth in 3.5% (abs) HNO_3**

Catalog Number:	CGBI1-1 and CGBI1-5
Lot Number:	**W-BI01089**
Starting Material:	Bi needles
Starting Material Purity (%):	99.999090
Starting Material Lot No	G25L16
Matrix:	3.5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4200 PO: F52383

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 4 µg/mL

Certified Density: 1.026 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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 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** **1002 ± 4 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3106 Lot Number: 991212

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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. 010281

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.

O	Al		0.00012	M	Dy	<	0.01202	O	Li	<	0.00002	M	Pr	<	0.00060	M	Te	<	0.06008
M	Sb	<	0.00100	M	Er	<	0.01001	M	Lu	<	0.00080	M	Re	<	0.00200	M	Tb	<	0.00060
M	As	<	0.02003	M	Eu	<	0.00601	O	Mg		0.00070	M	Rh	<	0.00200	M	Tl	<	0.00200
M	Ba	<	0.02003	M	Gd	<	0.00200	O	Mn	<	0.00020	M	Rb	<	0.00200	M	Th	<	0.00200
M	Be	<	0.00100	M	Ga	<	0.00200	O	Hg	<	0.01500	M	Ru	<	0.00401	M	Tm	<	0.00080
s	Bi			M	Ge	<	0.01202	M	Mo	<	0.00401	M	Sm	<	0.00200	M	Sn	<	0.01001
M	B	<	0.14018	M	Au	<	0.00601	M	Nd	<	0.00401	M	Sc	<	0.02003	M	Ti	<	0.10013
O	Cd		0.00017	M	Hf	<	0.00401	M	Ni	<	0.01602	M	Se	<	0.01602	M	W	<	0.02003
O	Ca		0.00245	M	Ho	<	0.00100	M	Nb	<	0.00100	O	Si		0.00105	M	U	<	0.00401
M	Ce	<	0.01001	O	In		0.00105	n	Os			M	Ag	<	0.00401	M	V	<	0.00401
M	Cs	<	0.00060	M	Ir	<	0.01001	O	Pd	<	0.00400	O	Na		0.00240	M	Yb	<	0.00200
O	Cr		0.00020	O	Fe		0.00014	O	P	<	0.01000	M	Sr	<	0.00100	M	Y	<	0.08011
M	Co	<	0.00601	M	La	<	0.00100	M	Pt	<	0.00401	O	S	<	0.03000	O	Zn		0.00008
O	Cu		0.00014	O	Pb		0.00135	O	K		0.00039	M	Ta	<	0.01402	M	Zr	<	0.01001

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010282

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 208.9804; +3; 6 ;Bi(O)(H_2O)$_2$"
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4 and HF. **Avoid** basic media forming insoluble hydroxide. Stable with most metals and inorganic anions in acidic media. Many salts that are insoluble in water are soluble in HCl, HNO_3 and HF. The major problem with Bi^{3+} is its tendency to hydrolyze at higher concentrations or in dilute acid. Nitric acid solutions should be 5% to hold the Bi in solution in the 100 to 10000 µg/mL concentration range
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 - 7% HNO_3 / LDPE container.
Bi Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HNO_3); Alloys (Dissolve in conc. 4:1 HCl /HNO_3. Heating may be required.); Organic based (dry ash at 450°C and dissolve ash in HNO_3 or acid digestion with conc. hot sulfuric acid adding hydrogen peroxide dropwise and carefully until clear.)
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 50 ppm concs.)
ICP-OES	223.061 nm	0.04 / 0.005 µg/mL	1	atom	Th, Ir, Ti Cu
ICP-OES	306.772 nm	0.08 / 0.01 µg/mL	1	atom	Th, U, Zr, Hf, Fe
ICP-OES	222.825 nm	0.1 / 0.02 µg/mL	1	atom	Cr, Hf, Ce, Os
ICP-MS	209 amu	2 ppt	n/a	M'	$^{191}Ir^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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

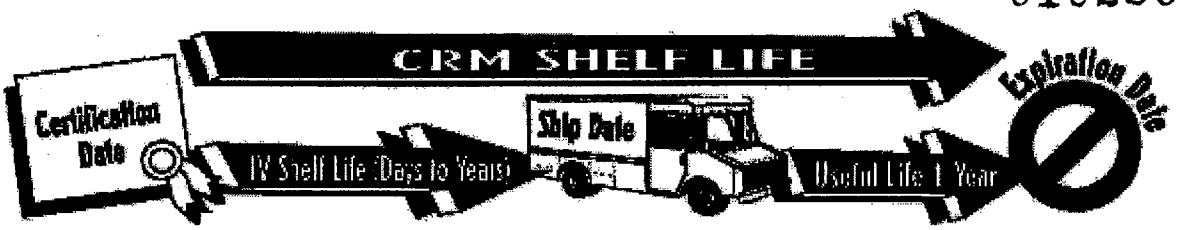
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

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

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4200 PO: F52383

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010283



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: March 28, 2003

Expiration Date: EXPIRES 1 8 2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

Certificate of Analysis

CUSTOM-GRADE SOLUTION

1000 μg/mL Lanthanum in 1.4% HNO_3 (abs) 010284

Catalog Number: CGLA1-1 and CGLA1-5

Lot Number: **T-QLA01057**

Starting Material:	Lanthanum Oxide
Starting Material Purity:	99.999%
Starting Material Lot No:	LA-0-5-017

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004
DATE OPENED: 08/26/03
INORG: 4221 PO: E53224

CERTIFIED CONCENTRATION: 1002 ± 3 μg/mL

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:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1002 ± 3 μg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 1007 ± 3 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3127a.

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.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.**
An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm.

O	Al	<0.040	M	Dy	<0.00060	M	Li	<0.0010	O	Pr	<0.020	M	Te	<0.0030
M	Sb	<0.000050	M	Er	0.0010	M	Lu	0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	<0.0030	M	Rh	<0.00010	M	Tl	<0.00010
O	Ba	<0.020	M	Gd	0.039	M	Mn	<0.00040	M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	O	Hg	<0.030	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	0.00040	M	Sn	<0.00050
O	B	<0.020	M	Au	<0.00030	M	Nd	0.00020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	<0.0010
O	Ca	<0.010	M	Ho	0.00010	M	Nb	<0.000050	O	Si	<0.020	M	U	<0.00020
i	Ce		O	In	<0.030	n	Os		M	Ag	<0.00020	M	V	<0.00020
n	Cs		M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.050	O	P	<0.050	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	s	La		M	Pt	<0.00020	n	S		M	Zn	<0.0020
M	Cu	<0.00060	M	Pb	<0.00030	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.009 g/mL **(over)**

QA:KSL Rev.121702DN

Paul K. Haines
Quality Assurance Manager

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

EXPIRES 1 SEP 2004

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

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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 Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Palladium in 3.3% (abs) HCL**

Catalog Number:	CGPD1-1 and CGPD1-5
Lot Number:	**W-PD02019**
Starting Material:	Pd(NO3)2
Starting Material Purity (%):	99.999248
Starting Material Lot No	11974A-00
Matrix:	3.3% (abs) HCL

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 03/01/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 03/01/04
INORG: 4477 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 994 ± 3 µg/mL

Certified Density: 1.022 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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 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** **994 ± 3 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3138 Lot Number: 990207

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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. 01C286

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.

O	Al	0.00400	M	Dy	< 0.00060	O	Li	< 0.04000	M	Pr	< 0.00003	O	Te	< 0.01300
O	Sb	< 0.00500	M	Er	< 0.00050	M	Lu	< 0.00004	M	Re	< 0.00010	M	Tb	< 0.00003
O	As	< 0.01400	M	Eu	< 0.00030	O	Mg	< 0.01100	O	Rh	< 0.00600	M	Tl	< 0.00010
M	Ba	< 0.00100	M	Gd	< 0.00010	O	Mn	< 0.00650	M	Rb	< 0.00010	M	Th	< 0.00010
O	Be	< 0.00009	M	Ga	< 0.00010	O	Hg	< 0.01100	O	Ru	< 0.00200	M	Tm	< 0.00004
M	Bi	< 0.00004	M	Ge	< 0.00060	M	Mo	< 0.00020	M	Sm	< 0.00010	O	Sn	< 0.00700
O	B	< 0.00090	O	Au	< 0.00300	M	Nd	< 0.00020	O	Sc	< 0.00009	O	Ti	< 0.00100
O	Cd	< 0.00600	M	Hf	< 0.00020	O	Ni	0.01800	M	Se	< 0.00080	M	W	< 0.00100
O	Ca	0.00700	M	Ho	< 0.00005	M	Nb	< 0.00005	O	Si	0.00600	M	U	< 0.00020
M	Ce	< 0.00050	O	In	< 0.03300	n	Os		O	Ag	< 0.00670	M	V	< 0.00020
M	Cs	< 0.00003	M	Ir	< 0.00050	S	Pd		O	Na	0.01500	M	Yb	< 0.00010
O	Cr	0.00450	O	Fe	0.04600	O	P	0.00600	M	Sr	< 0.00005	M	Y	< 0.00400
M	Co	< 0.00030	M	La	< 0.00005	O	Pt	< 0.00600	O	S	< 0.02500	O	Zn	< 0.00060
O	Cu	0.00360	M	Pb	< 0.00030	O	K	< 0.02000	M	Ta	< 0.00070	M	Zr	< 0.00050

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

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 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 106.42; +2; 6; $Pd(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media. Avoid contact with water soluble organics such as aldehydes since Pd^{2+} is easily reduced.
Stability - 2-100 ppb levels. 2ppb Pd is stable for 1 day in 1% HNO_3 / LDPE container. 10 ppb is stable for 3 days in 1% HNO_3 / LDPE container. 100 ppb is stable for 6.5 months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Pd Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3 or Aqua Regia); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).
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 ≤5ppm cncs.)
ICP-OES	340.458 nm	0.04 / 0.003 µg/mL	1	atom	Ce, Th, Zr
ICP-OES	363.470 nm	0.05 / 0.007 µg/mL	1	atom	
ICP-OES	229.651 nm	0.07 / 0.004 µg/mL	1	ion	Co
ICP-MS	105 amu	2 ppt	n/a	M+	$^{40}Ar^{65}Cu$, $^{89}Y^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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

010287

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

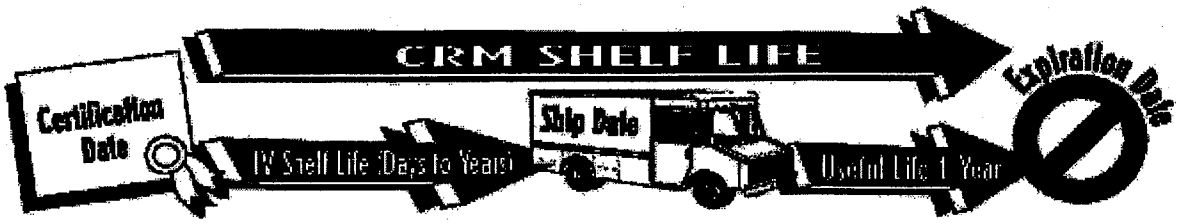
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), 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: March 14, 2003

Expiration Date:

EXPIRES
01 MAR 2005

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 03/01/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 03/01/04
INORG: 4477 PO: F52323

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010288

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010289

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 Statisical Principles."

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Sulfur in H_2O**

Catalog Number:	CGS1-1 and CGS1-5
Lot Number:	**W-QS01098**
Starting Material:	H_2SO_4
Starting Material Purity (%):	99.999965
Starting Material Lot No	N38818
Matrix:	H_2O

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 1 of 2
DATE EXPIRED: 12/1/2004 DR
DATE OPENED: 11/5/03
INORG: 4317 PO: F52258

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1010 ± 2 µg/mL

Certified Density: 1.000 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:

Certified Value (□) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

(□) = mean
x_i = individual results
n = number of measurements
Σs = 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** **998 ± 8 µg/mL**
ICP Assay NIST SRM 3154 Lot Number: 892205

Assay Method #2 **1010 ± 2 µg/mL**
Acidimetric NIST SRM 84k Lot Number: 84k

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.

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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.

O	Al	0.00025	M	Dy	< 0.01197	O	Li	< 0.00016	M	Pr	< 0.00060	M	Te	< 0.05984
M	Sb	< 0.00100	M	Er	< 0.00997	M	Lu	< 0.00080	M	Re	< 0.00200	M	Tb	< 0.00060
M	As	< 0.01995	M	Eu	< 0.00598	O	Mg	< 0.00004	M	Rh	< 0.00200	M	Tl	< 0.00200
M	Ba	< 0.01995	M	Gd	< 0.00200	M	Mn	< 0.00798	M	Rb	< 0.00200	M	Th	< 0.00200
O	Be	< 0.00200	M	Ga	< 0.00200	O	Hg	< 0.01100	M	Ru	< 0.00399	M	Tm	< 0.00080
M	Bi	< 0.00080	M	Ge	< 0.01197	M	Mo	< 0.00399	M	Sm	< 0.00200	M	Sn	< 0.00997
O	B	< 0.00990	M	Au	< 0.00598	M	Nd	< 0.00399	M	Sc	< 0.01995	M	Ti	< 0.09974
M	Cd	< 0.00598	M	Hf	< 0.00399	O	Ni	< 0.00230	O	Se	< 0.00620	M	W	< 0.01995
O	Ca	0.00020	M	Ho	< 0.00100	M	Nb	< 0.00100	O	Si	< 0.00410	M	U	< 0.00399
M	Ce	< 0.00997	M	In	< 0.01995	n	Os		M	Ag	< 0.00399	M	V	< 0.00399
M	Cs	< 0.00060	M	Ir	< 0.00997	M	Pd	< 0.00997	O	Na	< 0.00010	M	Yb	< 0.00200
M	Cr	< 0.00997	O	Fe	0.00015	O	P	< 0.00480	M	Sr	< 0.00100	M	Y	< 0.07979
M	Co	< 0.00598	M	La	< 0.00100	M	Pt	< 0.00399	s	S		O	Zn	0.00125
M	Cu	< 0.01197	M	Pb	< 0.00598	O	K	< 0.00170	M	Ta	< 0.01396	M	Zr	< 0.00997

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010291

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 32.066; +6; 6; (O=)$_4$ S(OH)$_2$

Chemical Compatibility - Soluble in HCl, HNO_3, H_3PO_4 and HF aqueous matrices water and NH_4OH. Stable with all metals and inorganic anions at low to moderate ppm levels under acidic conditions except Ba and Pb and to a lesser extent Sr, and Ca.

Stability - 2-100 ppb levels- stability unknown- in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in LDPE container.

S Containing Samples (Preparation and Solution) - We most often get questions about the determination of S in Rocks, Silicates and insoluble sulfates (the finely powered sample is fused in a Pt* crucible with 4-8 times its weight of Na_2CO_3 + 0.5 grams KNO_3. The fuseate is extracted with water. Any $BaSO_4$ present in the sample is transposed by the carbonate fusion to the $BaCO_3$ which is left behind in the water-insoluble residue. If $PbSO_4$ is present the fuseate should be boiled with a sodium carbonate saturated with CO_2 solution for 1 hour or more where the $PbSO_4$ will be transposed to the water insoluble carbonate which can be filtered off. Boiling the fuseate with a saturated carbonate solution is good insurance for samples containing Ba, Sr, and Ca. The Ba, Pb, Sr, Ca, free filtrate can be acidified and measured by ICP.)

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 ppm levels.)
ICP-OES	166.669nm	0.2 / 0.19 µg/mL	1	atom	Si, B
ICP-OES	182.034 nm	0.3 / 0.024 µg/mL	1	atom	
ICP-OES	143.328 nm	0.4 / 0.035 µg/mL	1	atom	
ICP-MS	32 amu	30,000 ppt	n/a	M+	$^{16}O_2$, $^{14}N^{16}O$, $^{14}N^{17}O$, $^{14}N^{17}O^1H$, $^{14}N^{16}O^1H$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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

010292

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.

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 282
DATE EXPIRED: 12/1/2004 DR
DATE OPENED: 11/5/03
INORG: 4317 PO: F52258

Certification Date: August 27, 2003

Expiration Date: EXPIRES 12/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Thorium in 3% HNO_3 (abs) 010293

Catalog Number: CGTH1-1 and CGTH1-5

Lot Number: **T-TH01059**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/08/03
DATE EXPIRED: 11/01/2004
DATE OPENED: 10/08/03
INORG: 4283 PO: F53240

Starting Material:	Thorium Nitrate
Starting Material Purity:	99.999%
Starting Material Lot No:	C01L32

CERTIFIED CONCENTRATION: 1001 ± 3 μg/mL

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:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1001 ± 3 μg/mL
Method: EDTA Titration vs NIST SRM Lead Nitrate.

Instrument Analysis: 1002 ± 4 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3159.

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.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm .

O	Al	<0.00090	M	Dy	0.0062	O	Li	<0.000030	M	Pr	0.00037	O	Te	<0.031
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
O	As	<0.014	M	Eu	<0.00030	O	Mg	<0.000060	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	0.0050	M	Gd	0.0054	O	Mn	<0.0000030	M	Rb	<0.00010	s	Th	
O	Be	<0.00020	M	Ga	<0.00010	i	Hg		M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	0.0095	M	Sn	<0.00050
O	B	<0.00060	M	Au	<0.00030	M	Nd	0.0026	M	Sc	<0.0010	O	Ti	<0.00092
O	Cd	<0.0045	M	Hf	<0.00020	O	Ni	<0.0023	M	Se	<0.010	M	W	<0.0010
O	Ca	<0.030	M	Ho	0.00022	M	Nb	<0.000050	O	Si	<0.0034	M	U	0.074
M	Ce	<0.00050	O	In	<0.0020	n	Os		M	Ag	<0.00020	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.00010	M	Yb	<0.00010
O	Cr	<0.00080	O	Fe	<0.0011	i	P		M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	O	S	<0.072	O	Zn	<0.00058
M	Cu	<0.00060	M	Pb	<0.00030	O	K	<0.0017	M	Ta	<0.00070	M	Zr	0.0085

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.022 g/mL

QA:KL Rev.050802DN

(over)

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Paul R. Haines
Quality Assurance Manager

EXPIRES 01 Nov 2004

inorganic ventures / iv labs

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phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

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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 Statisical Principles."

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Uranium in 1% (abs) HNO_3**

Catalog Number:	CGU1-1 and CGU1-5
Lot Number:	**W-U01059**
Starting Material:	$UO_2(NO_3)_2.6H_2O$
Starting Material Purity (%):	99.994419
Starting Material Lot No	RB0018
Matrix:	1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4473 PO: F52323

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 997 ± 2 µg/mL

Certified Density: 1.021 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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 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** **997 ± 2 µg/mL**
ICP Assay NIST SRM 3164 Lot Number: 891509

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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. 010295

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.

M	Al	0.05166	M	Dy	< 0.01494	M	Li	< 0.02490	M	Pr	< 0.00075	M	Te	< 0.07470
M	Sb	< 0.00125	M	Er	< 0.01245	M	Lu	< 0.00100	M	Re	< 0.00249	M	Tb	0.00003
M	As	< 0.02490	M	Eu	< 0.00747	M	Mg	< 0.07470	M	Rh	< 0.00249	M	Tl	< 0.00249
M	Ba	< 0.02490	M	Gd	0.00310	M	Mn	0.00083	M	Rb	< 0.00249	M	Th	< 0.00249
M	Be	< 0.00125	M	Ga	< 0.00249	i	Hg		M	Ru	< 0.00498	M	Tm	< 0.00100
M	Bi	< 0.00100	M	Ge	< 0.01494	M	Mo	0.00093	M	Sm	0.00010	O	Sn	< 0.10000
M	B	< 0.17429	M	Au	< 0.00747	M	Nd	< 0.00498	M	Sc	< 0.02490	M	Ti	0.00258
M	Cd	0.00103	M	Hf	< 0.00498	M	Ni	< 0.01992	M	Se	< 0.01992	M	W	< 0.02490
O	Ca	0.05395	M	Ho	0.00052	M	Nb	< 0.00125	i	Si		s	U	
M	Ce	0.00010	M	In	< 0.02490	n	Os		M	Ag	< 0.00498	M	V	< 0.00498
M	Cs	< 0.00075	M	Ir	< 0.01245	M	Pd	< 0.01245	O	Na	0.00664	M	Yb	< 0.00249
M	Cr	< 0.01245	M	Fe	< 0.49798	i	P		M	Sr	< 0.00125	M	Y	0.00062
M	Co	< 0.00747	M	La	0.00145	M	Pt	< 0.00498	i	S		M	Zn	0.00114
M	Cu	0.00072	M	Pb	0.00217	i	K		M	Ta	< 0.01743	M	Zr	< 0.01245

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 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 238.0289; +6; 8; UO_2^{2+}(uranyl)

Chemical Compatibility - Soluble in HCl and HNO_3. Avoid H_3PO_4. H_2SO_4 and HF matrices should not be a problem depending upon [U]. Although the UO_2^{2+} ion is distinctly basic, any U^{4+} will precipitate in basic media. UO_2^{2+} salts are generally soluble in water and UO_2^{2+} is stable with most metals and inorganic anions. The uranyl phosphate is insoluble in water. UF_4 and UF_6 are water soluble.

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.

U Containing Samples (Preparation and Solution) - Metal (Dissolves rapidly in HCl and HNO_3); Oxide (Soluble in HNO_3); Ores (Digest for 1-2 hours with 1 gram of ore to 30 mL 1:1 HNO_3. Silica insolubles are removed by filtration after bringing the sample to fumes with conc. H_2SO_4.)

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 ≤10ppm.)
ICP-OES	385.958 nm	0.3 / 0.01 µg/mL	1	ion	Th, Fe
ICP-OES	367.007 nm	0.3 / 0.02 µg/mL	1	ion	Th, Ce
ICP-OES	263.553 nm	0.3 / 0.01 µg/mL	1	ion	Ce, Ir, Th, Rh, W, Zr, Ta, Ti, V, Hf, Fe, Re, Ru
ICP-MS	238 amu	2 ppt	n/a	M^+	$^{206}Pb^{16}O_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4473 PO: F52323

***NOTICE TO ICP-MS USERS:** The ^{235}U in this standard is depleted. The certified abundances in Atom % are as follows:

	Isotope	Natural Abundance Atom %	IV's Certified Abundance Atom %
Uranium	^{238}U	99.3	99.8 ± 0.1
	^{235}U	0.70	0.204 ± 0.002

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: June 10, 2003

Expiration Date: EXPIRES 1/2/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

inorganic ventures / iv labs

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010298

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 Statisical Principles."*

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Tungsten in 1% (abs) HNO_3/1% (abs) HF**

Catalog Number:	CGW1-1 and CGW1-5
Lot Number:	**W-W01080**
Starting Material:	W Powder
Starting Material Purity (%):	99.990703
Starting Material Lot No	21418,C31H46,D02J21,E03K06,D11F29
Matrix:	1% (abs) HNO_3/1% (abs) HF

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4203 PO: E52383

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1001 ± 2 µg/mL

Certified Density: 1.006 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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 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** **1001 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3163 Lot Number: 990209

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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. 010299

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.

O	Al	0.01792	M	Dy	< 0.00595	O	Li	< 0.00008	M	Pr	< 0.00030	M	Te	< 0.02974
M	Sb	< 0.00050	M	Er	< 0.00496	M	Lu	< 0.00040	i	Re		M	Tb	< 0.00030
M	As	< 0.00991	M	Eu	< 0.00297	O	Mg	0.00120	M	Rh	< 0.00099	M	Tl	< 0.00099
M	Ba	< 0.00991	M	Gd	< 0.00099	M	Mn	< 0.00397	M	Rb	< 0.00099	M	Th	< 0.00099
M	Be	< 0.00050	M	Ga	< 0.00099	O	Hg	< 0.04778	M	Ru	< 0.00198	M	Tm	< 0.00040
M	Bi	< 0.00040	M	Ge	< 0.00595	M	Mo	0.00050	M	Sm	< 0.00099	M	Sn	< 0.00496
O	B	< 1.19460	M	Au	< 0.00297	M	Nd	< 0.00198	O	Sc	< 0.00036	M	Ti	0.00198
M	Cd	< 0.00297	M	Hf	< 0.00198	M	Ni	< 0.00793	M	Se	< 0.00793	S	W	
O	Ca	0.00080	M	Ho	< 0.00050	O	Nb	< 0.06371	O	Si	< 0.01354	M	U	< 0.00198
M	Ce	< 0.00496	M	In	< 0.00991	n	Os		M	Ag	< 0.00198	M	V	< 0.00198
M	Cs	< 0.00030	M	Ir	< 0.00496	M	Pd	< 0.00496	O	Na	0.04778	M	Yb	< 0.00099
M	Cr	< 0.00496	O	Fe	< 0.03982	n	P		M	Sr	< 0.00050	M	Y	< 0.03965
M	Co	< 0.00297	M	La	< 0.00050	M	Pt	< 0.00198	n	S		M	Zn	< 0.01983
M	Cu	< 0.00595	M	Pb	0.00060	O	K	0.03146	O	Ta	< 0.39820	M	Zr	0.00079

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010300

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4 °C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 183.85; +6; 6,7,8,9 WOF_5^{-2} (chemical form as received)
Chemical Compatibility - W is very readily hydrolyzed requiring 0.1 to 1% HF solutions for stable acidic solutions. The WOF_5^{-2} is soluble in % levels of HCl and HNO_3 provided it is in the WOF_5^{-2} form. Stable at ppm levels with some metals provided it is fluorinated. Do not mix with Alkaline or Rare Earths. Is best to be mixed only with other fluorinated metals (Ti, Zr, Hf, Nb, Ta, Mo, Si, Sn, Ge). Look for yellow WO_3 precipitate if mixed with other transition elements at higher levels indicating instability. The yellow WO_3 will form over a period of weeks even in trace HF, therefore, HF levels of W multi- element blends should be ~ 1 %.
Stability - 2-100 ppb levels stable (Alone or mixed with all other metals that are at comparable levels) as the WOF_5^{-2} for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the WOF_5^{-2} chemically stable for years in 1% HF in an LDPE container.
W Containing Samples (Preparation and Solution) - Metal (Soluble in HF / HNO_3); Oxide (Soluble in HF or NH.OH) ; Organic Matrices (Dry ash at 450 °C in Pt^6 and dissolve oxide with HF).
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 [illegible]oncs.)
ICP-OES	207.911 nm	0.03 / 0.001 µg/mL	1	ion	Ru, In
ICP-OES	224.875 nm	0.05 / 0.005 µg/mL	1	ion	Co, Rh, Ag
ICP-OES	209.475 nm	0.05 / 0.005 µg/mL	1	ion	Mo
ICP-MS	182 amu	5 ppt	n/a	M'	$^{166}Er^{16}O$

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4203 PO: F52383

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010301

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: February 10, 2003

Expiration Date: EXPIRES 1/2/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Yttrium in 1.4% HNO_3 (abs)

Catalog Number: CGY1-1 and CGY1-5

010302

Lot Number: **T-Y01086**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 05/09/03
DATE EXPIRED: 06/01/2004
DATE OPENED: 05/12/03
INORG: 4063 PO: F52181

Starting Material:	Y_2O_3
Starting Material Purity:	99.999%
Starting Material Lot No:	Y-O-5-9503201

CERTIFIED CONCENTRATION: 1004 ± 3 μg/mL

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:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n} \qquad \text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = mean x_i = individual results n = number of measurements $\sum S_i$ = The summation of all significant estimated errors.

Classical Wet Assay: 1004 ± 3 μg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 1004 ± 4 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3167a.

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.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN μg/mL:

Custom-Grade solutions tested for trace metallic impurities by **ICP-MS** were analyzed in an **ULPA-Filtered Clean Room.** An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm.

O	Al	0.00021	M	Dy	<0.0060	M	Li	<0.010	M	Pr	<0.00030	M	Te	<0.030
M	Sb	<0.00050	M	Er	<0.0050	O	Lu	<0.000020	M	Re	<0.0010	M	Tb	<0.00030
M	As	<0.010	M	Eu	<0.0030	O	Mg	<0.000030	M	Rh	<0.0010	M	Tl	<0.0010
M	Ba	<0.010	M	Gd	<0.0010	O	Mn	<0.000020	M	Rb	<0.0010	M	Th	<0.0010
M	Be	<0.00050	M	Ga	<0.0010	O	Hg	<0.020	M	Ru	<0.0020	M	Tm	<0.00040
M	Bi	<0.00040	M	Ge	<0.0060	M	Mo	<0.0020	M	Sm	<0.0010	M	Sn	<0.0050
O	B	<0.00014	M	Au	<0.0030	M	Nd	<0.0020	O	Sc	0.00024	M	Ti	<0.050
M	Cd	<0.0030	M	Hf	<0.0020	M	Ni	<0.080	M	Se	<0.0080	M	W	<0.010
O	Ca	0.00014	M	Ho	<0.00050	M	Nb	<0.00050	O	Si	0.000077	M	U	<0.0020
M	Ce	<0.0050	M	In	<0.010	n	Os		M	Ag	<0.0020	O	V	<0.00080
M	Cs	<0.00030	M	Ir	<0.0050	O	Pd	<0.10	O	Na	<0.050	M	Yb	<0.0010
M	Cr	<0.0050	O	Fe	0.0015	O	P	<0.070	M	Sr	<0.00050	s	Y	
M	Co	<0.0030	M	La	<0.00050	M	Pt	<0.0020	O	S	<0.043	M	Zn	<0.020
M	Cu	<0.0060	M	Pb	<0.0030	O	K	<0.10	M	Ta	<0.0070	O	Zr	<0.00070

M - checked by ICP-MS O - checked by ICP-OES i - spectral interference n - not checked for s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.010 g/mL

(over)

QA:KL Rev.061802DN

Paul R. Haines
Quality Assurance Manager

Inorganic Ventures, Inc.
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EXPIRES
1 JUN 2004

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010303

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 Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Zirconium in H_2O tr. HNO_3 tr. HF**

Catalog Number:	CGZR1-1 and CGZR1-5
Lot Number:	**W-ZR01056**
Starting Material:	ZrO_2
Starting Material Purity (%):	99.994542
Starting Material Lot No	22855
Matrix:	H_2O tr. HNO_3 tr. HF

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4474 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1004 ± 2 µg/mL

Certified Density: 0.999 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:

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

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_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 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** **1004 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3169 Lot Number: 990109

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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. 010304

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.

O	Al	0.01416	M	Dy	< 0.01188	O	Li	< 0.00012	M	Pr	< 0.00059	M	Te	< 0.05942
M	Sb	< 0.00099	M	Er	< 0.00990	M	Lu	< 0.00079	M	Re	< 0.00198	M	Tb	< 0.00059
M	As	< 0.01981	M	Eu	< 0.00594	O	Mg	< 0.00012	M	Rh	< 0.00198	M	Tl	< 0.00198
M	Ba	< 0.01981	M	Gd	< 0.00198	O	Mn	< 0.00401	M	Rb	< 0.00198	M	Th	< 0.00198
O	Be	< 0.40048	M	Ga	< 0.00198	O	Hg	< 0.04405	M	Ru	< 0.00396	M	Tm	< 0.00079
M	Bi	< 0.00079	M	Ge	< 0.01188	O	Mo	< 0.40048	M	Sm	< 0.00198	M	Sn	< 0.00990
M	B	< 0.13864	M	Au	< 0.00594	M	Nd	< 0.00396	O	Sc	< 0.00064	O	Ti	< 0.16019
O	Cd	< 0.02123	M	Hf	0.04403	O	Ni	0.01214	M	Se	< 0.01585	M	W	< 0.01981
O	Ca	0.00809	M	Ho	< 0.00099	O	Nb	< 0.08010	O	Si	< 0.80096	M	U	< 0.00396
M	Ce	< 0.00990	M	In	< 0.01981	n	Os		O	Ag	< 0.40048	M	V	< 0.00396
M	Cs	< 0.00059	M	Ir	< 0.00990	M	Pd	< 0.00990	O	Na	< 0.02803	M	Yb	< 0.00198
O	Cr	< 0.00881	O	Fe	0.00344	O	P	< 0.01922	M	Sr	< 0.00099	O	Y	< 0.00401
M	Co	< 0.00594	M	La	< 0.00099	M	Pt	< 0.00396	O	S	< 0.28033	O	Zn	< 0.04005
M	Cu	< 0.01188	M	Pb	< 0.00594	O	K	< 0.00681	M	Ta	< 0.01386	s	Zr	

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL 010305

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 91.224; +4; 6,7,8; $Zr(F)_6^{-2}$

Chemical Compatibility - Soluble in concentrated HCl, HF, H_2SO_4 (very hot) and HNO_3. Avoid H_3PO_4 and neutral to basic media. Unstable at ppm levels with metals that would pull F^- away (i.e. Do not mix with Alkaline or Rare Earths or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions but precipitation with phosphate, oxalate, and tartrate with a tendency to hydrolyze forming the hydrated oxide in all dilute acids except HF .

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the $Zr(F)_6^{-2}$ + $Zr(OH)_4F_2^{-2}$ for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $Zr(F)_6^{-2}$ chemically stable for years in 2-5% HNO_3 / trace HF in an LDPE container.

Zr Containing Samples (Preparation and Solution) - Metal (Soluble in H_2O / HF / HNO_3); Oxide - unlike TiO_2 the ZrO_2 is best fused in one of the following ways (Na_2O_2 in Ni*, Na_2CO_3 in Pt* or Borax in Pt*); Organic Matrices (Dry ash at 450 °C in Pt* and dissolve by fusing with Na_2CO_3 and dissolving in HF / HNO_3 / H_2O).

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 ≤10ppm.)
ICP-OES	343.823 nm	0.007 / 0.0004 µg/mL	1	ion	Hf, Nb
ICP-OES	339.198 nm	0.008 / 0.0007 µg/mL	1	ion	Th, Mo
ICP-OES	272.261 nm	0.018 / 0.001 µg/mL	1	ion	Cr, V, Th, W
ICP-MS	90 amu	2 ppt	n/a	M+	$^{74}Ge^{16}O$, $^{74}Se^{16}O$, [$^{180}X^{+2}$ (where X = Hf, Ta, W)]

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey 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)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005
DATE OPENED: 02/25/04
INORG: 4474 PO: F52323

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010306

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: March 19, 2003

Expiration Date:

EXPIRES
1/2/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010307

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040304-12
SRR: 25612
SDG: 241722
CASE: CNWRA
VTSR: March 04, 2004
PROJECT#: 06002.01.081

Pipette Calibrations

Book/Page: 03 025

SwRI – Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

(Space provide for Inorganic Laboratories' Fixed Volume Pipette Verification Spreadsheet)

3-1-04

010308

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	1.0015	1.0082	1.0076	1.01	100.58
TMA1	1000	1.0096	1.0048	1.0072	1.01	100.72
TMA2	1000	1.0073	1.0158	1.0162	1.01	101.31
TMA3	1000	OUT	OF	SERVICE		
TMA6	1000	1.0119	1.0067	1.0050	1.01	100.79
TMB1	900	0.9021	0.9036	0.9068	0.90	100.46
TMC1	800	0.7961	0.7956	0.7989	0.80	99.61
TMDD1	750	0.7613	0.7498	0.7500	0.75	100.49
TMD1	700	0.7065	0.7011	0.7001	0.70	100.37
TMD2	700	0.7035	0.7091	0.7058	0.71	100.88
TME1	600	0.6019	0.6009	0.6004	0.60	100.18
TMF2	500	0.5047	0.5023	0.5028	0.50	100.65
TMF5	500	0.5005	0.4999	0.5009	0.50	100.09
ICF1	500	0.5054	0.5048	0.5056	0.51	101.05
L30-500	500	0.5068	0.5100	0.5074	0.51	101.61
TMG3	400	0.3983	0.3958	0.3967	0.40	99.23
TMH1	300	OYT	OF	SERVICE		
TMH2	300	0.3033	0.2986	0.3038	0.30	100.63
TMJ1	250	0.2503	0.2499	0.2504	0.25	100.08
TMJ2	250	0.2515	0.2520	0.2502	0.25	100.49
TMJ3	250	0.2523	0.2538	0.2536	0.25	101.29
TMK2	200	0.2022	0.2031	0.2006	0.20	100.98
TML1	150	0.1509	0.1501	0.1503	0.15	100.29
TMM1	120	0.1216	0.1221	0.1218	0.12	101.53
TMN3	100	0.0998	0.1013	0.1005	0.10	100.53
ICN1	100	0.0990	0.1002	0.1004	0.10	99.87
TMQ1	80	0.0799	0.0800	0.0801	0.08	100.00
TMR1	70	OUT	OF	SERVICE		
TMS1	60	OUT	OF	SERVICE		
LAB-30A	50	NOT	FOUND			
TMU1	40	0.0401	0.0397	0.0399	0.04	99.75
TMU2	40	0.0398	0.0401	0.0399	0.04	99.83
TMV1	30	0.0300	0.0301	0.0302	0.03	100.33
L30-20	20	0.0201	0.0200	0.0201	0.02	100.33
TMW1	25	0.0250	0.0248	0.0248	0.02	99.47
TMY1	15	OUT	OF	SERVICE		

Book/Page 03 026

SwRI - Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (°C): 20 10309

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
Lab30	1000	1.0115	1.0082	1.0076
TMA1	1000	1.0096	1.0048	1.0072
TMA2	1000	1.0073	1.0158	1.0162
TMA3	1000	OUT	OF	Service
TMA6	1000	1.0119	1.0067	1.0050
TMB1	900	.9021	.9036	.9068
TMC1	800 3-1-04 x3	~~.0799~~ .7961	.7956 ~~.0800~~	.7989 ~~.0801~~
TMDD1	750	.7613	.7498	.7500
TMD1	700	.7065	.7011	.7001
TMD2	700	.7035	.7091	.7058
TME1	600	.6019	.6009	.6004
TMF2	500	.5047	.5023	.5028
TMF5	500	.5005	.4999	.5009
ICF1	500	.5054	.5048	.5056
L30-500	500	.5068	.5100	.5074
TMG3	400	.3983	.3958	.3967
TMH1	300 3-1-04	~~.32~~ OUT	OF	Service
TMH2	300	.3033	.2986	.3038
TMJ1	250	.2503	.2499	.2504
TMJ2	250	.2515	.2520	.2502
TMJ3	250	.2523	.2538	.2536
TMK2	200	.2022	.2031	.2006
TML1	150	.1509	.1501	.1503
TMM1	120	.1216	.1221	.1218
TMN3	100	.0998	.1013	.1005
ICN1	100	.0990	.1002	.1004
TMQ1	80	.0799	.0800	.0801
TMR1	70	OUT	OF	Service
TMS1	60	OUT	OF	Service
LAB-30A	50	NOT	FOUND	
TMU1	40	.0401	.0397	.0399
TMU2	40	.0398	.0401	.0399
TMV1	30	.0300	.0301	.0302
L30-20	20	.0201	.0200	.0201
TMW1	25	.0250	.0248	.0248
TMY1	15	OUT	OF	Service

Analyst: John Wille Date: 3-01-04

Reviewed by: Valerie [illegible] Date: 04/12/04

FRM-243b (Rev 3/Mar 03)

Book/page: 05 035

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

3-5-04

010310

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	0.0204	0.0204	0.0200	0.020	101.33
ADJ200-A	100	0.0993	0.1000	0.0994	0.100	99.57
	200	0.1991	0.1995	0.1992	0.199	99.63
	20	0.0202	0.0200	0.0202	0.020	100.67
ADJ200-C	100	0.0988	0.0987	0.0999	0.099	99.13
	200	0.1982	0.1984	0.1981	0.198	99.12
	20	0.0204	0.0203	0.0203	0.020	101.67
ADJ200-D	100	0.0992	0.0993	0.0991	0.099	99.20
	200	0.1989	0.1987	0.1993	0.199	99.48
	20					
ADJ200-G	100					
	200					
	20					
ADJ200-H	100					
	200					
	20					
ADJ200-J	100					
	200					
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					
	20	0.0201	0.0203	0.0200	0.020	100.67
ADJ200K	100	0.0992	0.0990	0.0991	0.099	99.10
	200	0.1998	0.2001	0.1993	0.200	99.87

FRM-247a (Rev 3/Oct 03)

Book/page: 05 036

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010311

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

20 µL – 200 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	20	.0204	.0204	.0200
ADJ200-A	100	.0993	.1000	.0994
	200	.1991	.1995	.1992
	20	.0202	.0200	.0202
ADJ200-C	100	.0988	.0987	.0999
	200	.1982	.1984	.1981
	20	.0204	.0203	.0203
ADJ200-D	100	.0992	.0993	.0991
	200	.1989	.1987	.1993
	20			
ADJ200-G	100			
	200			
	20			
ADJ200-H	100			
	200			
	20			
ADJ200-J	100			
	200			
	20			
ADJ200	100			
	200			
	20	.0201	.0203	.0200
ADJ200 K	100	.0992	.0990	.0991
JW 3-5-04	200	.1998	.2001	.1993

JW 3-5-04

Analyst: John Wilks Date: 3-5-04

Reviewed by: [signature] Date: 04/12/04

Book/page: 05 037

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010312

Michael Hardy 3/5/04

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				0.000	0.00
ADJ200-A	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-C	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-D	100				0.000	0.00
	200				0.000	0.00
	20	0.0202	0.0202	0.0205	0.020	101.50
ADJ200-G	100	0.0996	0.0991	0.0993	0.099	99.33
	200	0.1995	0.1992	0.1997	0.199	99.73
	20	0.0203	0.0204	0.0203	0.020	101.67
ADJ200-H	100	0.0993	0.0994	0.0994	0.099	99.37
	200	0.1991	0.1991	0.1992	0.199	99.57
	20	0.0201	0.0203	0.0199	0.020	100.50
ADJ200-J	100	0.0997	0.1004	0.1001	0.100	100.07
	200	0.1993	0.1991	0.1999	0.199	99.72
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00

FRM-247a (Rev 3/Oct 03)

Book/page: 05 038

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010313

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

20 µL – 200 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	20			
ADJ200-A	100			
	200			
	20			
ADJ200-C	100			
	200			
	20			
ADJ200-D	100			
	200			
	20	0.0202	0.0202	0.0205
ADJ200-G	100	0.0996	0.0991	0.0993
	200	0.1995	0.1992	0.1997
	20	0.0203	0.0204	0.0203
ADJ200-H	100	0.0993	0.0994	0.0994
	200	0.1991	0.1991	0.1992
	20	0.0201	0.0203	0.0199
ADJ200-J	100	0.0997	0.1004	0.1001
	200	0.1993	0.1991	0.1999
	20			
ADJ200	100			
	200			
	20			
ADJ200	100			
	200			

cb 3/5/04

cb 3/5/04

Analyst: [signature] Date: 3/5/04

Reviewed by: [signature] Date: ~~03~~ 04/12/04 VOS

Book/page: 05 047

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

3-26-04

010314

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	0.0200	0.0201	0.0203	0.020	100.67
ADJ200-A	100	0.0998	0.1000	0.0999	0.100	99.90
	200	0.2018	0.2012	0.2004	0.201	100.57
	20	0.0202	0.0201	0.0203	0.020	101.00
ADJ200-C	100	0.0987	0.1012	0.1000	0.100	99.97
	200	0.2006	0.2002	0.1994	0.200	100.03
	20	0.0202	0.0203	0.0201	0.020	101.00
ADJ200-D	100	0.0989	0.1003	0.0992	0.099	99.47
	200	0.1976	0.1981	0.1990	0.198	99.12
	20					
ADJ200-G	100					
	200					
	20					
ADJ200-H	100					
	200					
	20					
ADJ200-J	100					
	200					
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					
	20	0.0201	0.0201	0.0200	0.020	100.33
ADJ200-K	100	0.1008	0.1006	0.1010	0.101	100.80
	200	0.2004	0.1998	0.1998	0.200	100.00

FRM-247a (Rev 3/Oct 03)

Book/page: 05 048

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010315

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

20 µL – 200 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	20	.0200	.0201	.0203
ADJ200-A	100	.0998	.1000	.0999
	200	.2018	.2012	.2004
	20	.0202	.0201	.0203
ADJ200-C	100	.0987	.1012	.1000
	200	.2006	.2002	.1994
	20	.0202	.0203	.0201
ADJ200-D	100	.0989	.1003	.0992
	200	.1976	.1981	.1990
	20			
ADJ200-G	100			
	200			
	20			
ADJ200-H	100			
	200			
	20			
ADJ200-J	100			
	200			
	20			
ADJ200	100			
	200			
	20	.0201	.0201	.0200
ADJ200 – K	100	.1008	.1006	.1010
JW 3-26-04	200	.2004	.1998	.1998

JW 3-26-04

Analyst: John Wilke Date: 3-26-04

Reviewed by: Walter [illegible] Date: 04/12/04

Book/page: 05 049

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010316

3/26/04

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				0.000	0.00
ADJ200-A	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-C	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200-D	100				0.000	0.00
	200				0.000	0.00
	20	0.0204	0.0201	0.0202	0.020	101.17
ADJ200-G	100	0.0992	0.1007	0.0994	0.100	99.77
	200	0.1997	0.1986	0.1991	0.199	99.57
	20	0.0202	0.0202	0.0204	0.020	101.33
ADJ200-H	100	0.0996	0.0985	0.0990	0.099	99.03
	200	0.1999	0.1994	0.1992	0.200	99.75
	20	0.0201	0.0200	0.0202	0.020	100.50
ADJ200-J	100	0.0984	0.0988	0.0989	0.099	98.70
	200	0.1991	0.1982	0.1987	0.199	99.33
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00
	20				0.000	0.00
ADJ200	100				0.000	0.00
	200				0.000	0.00

FRM-247a (Rev 3/Oct 03)

Book/page: 05 050

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010317

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

20 µL – 200 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	20			
ADJ200-A	100			
	200			
	20			
ADJ200-C	100			
	200			
	20			
ADJ200-D	100			
	200			
	20	0.0204	0.0201	0.0202
ADJ200-G	100	0.0992	0.1007	0.0994
	200	0.1997	0.1986	0.1991
	20	0.0202	0.0202	0.0204
ADJ200-H	100	0.0996	0.0985	0.0990
	200	0.1999	0.1994	0.1992
	20	0.0201	0.0200	0.0202
ADJ200-J	100	0.0984	0.0988	0.0989
	200	0.1991	0.1982	0.1987
	20			
ADJ200	100			
	200			
	20			
ADJ200	100			
	200			

3/26/04

3/26/04

Analyst: [signature] Date: 3/26/04

Reviewed by: [signature] Date: 04/12/04

Book/page: 05 087

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

3-5-04

010318

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	0.1013	0.1014	0.1016	0.101	101.43
ADJ1000-C	500	0.4986	0.5002	0.4997	0.500	99.90
	1000	0.9921	0.9918	0.9931	0.992	99.23
	100	0.1019	0.1014	0.1017	0.102	101.67
ADJ1000-D	500	0.4953	0.4940	0.4938	0.494	98.87
	1000	1.0000	0.9993	0.9959	0.998	99.84
	100	0.0991	0.1001	0.1001	0.100	99.77
ADJ1000-E	500	0.4970	0.4975	0.4973	0.497	99.45
	1000	1.0023	1.0026	0.9989	1.001	100.13
	100	0.0989	0.0998	0.0994	0.099	99.37
ADJ1000-F	500	0.4952	0.4959	0.4953	0.495	99.09
	1000	0.9912	0.9982	0.9959	0.995	99.51
	100					
ADJ1000-G	500					
	1000					
	100					
ADJ1000-H	500					
	1000					
	100					
ADJ1000-J	500					
	1000					
	100					
ADJ1000	500					
	1000					
	100	0.1018	0.1014	0.1015	0.102	101.57
ADJ1000K	500	0.5042	0.5036	0.5048	0.504	100.84
	1000	0.9999	1.0002	0.9991	1.000	99.97

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Book/page: 05 088

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

010319

Balance #: 34 Thermometer #: GO 11 diH20 Temperature (° C) 21

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100	.1013	.1014	.1016
ADJ1000-C	500	.4986	.5002	.4997
	1000	.9921	.9918	.9931
	100	.1019	.1014	.1017
ADJ1000-D	500	.4953	.4940	.4938
	1000	1.0000	.9993	.9959
	100	.0991	.1001	.1001
ADJ1000-E	500	.4970	.4975	.4973
	1000	1.0023	1.0026	.9989
	100	.0989	.0998	.0994
ADJ1000-F	500	.4952	.4959	.4953
	1000	.9912	.9982	.9959
	100			
ADJ1000-G	500			
	1000			
	100			
ADJ1000-H	500			
	1000			
	100			
ADJ1000-J	500			
	1000			
	100			
ADJ1000	500			
	1000			
	100	.1018	.1014	.1015
ADJ1000 K	500	.5042	.5036	.5048
Jeo 3-5-04	1000	.9999	1.0002	.9991

Jeo 3-5-04

Analyst: John Wills Date: 3-5-04

Reviewed by: Nadeen Alger Date: 04/12/04

Book/page: 05 089

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010320

3/5/04

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	0.0999	0.0997	0.1000	0.100	99.87
ADJ1000-G	500	0.4970	0.4982	0.5011	0.499	99.75
	1000	0.9909	0.9924	0.9912	0.992	99.15
	100	0.0998	0.0998	0.1001	0.100	99.90
ADJ1000-H	500	0.4931	0.4938	0.4941	0.494	98.73
	1000	0.9894	0.9889	0.9885	0.989	98.89
	100	0.0995	0.1013	0.0998	0.100	100.20
ADJ1000-J	500	0.4957	0.4956	0.4962	0.496	99.17
	1000	0.9927	0.9947	0.9940	0.994	99.38
	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

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Book/page: 05 090

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010321

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100			
ADJ1000-C	500			
	1000			
	100			
ADJ1000-D	500			
	1000			
	100			
ADJ1000-E	500			
	1000			
	100			
ADJ1000-F	500			
	1000			
	100	0.0999	0.0997	0.1000
ADJ1000-G	500	0.4970	0.4982	0.5011
	1000	0.9909	0.9924	0.9912
	100	0.0998	0.0998	0.1001
ADJ1000-H	500	0.4931	0.4938	0.4941
	1000	0.9894	0.9889	0.9885
	100	0.0995	0.1013	0.0998
ADJ1000-J	500	0.4957	0.4956	0.4962
	1000	0.9927	0.9947	0.9940
	100			
ADJ1000	500			
	1000			
	100			
ADJ1000	500			
	1000			

cb 3/5/04

Analyst: [signature] Date: 3/5/04

Reviewed by: [signature] Date: 04/12/04

Book/page: 05 099

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010322

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	0.1019	0.1016	0.1020	0.102	101.83
ADJ1000-C	500	0.4996	0.4975	0.4980	0.498	99.67
	1000	0.9930	1.0039	0.9991	0.999	99.87
	100	0.1018	0.1020	0.1011	0.102	101.63
ADJ1000-D	500	0.5010	0.5024	0.4989	0.501	100.15
	1000	1.0007	1.0007	0.9998	1.000	100.04
	100	0.1002	0.1016	0.1010	0.101	100.93
ADJ1000-E	500	0.4926	0.4955	0.4966	0.495	98.98
	1000	1.0020	0.9986	1.0033	1.001	100.13
	100	0.1018	0.1008	0.1004	0.101	101.00
ADJ1000-F	500	0.5027	0.5018	0.4979	0.501	100.16
	1000	1.0020	1.0006	1.0001	1.001	100.09
	100					
ADJ1000-G	500					
	1000					
	100					
ADJ1000-H	500					
	1000					
	100					
ADJ1000-J	500					
	1000					
	100					
ADJ1000	500					
	1000					
	100	0.0999	0.1004	0.1001	0.100	100.13
ADJ1000-K	500	0.4999	0.4992	0.5003	0.500	99.96
	1000	1.0010	1.0003	0.9996	1.000	100.03

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Book/page: 05 100

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010323

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100	.1019	.1016	.1020
ADJ1000-C	500	.4996	.4975	.4980
	1000	.9930	1.0039	.9991
	100	.1018	.1020	.1011
ADJ1000-D	500	.5010	.5024	.4989
	1000	1.0007	1.0007	.9998
	100	.1002	.1016	.1010
ADJ1000-E	500	.4926	.4955	.4966
	1000	1.0020	.9986	1.0033
	100	.1018	.1008	.1004
ADJ1000-F	500	.5027	.5018	.4979
	1000	1.0020	1.0006	1.0001
	100			
ADJ1000-G	500			
	1000			
	100			
ADJ1000-H	500			
	1000			
	100			
ADJ1000-J	500			
	1000			
	100			
ADJ1000	500			
	1000			
	100	.0999	.1004	.1001
ADJ1000-K	500	.4999	.4992	.5003
JW 3-26-04	1000	1.0010	1.0003	.9996

JW 3-26-04

Analyst: [signature] Date: 3-26-04

Reviewed by: [signature] Date: 04/12/04

Book/page: 05 101

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010324

3/26/04

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	0.1012	0.0994	0.1006	0.100	100.40
ADJ1000-G	500	0.4935	0.4962	0.4951	0.495	98.99
	1000	0.9822	0.9831	0.9817	0.982	98.23
	100	0.1014	0.1019	0.1010	0.101	101.43
ADJ1000-H	500	0.4981	0.4969	0.4975	0.498	99.50
	1000	0.9926	0.9931	0.9896	0.992	99.18
	100	0.1019	0.1015	0.1023	0.102	101.90
ADJ1000-J	500	0.5010	0.4992	0.5013	0.501	100.10
	1000	0.9947	0.9886	0.9972	0.994	99.35
	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

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010325

Book/page: 05 102

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100			
ADJ1000-C	500			
	1000			
	100			
ADJ1000-D	500			
	1000			
	100			
ADJ1000-E	500			
	1000			
	100			
ADJ1000-F	500			
	1000			
	100	0.1012	0.0994	0.1006
ADJ1000-G	500	0.4935	0.4962	0.4951
	1000	0.9822	0.9831	0.9817
	100	0.1014	0.1019	0.1010
ADJ1000-H	500	0.4981	0.4969	0.4975
	1000	0.9926	0.9931	0.9896
	100	0.1019	0.1015	0.1023
ADJ1000-J	500	0.5010	0.4992	0.5013
	1000	0.9947	0.9886	0.9972
	100			
ADJ1000	500			
	1000			
	100			
ADJ1000	500			
	1000			

3/26/04

3/26/04

Analyst: [signature] Date: 3/26/04

Reviewed by: [signature] Date: 04/12/04

Book/page: 05 141

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

3-5-04

010326

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	0.5066	0.5078	0.5093	0.508	101.58
ADJ5000-C	2500	2.5041	2.4962	2.4995	2.500	100.00
	5000	5.0276	5.0069	5.0109	5.015	100.30
	500					
ADJ5000-G	2500	OUT	OF	SERVICE		
	5000					
	500					
ADJ5000-H	2500	OUT	OF	SERVICE		
	5000					
	500	0.4925	0.4968	0.4952	0.495	98.97
ADJ5000-I	2500	2.5110	2.5060	2.5091	2.509	100.35
	5000	5.0202	5.0298	5.0014	5.017	100.34
	500					
ADJ5000-J	2500					
	5000					
	500					
ADJ5000-K	2500					
	5000					
	500					
ADJ5000-L	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500	0.4988	0.4992	0.4990	0.499	99.80
ADJ5000M	2500	2.4953	2.4961	2.4948	2.495	99.82
	5000	5.0110	5.0063	5.0020	5.006	100.13

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010327

Book/page: 05 142

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: GO 11 diH20 Temperature (° C) 21

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500	.5066	.5078	.5093
ADJ5000-C	2500	2.5041	2.4962	2.4995
	5000	5.0276	5.0069	5.0109
	500			
ADJ5000-G	2500	OUT	OF	SERVICE
	5000			
	500			
ADJ5000-H	2500	OUT	OF	SERVICE
	5000			
	500	.4925	.4968	.4952
ADJ5000-I	2500	2.5110	2.5060	2.5091
	5000	5.0202	5.0298	5.0014
	500			
ADJ5000-J	2500			
	5000			
	500			
ADJ5000-K	2500			
	5000			
	500			
ADJ5000-L	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500	.4988	.4992	.4990
ADJ5000 M	2500	2.4953	2.4961	2.4948
	5000	5.0110	5.0063	5.0020

JW 3-5-04

Analyst: John Wilke Date: 3-5-04

Reviewed by: Valer [illegible] Date: 04/12/04

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Book/page: 05 143

010328

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

3/5/04

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	0.4981	0.4994	0.5003	0.499	99.85
ADJ5000-J	2500	2.4986	2.5023	2.5025	2.501	100.05
	5000	5.0087	5.0120	5.0096	5.010	100.20
	500	0.4994	0.5002	0.5026	0.501	100.15
ADJ5000-K	2500	2.5016	2.5034	2.5038	2.503	100.12
	5000	5.0249	5.0206	5.0179	5.021	100.42
	500	0.5003	0.4980	0.4997	0.499	99.87
ADJ5000-L	2500	2.4970	2.5020	2.4990	2.499	99.97
	5000	5.0096	5.0062	5.0073	5.008	100.15
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00

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Book/page: 05 144

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G011. diH20 Temperature (° C) 21

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500			
ADJ5000-C	2500			
	5000			
	500			
ADJ5000-G	2500			
	5000			
	500			
ADJ5000-H	2500			
	5000			
	500			
ADJ5000-I	2500			
	5000			
	500	0.4981	0.4994	0.5003
ADJ5000-J	2500	2.4986	2.5023	2.5025
	5000	5.0087	5.0120	5.0096
	500	0.4994	0.5002	0.5026
ADJ5000-K	2500	2.5016	2.5034	2.5038
	5000	5.0249	5.0206	5.0179
	500	0.5003	0.4980	0.4997
ADJ5000-L	2500	2.4970	2.5020	2.4990
	5000	5.0096	5.0062	5.0073
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

3/5/04

3/5/04

Analyst: [signature] Date: 3/5/04

Reviewed by: [signature] Date: 04/12/04

Book/page: 05 153

010330

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

3-26-04

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	0.5084	0.5072	0.5048	0.507	101.36
ADJ5000-C	2500	2.4973	2.5013	2.4980	2.499	99.95
	5000	5.0248	5.0440	5.0560	5.042	100.83
	500					
ADJ5000-G	2500	OUT	OF	SERVICE		
	5000					
	500					
ADJ5000-H	2500	OUT	OF	SERVICE		
	5000					
	500	0.4955	0.4961	0.4948	0.495	99.09
ADJ5000-I	2500	2.5020	2.4994	2.4991	2.500	100.01
	5000	4.9938	4.9941	4.9948	4.994	99.88
	500					
ADJ5000-J	2500					
	5000					
	500					
ADJ5000-K	2500					
	5000					
	500					
ADJ5000-L	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500	0.4993	0.4994	0.5012	0.500	99.99
ADJ5000-M	2500	2.5018	2.4996	2.4987	2.500	100.00
	5000	5.0040	5.0038	5.0056	5.004	100.09

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010331

Book/page: 05 154

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: GOW diH20 Temperature (° C) 21

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500	.5084	.5072	.5048
ADJ5000-C	2500	2.4973	2.5013	2.4980
	5000	5.0248	5.0440	5.0560
	500			
ADJ5000-G	2500	OUT	OF	SERVICE
	5000			
	500			
ADJ5000-H	2500	OUT	OF	SERVICE
	5000			
	500	.4955	.4961	.4948
ADJ5000-I	2500	2.5020	2.4994	2.4991
	5000	4.9938	4.9941	4.9948
	500			
ADJ5000-J	2500			
	5000			
	500			
ADJ5000-K	2500			
	5000			
	500			
ADJ5000-L	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500	.4993	.4994	.5012
ADJ5000-M	2500	2.5018	2.4996	2.4987
3-26-04 JED	5000	5.0040	5.0038	5.0056

JW 3-26-04

Analyst: John Wilder Date: 3-26-04

Reviewed by: [signature] Date: 04/12/04

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Book/page: 05 155

010332

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

Michael Henry 3/26/04

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	0.5041	0.5029	0.5036	0.504	100.71
ADJ5000-J	2500	2.5014	2.5027	2.5080	2.504	100.16
	5000	5.0162	5.0089	5.0072	5.011	100.22
	500	0.5074	0.5068	0.5091	0.508	101.55
ADJ5000-K	2500	2.5024	2.4983	2.4991	2.500	100.00
	5000	5.0032	5.0064	5.0116	5.007	100.14
	500	0.5047	0.5030	0.5019	0.503	100.64
ADJ5000-L	2500	2.4973	2.4961	2.4985	2.497	99.89
	5000	5.0637	5.0583	5.0222	5.048	100.96
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00

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010333

Book/page: 05 156

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G011. diH20 Temperature (° C) 21

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500			
ADJ5000-C	2500			
	5000			
	500			
ADJ5000-G	2500			
	5000			
	500			
ADJ5000-H	2500			
	5000			
	500			
ADJ5000-I	2500			
	5000			
	500	0.5041	0.5089	0.5036
ADJ5000-J	2500	2.5014	2.5027	2.5080
	5000	5.0162	5.0089	5.0072
	500	0.5074	0.5068	0.5091
ADJ5000-K	2500	2.5024	2.4983	2.4991
	5000	5.0032	5.0064	5.0116
	500	0.5047	0.5030	0.5019
ADJ5000-L	2500	2.4973	2.4961	2.4985
	5000	5.0637	5.0583	5.0222
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

Nr 3/26/04

Nr 3/26/04

Analyst: [signature] Date: 3/26/04

Reviewed by: [signature] Date: 04/12/04

010334

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040304-12
SRR: 25612
SDG: 241722
CASE: CNWRA
VTSR: March 04, 2004
PROJECT#: 06002.01.081

Balance Calibrations

Southwest Research Institute
Division 01
BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
16	28	P37987	±0.0005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
3-8-04	2.0000	1.9999	KE	SN: J50526-15
3-9-04	2.0000	2.0000	KE	"
3-10-04	1.9999	2.0000	[illegible]	"
3-11-04	2.0000	2.0001	[illegible]	"
3-12-04	2.0000	1.9999	KE	"
3-13-04	2.0000	2.0000	KE	"
3-15-04	2.0000	2.0000	KE	"
3-16-04	2.0000	2.0000	[illegible]	"
3-17-04	2.0000	2.0000	[illegible]	"
3-18-04	2.0000	1.9999	KE	"

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 (x5896) for service.

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Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
16	28	P37987	±0.0005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
3/19/04	2.0000	2.0000	KE	SN: J50526-15
3-22-04	2.0000	2.0000	KE	"
3-23-04	2.0000	1.9999	KE	"
3-24-04	2.0000	2.0000	JW	"
3-25-04	2.0000	2.0000	KE	"
3-26-04	2.0000	2.0000	KE	"
3-29-04	2.0000	1.9999	KE	"
3-30-04	2.0000	2.0001	KE	"
3-31-04	2.0000	2.0000	KE	"
*3-31-04	Balance moved to Lab 31 for SWF project.			

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 (x5896) for service.

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Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
19	27	0068597	±0.05	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
3-8-04	10.00	9.99	KE	SN: J50624-5
3-9-04	10.00	10.00	KE	"
3-10-04	10.00	10.00	Jew	"
3-11-04	10.00	10.00	Jew	"
3-12-04	10.00	10.00	KE	"
3-13-04	10.00	10.00	KE	"
3-15-04	10.00	10.00	KE	"
3-16-04	10.00	10.00	Jew	"
3-17-04	10.00	9.99	Jew	"
3-18-04	10.00	10.00	KE	"

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 (x5896) for service.

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Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
19	27	0068597	±0.05	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
3-19-04	KE ~~2~~ 10.00	10.00	KE	SN: J50624-5
3-22-04	10.00	10.00	KE	"
3-23-04	10.00	10.00	KE	"
3-24-04	10.00	10.00	JW	"
3-25-04	10.00	10.00	KE	"
3-26-04	10.00	10.00	KE	"
3-29-04	10.00	10.00	KE	"
3-30-04	10.00	10.00	KE	"
3-30-04	100.	100.07	T.O.B	SN: 99-J50031-1
3-31-04	10.00	10.00	KE	SN: J50624-5

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 (x5896) for service.

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Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
34	28	1116031935	±0.0005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
3-3-04	2.0000	2.0000	KE	SN: J50526-15
3-4-04	2.0000	2.0000	KE	"
3-5-04	2.0000	2.0000	JW	"
3-8-04	2.0000	1.9999	KE	"
3-9-04	2.0000	2.0000	KE	"
3-10-04	2.0000	2.0000	JW	"
3-11-04	2.0000	2.0000	JW	"
3-12-04	2.0000	2.0000	KE	"
3-13-04	2.0000	1.9999	KE	"
3-15-04	2.0000	2.0000	KE	"

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 (x5896) for service.

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Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
34	28	1116031935	±0.0005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
3-16-04	2.0000	2.0000	Jew	SN: J50526-15
3-17-04	2.0000	2.0000	Jew	"
3-18-04	2.0000	2.0000	KE	"
3-19-04	2.0000	2.0000	KE	"
3-22-04	2.0000	2.0000	KE	"
3-23-04	2.0000	2.0000	KE	"
3-24-04	2.0000	1.9999	Jew	"
3-25-04	2.0000	2.0000	KE	"
3-26-04	2.0000	2.0000	KE	"
3-27-04	10.0000	10.0001	RCH	SN:99-J50 24-5

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights. KE 3/30/04
If balance is still out of limits, place a "DO NOT USE" sign on it and call (x5896) for service.

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Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
34	28	1116031935	±0.0005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
3-29-04	2.0000	1.9999	KE	SN: J505 26-15
3-30-04	2.0000	2.0000	KE	"
3-31-04	2.0000	2.0000	KE	"
4-1-04	2.0000	2.0000	KE	"
4-2-04	2.0000	2.0000	KE	"
4-3-04	2.0000	2.0000	[illegible]	"
4-5-04	2.0000	2.0000	KE	"
4-6-04	2.0000	2.0000	KE	"
4-7-04	2.0000	2.0000	KE	"
4-8-04	2.0000	2.0001	[illegible]	"

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 (x5896) for service.

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SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040304-12
SRR: 25612
SDG: 241722
CASE: CNWRA
VTSR: March 04, 2004
PROJECT#: 06002.01.081

DI Water Verification

D.I. WATER SYSTEM NOTEBOOK
SOUTHWEST RESEARCH INSTITUTE
BUILDING 70

C40002

Contact U.S. Filter (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

010343

HIGH PURITY SYSTEM (HP)

DATE / TIME	INITIALS	RESISTIVITY MONITOR (M OHMS)	RESISTIVITY MONITOR QC LT.	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
02/24/04 7:24pm	DR	✓	✓	✓	✓	660.9	tank xchange, all ok.
02/25/04 6:53pm	DR	✓	✓	✓	✓	667.4	—
02/26/04 7:53pm	DR	✓	✓	✓	✓	676.5	—
02/27/04 7:42pm	DR	✓	✓	✓	✓	686.1	—
03/1/04 5:55pm	DR	✓	✓	✓	✓	698.4	—
3/2/04 5:30pm	DR	✓	✓	✓	✓	708.9	—
3/3/04 6:00pm	DR	✓	✓	✓	✓	719.9	—
3/4/04 9:32pm	DR	✓	✓	✓	✓	735.4	—
3/5/04 6:21pm	DR	✓	✓	✓	✓	744.1	—
3/8/04 6:13pm	DR	✓	✓	✓	✓	762.0	—
3/9/04 5:03pm	DR	✓	✓	✓	✓	770.9	—
3/10/04 5:49pm	DR	✓	✓	✓	✓	790.7	—
3/11/04 6:26pm	DR	✓	✓	✓	✓	798.8	—
3/12/04 4:55pm	DR	✓	✓	✓	✓	813.9	—
3/13/04 10:54pm	DR	✓	✓	✓	✓	831.8	—
3/16/04 7:25pm	DR	✓	✓	✓	✓	845.7	—

Legend: Check = Green (OK); X = Red (call for service)

LOW PURITY SYSTEM (LP)

DATE / TIME	INITIALS	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
02/24/04 7:25pm	DR	X	✓	604.6	tank xchange. need to bleed to check QC1
02/25/04 6:53pm	DR	✓	✓	620.2	All ok.
02/26/04 7:54pm	DR	✓	✓	627.4	—
02/27/04 7:49pm	DR	✓	✓	631.2	—
3/1/04 5:56pm	DR	✓	✓	647.5	—
3/2/04 5:51pm	DR	✓	✓	661.0	—
3/3/04 6:01pm	DR	✓	✓	676.0	—
3/4/04 9:33pm	DR	✓	✓	694.4	—
3/5/04 6:21pm	DR	✓	✓	700.5	—
3/8/04 6:14pm	DR	✓	✓	703.3	—
3/9/04 5:04pm	DR	✓	✓	705.2	—
3/10/04 5:50pm	DR	✓	✓	707.9	—
3/11/04 6:29pm	DR	✓	✓	708.7	—
3/12/04 4:56pm	DR	✓	✓	714.2	—
3/15/04 10:55pm	DR	✓	✓	715.4	—
3/16/04 7:26pm	DR	✓	✓	718.9	—

Legend: Check = Green (OK); X = Red (call for service)

D.I. WATER SYSTEM NOTEBOOK
SOUTHWEST RESEARCH INSTITUTE
BUILDING 70

040003

Contact U.S. Filter (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

010344

HIGH PURITY SYSTEM (HP)

DATE / TIME	INITIALS	RESISTIVITY MONITOR (M OHMS)	RESISTIVITY MONITOR QC LT.	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
3/17/04 6:50pm	DR	18 ✓	✓	✓	✓	859.1	—
3/18/04 8:36pm	DR	✓	✓	✓	✓	871.8	—
3/19/04 6:04pm	DR	✓	✓	✓	✓	892.6	—
3/22/04 7:07pm	DR	✓	✓	✓	✓	907.1	—
3/23/04 6:25pm	DR	✓	✓	✓	✓	940.5	Dan's B-Day!!
3/24/04 10:06pm	DR	✓	✓	✓	✓	958.3	—
3/25/04 6:25pm	DR	✓	✓	✓	✓	992.0	—
3/26/04 7pm	DR	✓	✓	✓	✓	1013.6	—
3/29/04 6:37pm	DR	✓	✓	✓	✓	1030.0	—
3/30/04 7:07pm	DR	✓	✓	✓	✓	1059.9	—
3/31/04 8pm	DR	✓	✓	✓	✓	1077.3	—
4/1/04 7:20pm	DR	✓	✓	✓	✓	1097.4	—
4/2/04 2pm	DR	✓	✓	✓	✓	1099.7	—
4/6/04 5:50pm	DR	✓	✓	✓	✓	1164.1	DR out 4/5/04
4/7/04 6:08pm	DR	✓	✓	✓	✓	1174.7	—
4/8/04 6:20pm	DR	✓	✓	✓	✓	1216.7	—

Legend: Check = Green (OK); X = Red (call for service)

LOW PURITY SYSTEM (LP)

DATE / TIME	INITIALS	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
3/17/04 6:50pm	DR	✓	✓	728.1	—
3/18/04 8:37pm	DR	✓	✓	747.2	—
3/19/04 6:04pm	DR	✓	✓	753.6	—
3/22/04 7:08pm	DR	✓	✓	762.2	—
3/23/04 6:26pm	DR	✓	✓	768.2	hurray for Dan!
3/24/04 10:07pm	DR	✓	✓	794.8	—
3/25/04 6:26pm	DR	✓	✓	818.5	—
3/26/04 7:01pm	DR	✓	✓	825.4	—
3/29/04 6:38pm	DR	✓	✓	828.5	—
3/30/04 7:08pm	DR	✓	✓	830.7	—
3/31/04 8:01pm	DR	✓	✓	840.8	—
4/1/04 7:21pm	DR	✓	✓	844.5	—
4/2/04 2:01pm	DR	✓	✓	845.4	—
4/6/04 5:51pm	DR	✓	✓	850.2	—
4/7/04 6:09pm	DR	✓	✓	850.7	—
4/8/04 6:20pm	DR	✓	✓	851.4	—

Legend: Check = Green (OK); X = Red (call for service)