SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030930-7
SRR: 25032
SDG: 235410
CASE: CNWRA
VTSR: September 30, 2003
PROJECT#: 06002.01.081

FINAL REPORT

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010001

Sample ID
PT 7 - Container 1

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 09/30/03

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 030930-7

SRR: 25032

Lab System ID: 235410

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Cobalt	<0.167	0.167
Chromium	<0.167	0.167
Iron	<1.67	1.67
Potassium	489	3.33
Molybdenum	<0.333	0.333
Sodium	<1.67	1.67
Nickel	<0.167	0.167
Tungsten	<0.333	0.333

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SOUTHWEST RESEARCH INSTITUTE

DUPLICATE SUMMARY

Sample ID 010002

PT 7 - Container 1

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 09/30/03

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 030930-7

SRR: 25032

Lab System ID: 235410

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Cobalt	<0.167	<0.167	0.00%
Chromium	<0.167	<0.167	0.00%
Iron	<1.67	<1.67	0.00%
Potassium	489	488	0.20%
Molybdenum	<0.333	<0.333	0.00%
Sodium	<1.67	<1.67	0.00%
Nickel	<0.167	<0.167	0.00%
Tungsten	<0.333	<0.333	0.00%

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010003

Sample ID
PT 7 - Container 2

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Liquid

Task Order: 030930-7

Lab System ID: 235410

Client: Division 20

Date Received: 09/30/03

Project No.: 20.06002.01.081

SRR: 25032

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Cobalt	<0.167	0.167
Chromium	<0.167	0.167
Iron	<1.67	1.67
Potassium	484	3.33
Molybdenum	<0.333	0.333
Sodium	1.71	1.67
Nickel	<0.167	0.167
Tungsten	<0.333	0.333

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010004

Sample ID
PT 8 - Container 1

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 09/30/03

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 030930-7

SRR: 25032

Lab System ID: 235411

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Cobalt	<0.167	0.167
Chromium	<0.167	0.167
Iron	<1.67	1.67
Potassium	584	3.33
Molybdenum	<0.333	0.333
Sodium	36.8	1.67
Nickel	<0.167	0.167
Tungsten	<0.333	0.333

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SOUTHWEST RESEARCH INSTITUTE

MATRIX SPIKE SUMMARY

010005

Sample ID
PT 8 - Container 1

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 09/30/03

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 030930-7

SRR: 25032

Lab System ID: 235411

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Cobalt	<0.167	17.0	16.7	102%
Chromium	<0.167	6.91	6.70	103%
Iron	<1.67	34.5	33.3	104%
Potassium	584	1315	666	110%
Molybdenum	<0.333	139	133	105%
Sodium	36.8	645	666	91.3%
Nickel	<0.167	17.3	16.7	104%
Tungsten	<0.333	139	133	105%

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010006

Sample ID
PT 8 - Container 2

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 09/30/03

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 030930-7

SRR: 25032

Lab System ID: 235411

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Cobalt	<0.167	0.167
Chromium	<0.167	0.167
Iron	<1.67	1.67
Potassium	561	3.33
Molybdenum	<0.333	0.333
Sodium	37.2	1.67
Nickel	<0.167	0.167
Tungsten	<0.333	0.333

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010007

Sample ID
W 7 - Container 1

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Liquid

Task Order: 030930-7

Lab System ID: 235412

Client: Division 20

Date Received: 09/30/03

Project No.: 20.06002.01.081

SRR: 25032

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Cobalt	<0.167	0.167
Chromium	<0.167	0.167
Iron	<1.67	1.67
Potassium	19364	20.0
Molybdenum	<0.333	0.333
Sodium	7.33	1.67
Nickel	0.385	0.167
Tungsten	<0.333	0.333

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010008

Sample ID
W 7 - Container 2

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Liquid

Task Order: 030930-7

Lab System ID: 235412

Client: Division 20

Date Received: 09/30/03

Project No.: 20.06002.01.081

SRR: 25032

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Cobalt	<0.167	0.167
Chromium	<0.167	0.167
Iron	<1.67	1.67
Potassium	19852	20.0
Molybdenum	<0.333	0.333
Sodium	7.01	1.67
Nickel	0.325	0.167
Tungsten	<0.333	0.333

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010009

Sample ID
W 8 - Container 1

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Liquid

Task Order: 030930-7

Lab System ID: 235413

Client: Division 20

Date Received: 09/30/03

Project No.: 20.06002.01.081

SRR: 25032

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Cobalt	<0.167	0.167
Chromium	<0.167	0.167
Iron	<1.67	1.67
Potassium	25795	20.0
Molybdenum	<0.333	0.333
Sodium	10.4	1.67
Nickel	0.175	0.167
Tungsten	<0.333	0.333

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

Sample ID: 010010

W 8 - Container 2

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 09/30/03

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 030930-7

SRR: 25032

Lab System ID: 235413

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Cobalt	<0.167	0.167
Chromium	<0.167	0.167
Iron	<1.67	1.67
Potassium	25614	20.0
Molybdenum	<0.333	0.333
Sodium	10.8	1.67
Nickel	0.182	0.167
Tungsten	<0.333	0.333

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SOUTHWEST RESEARCH INSTITUTE

LABORATORY CONTROL SAMPLE 010011

Sample ID
LCSW - K08W1

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 030930-7

SRR: 25032

Lab System ID: NA

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Cobalt	16.9	16.7	101%
Chromium	6.81	6.70	102%
Iron	33.7	33.3	101%
Potassium	569	666	85.4%
Molybdenum	139	133	105%
Sodium	595	666	89.3%
Nickel	17.2	16.7	103%
Tungsten	140	133	105%

NA- Not Applicable.

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SOUTHWEST RESEARCH INSTITUTE

BLANK SUMMARY

010012

Sample ID
PBW - K08W1

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Liquid

Project No.: 20.06002.01.081

Task Order: 030930-7

SRR: 25032

Lab System ID: NA

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Cobalt	<0.167	0.167
Chromium	<0.167	0.167
Iron	<1.67	1.67
Potassium	<3.33	3.33
Molybdenum	<0.333	0.333
Sodium	<1.67	1.67
Nickel	<0.167	0.167
Tungsten	<0.333	0.333

NA- Not Applicable.

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SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030930-7
SRR: 25032
SDG: 235410
CASE: CNWRA
VTSR: September 30, 2003
PROJECT#: 06002.01.081

Task Orders/01-QPP-015

Southwest Research Institute

Laboratory Task Order

TO #: 030930-7 Revision: 1

010013

SDG: 235410
VTSR: 09/30/03
CASE: CNWRA - DARRELL DUNN

SRR #'s: 25032
Client(s): DIV 20

Project(s): 06002.01.081
Manager(s): DAMMANN, MIKE
To PM: 10/07/03
To QA: 10/15/03
To Client: 10/16/03

Instructions

DIVISION 20 - CNWRA. 7-day preliminary, 14-day on hard copy (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. SEND Forms to Darrell Dunn. Contact PM with any questions.
REVISION 1: Updated task order (dr101403)

Documents Related to this task order: 6552

Test: DIL-DILUTION
Section: METALPREP

Holding: 28 days from CED

Prep, Dilution Cnt: 4

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
235410		1	Liquid	PT 7	16 Sep 03	14 Oct 03
235410		2	Liquid	PT 7	16 Sep 03	14 Oct 03
235411		1	Liquid	PT 8	30 Sep 03	28 Oct 03
235411		2	Liquid	PT 8	30 Sep 03	28 Oct 03
235412		1	Liquid	W 7	16 Sep 03	14 Oct 03
235412		2	Liquid	W 7	16 Sep 03	14 Oct 03
235413		1	Liquid	W 8	30 Sep 03	28 Oct 03
235413		2	Liquid	W 8	30 Sep 03	28 Oct 03

Test: ICP-SWRI
Section: METALS

Holding: 180 days from CED

ICP Analysis by SwRI Method Cnt: 4

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
235410		1	Liquid	PT 7	16 Sep 03	14 Mar 04
235410		2	Liquid	PT 7	16 Sep 03	14 Mar 04
235411		1	Liquid	PT 8	30 Sep 03	28 Mar 04
235411		2	Liquid	PT 8	30 Sep 03	28 Mar 04
235412		1	Liquid	W 7	16 Sep 03	14 Mar 04
235412		2	Liquid	W 7	16 Sep 03	14 Mar 04
235413		1	Liquid	W 8	30 Sep 03	28 Mar 04
235413		2	Liquid	W 8	30 Sep 03	28 Mar 04

010014

Sample Receipt

Southwest Research Institute

Sample Receipt Number: 25032

VTSR: 09/30/03

Time: 14:25:00

Project: 06002.01.081
Case #: CNWRA
Client: DIV 20

Manager: DAMMANN, MIKE
Logged in by: Dino.Roman
Creation Date: 09/30/03

Notes

Samples were received hand delivered at ambient temperature (22.0° C).

QC Note: As per method.

Parameters: Analysis of Cr, Co, Fe, Mo, Ni, K, Na, and W by ICP, see attached.

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.

Note: See chain of custody as part of the work order system for more information. Contact Project Manager for questions. POC- is Darrel Dunn X6090.

Note: Turnaround time is 14 days from VTSR.

Note: Samples were received intact.
*** Dino.Roman Sep 30 2003 2:41PM ***

System ID	Customer ID	CED	Matrix	Containers	Special Reqs.
235410	PT 7	09/16/03	Liquid	2	
235411	PT 8	09/30/03	Liquid	2	
235412	W 7	09/16/03	Liquid	2	
235413	W 8	09/30/03	Liquid	2	
Containers: 8				**Samples: 4**	

These documents are associated with this receipt: 6552

Thermometer: 027
Temperature: 22.0

Client: DIV 20

SR#: 25032

FRM-002

Page Printed: 9 Oct 2003 13:24:24
ver (09/10/2003)

01-QPP-015 010015
Division 01
Revision 4
November 2002

Document No. 3

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DIV. 20 SRR #25032
PROJECT #06002.01.081
CASE: CNWRA
VTSR: 9/30/03 14:25

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

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

QUALITY PROJECT PLAN FOR PERFORMANCE OF CHEMICAL ANALYSES FOR COMMERCIAL NUCLEAR POWER PLANTS WITHIN THE DEPARTMENT OF ANALYTICAL AND 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 — 10/30/02

JOANN BOYD (210) 522-2169 — **DATE**
Quality Assurance Manager

R Karimi — 10/30/02

REZA KARIMI (210) 522-2412 — **DATE**
Director, Department of Analytical and Environmental Chemistry

Nizar Dawelbait — 10/30/02

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

Christopher Hobson — 10/30/02

CHRISTOPHER HOBSON (210) 522-5838 — **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-01-5.2**, *Preparation and Revision of Plans*.

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-01-18.1**, *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-01-18.1**, *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 procedures under **SOP-01-5.0**, *Document and Data Control*, depending on the type of document supplied. 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-01-6.1**, *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-01-10.1**, *Inspection and Test Conduct*. 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 and Login*, and **TAP-01-0407-035**, *Sample/Extract Storage and Custody*.

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-01-8.1**, *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-01-10.1**, *Inspection and Test Conduct.*

4.9.3 Controls for measuring and test equipment shall be as specified in **SOP-01-11.1**, *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-01-13.1**, *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-01-15.1**, *Handling, Storage, Packaging, Preservation, 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-01-16.1**, *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-01-16.1**, *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-CH/AN* to Quality Project Plan, *QPP-015*
Extensive revision to comply with Project Quality Plan PQP-Nuclear, *Nuclear Services*, which replaces SwRI NQAPM, *Nuclear Quality Assurance Program Manual.*

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030930-7
SRR: 25032
SDG: 235410
CASE: CNWRA
VTSR: September 30, 2003
PROJECT#: 06002.01.081

Chain of Custody/Login Paperwork

6552

SAMPLE LIST/CHAIN OF CUSTODY

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

Shipper Name/Address: Darrell Dunn
Div #20

Client: Darrell Dunn - CNWRA
X6090

Client Purchase Order/Other ID:

Site/Zone ID:

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

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
w 7	9/16/03	12pm	L		x2	✓										Inlect (Samples)
pt 7	9/16/03	1pm	L		x2	✓										
w 8	9/30/03	1pm	L		x2	✓										
pt 8	9/30/03	2:15pm	L		x2	✓										

DIV. 20 SRR #25032
PROJECT #06002.01.081
CASE: CNWRA
VTSR: 9/30/03 14:25

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: QA Nuclear, see attached DR

Relinquished by (Print/Signature)	Date	Time
Brian K. Deeby / [signature] (x5448 Lab)	9/30/03	2:20pm
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]

Date: 9/30/03 Time: 1425

Samples Disposed: Date: Time:

Samples Disposed by:

010024

Southwest Research Institute

LOG-IN CHECKLIST

Sample Receipt Report No.: **25032**

010025

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: 09/30/03		Time: 2:52 PM	

SAMPLE LOG-IN SHEET

010026

Lab Name: Southwest Research Institute	Page 1 of 1
Received By (Print Name): DINO ROMAN	Log-in Date: 09/30/2003
Received By (Signature):	
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	09/30/2003
12.	Time Received	14:25:00

EPA Sample #	Corresponding Sample Tag #	Corresponding Assigned Lab #	Remarks: Condition of Sample Shipment, etc
PT 7	None	235410	Intact
PT 8	None	235411	Intact
W 7	None	235412	Intact
W 8	None	235413	Intact

Sample Transfer

Fraction: Inorganics	Fraction:
Area #: Inorg # 2	Area #:
By: DINO ROMAN	By:
On: 09/30/2003	On:

* Contact SMO and attach record of resolution

Reviewed By	CYNTHIA A. SALCEDA	Logbook No.	Sample Receipt (25032)
Date	10/03/2003	Logbook Page No.	4845 (SECTION 3 OF 4)

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030930-7
SRR: 25032
SDG: 235410
CASE: CNWRA
VTSR: September 30, 2003
PROJECT#: 06002.01.081

Copies of Login Book

Sample Login Book

Sep 30, 2003

010027

SwRI Login Area
Division 1

Sample Receipt: 25031	Project: 06391.02.00X	Client: Public Ctr. for
VTSR Date: Sep 30, 2003	VTSR Time: 11:15:00	Manager: TAN, CK

System ID	Customer Sample ID	Matrix
235404	3438 Weir	Bananas
235405	415 Peabody	Bananas
235406	807 Vermont	Bananas

Sample Receipt: 25032	Project: 06002.01.081	Client: DIV 20
VTSR Date: Sep 30, 2003	VTSR Time: 14:25:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
235410	PT 7	Liquid
235411	PT 8	Liquid
235412	W 7	Liquid
235413	W 8	Liquid

Sample Receipt: 25033	Project: 06355.15.006	Client: INEEL
VTSR Date: Sep 30, 2003	VTSR Time: 10:35:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
235418	WGS10501PA,R9,VB	Solid Waste
235419	WGS10601PA,R9	Solid Waste
235420	WGS10602R9	Solid Waste
235421	WGS10701PA,R9	Solid Waste
235422	WGS10801PA,R9,VB	Solid Waste
235423	WGS10901PA	Solid Waste
235424	WGS10902R9	Solid Waste
235425	WGS11001PA,R9	Solid Waste
235426	WGS10901R9	Solid Waste

Sample Receipt: 25034	Project: 06053.06.009	Client: BLUE LINE CORP.
VTSR Date: Sep 30, 2003	VTSR Time: 16:14:00	Manager: RANGER, JACKIE

System ID	Customer Sample ID	Matrix
235427	Cerium (III) Acetate Solution	Liquid

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030930-7
SRR: 25032
SDG: 235410
CASE: CNWRA
VTSR: September 30, 2003
PROJECT#: 06002.01.081

RAW DATA

div 20
to#030930-7
06002.01.081

10/9/03

10/13/03

140903

system id	elem	result	qual	units	rl	tv	rec		ug/ml	rl	df	mg/L	date	time
235410-1 df33	Co2286	0.167	U	mg/L	0.167				0.00234	0.005	33.3	0.0780	10/08/03	16:05
235410-1 df33	Cr2677	0.167	U	mg/L	0.167				0.00097	0.005	33.3	0.0323	10/08/03	16:05
235410-1 df33	Fe2714	1.67	U	mg/L	1.67				-0.00050	0.05	33.3	-0.0167	10/08/03	16:05
235410-1 df33	K_7664	489		mg/L	3.33				14.68262	0.1	33.3	489.4207	10/08/03	16:05
235410-1 df33	Mo2020	0.333	U	mg/L	0.333				0.00093	0.01	33.3	0.0310	10/08/03	16:05
235410-1 df33	Na5889	1.67	U	mg/L	1.67				0.03237	0.05	33.3	1.0790	10/08/03	16:05
235410-1 df33	Ni2316	0.167	U	mg/L	0.167				0.00240	0.005	33.3	0.0800	10/08/03	16:05
235410-1 df33	W_2079	0.333	U	mg/L	0.333				0.00175	0.01	33.3	0.0583	10/08/03	16:05
235410-1d df33	Co2286	0.167	U	mg/L	0.167				0.00204	0.005	33.3	0.0680	10/08/03	16:10
235410-1d df33	Cr2677	0.167	U	mg/L	0.167				-0.00036	0.005	33.3	-0.0120	10/08/03	16:10
235410-1d df33	Fe2714	1.67	U	mg/L	1.67				-0.01841	0.05	33.3	-0.6137	10/08/03	16:10
235410-1d df33	K_7664	488		mg/L	3.33				14.63572	0.1	33.3	487.8573	10/08/03	16:10
235410-1d df33	Mo2020	0.333	U	mg/L	0.333				0.00041	0.01	33.3	0.0137	10/08/03	16:10
235410-1d df33	Na5889	1.67	U	mg/L	1.67				0.03128	0.05	33.3	1.0427	10/08/03	16:10
235410-1d df33	Ni2316	0.167	U	mg/L	0.167				0.00110	0.005	33.3	0.0367	10/08/03	16:10
235410-1d df33	W_2079	0.333	U	mg/L	0.333				0.00256	0.01	33.3	0.0853	10/08/03	16:10
235410-2 df33	Co2286	0.167	U	mg/L	0.167				0.00205	0.005	33.3	0.0683	10/08/03	16:16
235410-2 df33	Cr2677	0.167	U	mg/L	0.167				0.00127	0.005	33.3	0.0423	10/08/03	16:16
235410-2 df33	Fe2714	1.67	U	mg/L	1.67				0.00359	0.05	33.3	0.1197	10/08/03	16:16
235410-2 df33	K_7664	484		mg/L	3.33				14.51628	0.1	33.3	483.8760	10/08/03	16:16
235410-2 df33	Mo2020	0.333	U	mg/L	0.333				0.00111	0.01	33.3	0.0370	10/08/03	16:16
235410-2 df33	Na5889	1.71		mg/L	1.67				0.05136	0.05	33.3	1.7120	10/08/03	16:16
235410-2 df33	Ni2316	0.167	U	mg/L	0.167				0.00281	0.005	33.3	0.0937	10/08/03	16:16
235410-2 df33	W_2079	0.333	U	mg/L	0.333				0.00218	0.01	33.3	0.0727	10/08/03	16:16
235411-1 df33	Co2286	0.167	U	mg/L	0.167				0.00195	0.005	33.3	0.0650	10/08/03	16:21
235411-1 df33	Cr2677	0.167	U	mg/L	0.167				0.00106	0.005	33.3	0.0353	10/08/03	16:21
235411-1 df33	Fe2714	1.67	U	mg/L	1.67				0.00559	0.05	33.3	0.1863	10/08/03	16:21
235411-1 df33	K_7664	584		mg/L	3.33				17.53001	0.1	33.3	584.3337	10/08/03	16:21
235411-1 df33	Mo2020	0.333	U	mg/L	0.333				0.00033	0.01	33.3	0.0110	10/08/03	16:21
235411-1 df33	Na5889	36.8		mg/L	1.67				1.10477	0.05	33.3	36.8257	10/08/03	16:21
235411-1 df33	Ni2316	0.167	U	mg/L	0.167				0.00251	0.005	33.3	0.0837	10/08/03	16:21
235411-1 df33	W_2079	0.333	U	mg/L	0.333				0.00320	0.01	33.3	0.1067	10/08/03	16:21
235411-1s df33	Co2286	17.0		mg/L	0.167	16.7	102.0%		0.50995	0.005	33.3	16.9983	10/08/03	16:27
235411-1s df33	Cr2677	6.91		mg/L	0.167	6.7	103.7%		0.20732	0.005	33.3	6.9107	10/08/03	16:27
235411-1s df33	Fe2714	34.5		mg/L	1.67	33.3	103.5%		1.03488	0.05	33.3	34.4960	10/08/03	16:27
235411-1s df33	K_7664	1315		mg/L	3.33	666	109.7%		39.44464	0.1	33.3	1314.8213	10/08/03	16:27
235411-1s df33	Mo2020	139		mg/L	0.333	133	104.5%		4.17904	0.01	33.3	139.3013	10/08/03	16:27
235411-1s df33	Na3302	645		mg/L	1.67	666	91.3%		19.33591	0.05	33.3	644.5303	10/08/03	16:27
235411-1s df33	Ni2316	17.3		mg/L	0.167	16.7	103.8%		0.51905	0.005	33.3	17.3017	10/08/03	16:27

010028

div 20
to#030930-7
06002.01.081

system id	elem	result	qual	units	rl	tv	rec		ug/ml	rl	df	mg/L	date	time
235411-1s df33	W_2079	139		mg/L	0.333	133	104.3%		4.16841	0.01	33.3	138.9470	10/08/03	16:27
235411-2 df33	Co2286	0.167	U	mg/L	0.167				0.00185	0.005	33.3	0.0617	10/08/03	16:32
235411-2 df33	Cr2677	0.167	U	mg/L	0.167				0.00309	0.005	33.3	0.1030	10/08/03	16:32
235411-2 df33	Fe2714	1.67	U	mg/L	1.67				0.01394	0.05	33.3	0.4647	10/08/03	16:32
235411-2 df33	K_7664	561		mg/L	3.33				16.83994	0.1	33.3	561.3313	10/08/03	16:32
235411-2 df33	Mo2020	0.333	U	mg/L	0.333				0.00585	0.01	33.3	0.1950	10/08/03	16:32
235411-2 df33	Na5889	37.2		mg/L	1.67				1.11735	0.05	33.3	37.2450	10/08/03	16:32
235411-2 df33	Ni2316	0.167	U	mg/L	0.167				0.00409	0.005	33.3	0.1363	10/08/03	16:32
235411-2 df33	W_2079	0.333	U	mg/L	0.333				0.00524	0.01	33.3	0.1747	10/08/03	16:32
235412-1 df33	Co2286	0.167	U	mg/L	0.167				0.00378	0.005	33.3	0.1260	10/08/03	16:38
235412-1 df33	Cr2677	0.167	U	mg/L	0.167				0.00157	0.005	33.3	0.0523	10/08/03	16:38
235412-1 df33	Fe2714	1.67	U	mg/L	1.67				0.01423	0.05	33.3	0.4743	10/08/03	16:38
235412-1 df200	K_7664	19364		mg/L	20.0				96.82212	0.1	200	19364.4240	10/08/03	15:26
235412-1 df33	Mo2020	0.333	U	mg/L	0.333				0.00196	0.01	33.3	0.0653	10/08/03	16:38
235412-1 df33	Na5889	7.33		mg/L	1.67				0.21992	0.05	33.3	7.3307	10/08/03	16:38
235412-1 df33	Ni2316	0.385		mg/L	0.167				0.01155	0.005	33.3	0.3850	10/08/03	16:38
235412-1 df33	W_2079	0.333	U	mg/L	0.333				0.00029	0.01	33.3	0.0097	10/08/03	16:38
235412-2 df33	Co2286	0.167	U	mg/L	0.167				0.00299	0.005	33.3	0.0997	10/08/03	16:44
235412-2 df33	Cr2677	0.167	U	mg/L	0.167				0.00058	0.005	33.3	0.0193	10/08/03	16:44
235412-2 df33	Fe2714	1.67	U	mg/L	1.67				-0.00180	0.05	33.3	-0.0600	10/08/03	16:44
235412-2 df200	K_7664	19852		mg/L	20.0				99.25852	0.1	200	19851.7040	10/08/03	15:31
235412-2 df33	Mo2020	0.333	U	mg/L	0.333				0.00146	0.01	33.3	0.0487	10/08/03	16:44
235412-2 df33	Na5889	7.01		mg/L	1.67				0.21020	0.05	33.3	7.0067	10/08/03	16:44
235412-2 df33	Ni2316	0.325		mg/L	0.167				0.00976	0.005	33.3	0.3253	10/08/03	16:44
235412-2 df33	W_2079	0.333	U	mg/L	0.333				0.00040	0.01	33.3	0.0133	10/08/03	16:44
235413-1 df33	Co2286	0.167	U	mg/L	0.167				0.00277	0.005	33.3	0.0923	10/08/03	16:49
235413-1 df33	Cr2677	0.167	U	mg/L	0.167				0.00016	0.005	33.3	0.0053	10/08/03	16:49
235413-1 df33	Fe2714	1.67	U	mg/L	1.67				-0.00561	0.05	33.3	-0.1870	10/08/03	16:49
235413-1 df200	K_7664	25795		mg/L	20.0				128.97451	0.1	200	25794.9020	10/08/03	15:36
235413-1 df33	Mo2020	0.333	U	mg/L	0.333				0.00029	0.01	33.3	0.0097	10/08/03	16:49
235413-1 df33	Na5889	10.4		mg/L	1.67				0.31197	0.05	33.3	10.3990	10/08/03	16:49
235413-1 df33	Ni2316	0.175		mg/L	0.167				0.00525	0.005	33.3	0.1750	10/08/03	16:49
235413-1 df33	W_2079	0.333	U	mg/L	0.333				-0.00157	0.01	33.3	-0.0523	10/08/03	16:49
235413-2 df33	Co2286	0.167	U	mg/L	0.167				0.00392	0.005	33.3	0.1307	10/08/03	16:54
235413-2 df33	Cr2677	0.167	U	mg/L	0.167				-0.00038	0.005	33.3	-0.0127	10/08/03	16:54
235413-2 df33	Fe2714	1.67	U	mg/L	1.67				-0.01318	0.05	33.3	-0.4393	10/08/03	16:54
235413-2 df200	K_7664	25614		mg/L	20.0				128.07189	0.1	200	25614.3780	10/08/03	15:41
235413-2 df33	Mo2020	0.333	U	mg/L	0.333				0.00009	0.01	33.3	0.0030	10/08/03	16:54
235413-2 df33	Na5889	10.8		mg/L	1.67				0.32393	0.05	33.3	10.7977	10/08/03	16:54

010029

div 20
to#030930-7
06002.01.081

system id	elem	result	qual	units	rl	tv	rec		ug/ml	rl	df	mg/L	date	time
235413-2 df33	Ni2316	0.182		mg/L	0.167				0.00547	0.005	33.3	0.1823	10/08/03	16:54
235413-2 df33	W_2079	0.333	U	mg/L	0.333				0.00228	0.01	33.3	0.0760	10/08/03	16:54
lcsw-K08W1	Co2286	16.9		mg/L	0.167	16.7	101.2%		0.50582	0.005	33.3	16.8607	10/08/03	14:30
lcsw-K08W1	Cr2677	6.81		mg/L	0.167	6.7	102.2%		0.20432	0.005	33.3	6.8107	10/08/03	14:30
lcsw-K08W1	Fe2714	33.7		mg/L	1.67	33.3	101.2%		1.01160	0.05	33.3	33.7200	10/08/03	14:30
lcsw-K08W1	K_7664	569		mg/L	3.33	666	85.4%		17.06491	0.1	33.3	568.8303	10/08/03	14:30
lcsw-K08W1	Mo2020	139		mg/L	0.333	133	103.9%		4.15696	0.01	33.3	138.5653	10/08/03	14:30
lcsw-K08W1	Na3302	595		mg/L	1.67	666	89.4%		17.85865	0.05	33.3	595.2883	10/08/03	14:30
lcsw-K08W1	Ni2316	17.2		mg/L	0.167	16.7	103.2%		0.51594	0.005	33.3	17.1980	10/08/03	14:30
lcsw-K08W1	W_2079	140		mg/L	0.333	133	104.9%		4.19107	0.01	33.3	139.7023	10/08/03	14:30
pbw-K08W1	Co2286	0.167	U	mg/L	0.167				0.00224	0.005	33.3	0.0747	10/08/03	14:19
pbw-K08W1	Cr2677	0.167	U	mg/L	0.167				0.00016	0.005	33.3	0.0053	10/08/03	14:19
pbw-K08W1	Fe2714	1.67	U	mg/L	1.67				0.00148	0.05	33.3	0.0493	10/08/03	14:19
pbw-K08W1	K_7664	3.33	U	mg/L	3.33				0.00528	0.1	33.3	0.1760	10/08/03	14:19
pbw-K08W1	Mo2020	0.333	U	mg/L	0.333				0.00093	0.01	33.3	0.0310	10/08/03	14:19
pbw-K08W1	Na5889	1.67	U	mg/L	1.67				-0.00972	0.05	33.3	-0.3240	10/08/03	14:19
pbw-K08W1	Ni2316	0.167	U	mg/L	0.167				0.00035	0.005	33.3	0.0117	10/08/03	14:19
pbw-K08W1	W_2079	0.333	U	mg/L	0.333				0.00309	0.01	33.3	0.1030	10/08/03	14:19

ICP ANALYSIS

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
06002.01.081	Div 20	030930-7	10-8-03	Liquid	S4 221
06002.01.081	Div 20	030930-7	10-8-03	Liquid	S4 222

INSTRUMENT: TRACE1 FILENAME: A309307

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INSTRUMENT DL:

Standardization Rpt. 10/08/03 01:40:12 PM page 1

Method: DAILY1 Standard: blk
Run Time: 10/08/03 13:35:13

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Avge	-.00001	.0006	-.0000	.0007	-.0000	-.0001	-.0000
SDev	.00001	.0000	.0000	.0001	.0000	.0000	.0000
%RSD	169.98	1.561	38.74	6.937	11.16	.6247	196.4
#1	.00000	.0006	-.0001	.0007	-.0000	-.0001	.0000
#2	-.00002	.0007	-.0000	.0007	-.0000	-.0001	-.0000

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Avge	.0000	-.0000	-.0000	-.0000	.0004	-.0000	.0017
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0002
%RSD	.6247	17.52	53.07	429.3	.3245	26.59	9.845
#1	.0000	-.0000	-.0000	.0000	.0004	-.0000	.0018
#2	.0000	-.0000	-.0000	-.0000	.0004	-.0000	.0016

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Avge	.0005	.0000	-.0000	.0000	-.0000	-.0074	-.0002
SDev	.0000	.0000	.0000	.0000	.0000	.0001	.0000
%RSD	4.435	11.50	60.10	141.4	54.92	1.291	11.59
#1	.0005	.0000	-.0000	.0000	-.0000	-.0073	-.0002
#2	.0005	.0000	-.0000	.0000	-.0000	-.0074	-.0002

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Avge	-.0001	.0000	.0001	-.0001	-.0000	.0000	-.0000
SDev	.0000	.0000	.0001	.0001	.0000	.0000	.0000
%RSD	46.58	134.0	55.95	98.48	50.88	65.05	24.18
#1	-.0000	.0001	.0002	-.0000	-.0000	.0000	-.0000
#2	-.0001	.0000	.0001	-.0001	-.0000	.0000	-.0000

Elem	Sc3613	1960/1	1960/2	Si2881	Sn1899	Sr4215	Th2837
Avge	65.07	-.0000	.0001	.0014	-.0000	.0000	.0000
SDev	.41	.0001	.0000	.0000	.0000	.0000	.0000
%RSD	.6236	132.5	29.61	.8500	2599.	33.23	67.47
#1	64.79	-.0000	.0001	.0015	.0000	.0000	.0000
#2	65.36	-.0001	.0001	.0014	-.0000	.0000	.0000

Elem	Ti3372	Tl1908	U_3859	V_2924	W_2079	Y_3710	Zn2062
Avge	-.0015	-.0000	.0041	-.0000	.0001	-.0000	.0000
SDev	.0000	.0000	.0000	.0000	.0001	.0000	.0000
%RSD	1.151	44.98	.7849	84.45	51.20	305.3	60.10
#1	-.0015	-.0000	.0041	-.0000	.0001	.0000	.0000
#2	-.0015	-.0001	.0040	-.0000	.0001	-.0000	.0000

Elem	Zr3496
Avge	.0001
SDev	.0001
%RSD	76.59
#1	.0001
#2	.0000

10-8-03

10/9/03

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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	650714	10000	--	--	--	--	--
SDev	4065.157	.0000000	--	--	--	--	--
%RSD	.6247221	.0000000	--	--	--	--	--
#1	647840	10000	--	--	--	--	--
#2	653589	10000	--	--	--	--	--

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Standardization Rpt. 10/08/03 01:44:37 PM page 1

Method: DAILY1 Standard: clp_std4
Run Time: 10/08/03 13:40:21

Elem	Ag3280	As1890	2203/1	2203/2	Sb2068	1960/1	1960/2
Avge	.05461	.1067	.4169	.4390	.1137	.2228	.3905
SDev	.00017	.0002	.0004	.0001	.0001	.0004	.0034
%RSD	.31577	.1730	.0920	.0313	.1083	.1777	.8615
#1	.05449	.1069	.4166	.4391	.1137	.2225	.3881
#2	.05473	.1066	.4171	.4389	.1136	.2231	.3929

Elem	Tl1908
Avge	.0288
SDev	.0001
%RSD	.1778
#1	.0289
#2	.0288

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	646364	10000	--	--	--	--	--
SDev	2840.448	.0000000	--	--	--	--	--
%RSD	.4394506	.0000000	--	--	--	--	--
#1	644355	10000	--	--	--	--	--
#2	648372	10000	--	--	--	--	--

Standardization Rpt. 10/08/03 01:49:02 PM

Method: DAILY1 Standard: clp_std1
Run Time: 10/08/03 13:44:46

Elem	Al3082	Ca3179	Fe2714	K_7664	Li6707	Mg2790	Na3302
Avge	.1264	.1476	.1019	1.628	3.205	.0545	.0123
SDev	.0004	.0007	.0010	.029	.045	.0006	.0001
%RSD	.3511	.4900	1.005	1.751	1.409	1.040	.3940
#1	.1261	.1471	.1011	1.608	3.173	.0541	.0122
#2	.1267	.1481	.1026	1.648	3.237	.0549	.0123

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	655289	10000	--	--	--	--	--
SDev	1428.356	.0000000	--	--	--	--	--
%RSD	.2179734	.0000000	--	--	--	--	--
#1	656299	10000	--	--	--	--	--
#2	654279	10000	--	--	--	--	--

Standardization Rpt. 10/08/03 01:53:06 PM page 1

Method: DAILY1 Standard: clp_std5
Run Time: 10/08/03 13:49:12

Elem	B_2496	Bi2230	Mo2020	P_1782	Si2881	Sn1899	Sr4215
Avge	.3941	.0597	.1572	.0266	.1294	.1818	1.513
SDev	.0027	.0004	.0016	.0002	.0003	.0002	.010
%RSD	.6943	.7599	1.048	.8062	.2185	.0959	.6545
#1	.3921	.0594	.1560	.0268	.1292	.1820	1.506
#2	.3960	.0600	.1583	.0265	.1296	.1817	1.520

Elem	Ti3372
Avge	1.071
SDev	.000
%RSD	.0376
#1	1.071
#2	1.071

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	669731	10000	--	--	--	--	--
SDev	4129.503	.0000000	--	--	--	--	--
%RSD	.6165914	.0000000	--	--	--	--	--
#1	672651	10000	--	--	--	--	--
#2	666811	10000	--	--	--	--	--

Standardization Rpt. 10/08/03 01:56:48 PM page 1

Method: DAILY1 Standard: clp_std2
Run Time: 10/08/03 13:53:16

Elem	Ba4934	Be3130	Cr2677	Cu3247	Ni2316
Avge	.6190	.2157	.2968	.3224	.7443
SDev	.0015	.0009	.0018	.0008	.0049
%RSD	.2455	.4383	.6160	.2357	.6525
#1	.6179	.2151	.2981	.3229	.7408
#2	.6201	.2164	.2955	.3219	.7477

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	641998	10000	--	--	--	--	--
SDev	11135.52	.0000000	--	--	--	--	--
%RSD	1.734510	.0000000	--	--	--	--	--
#1	634124	10000	--	--	--	--	--
#2	649872	10000	--	--	--	--	--

Standardization Rpt. 10/08/03 02:01:13 PM page 1

Method: DAILY1 Standard: clp_std3
Run Time: 10/08/03 13:56:58

Elem	Cd2265	Co2286	Mn2576	V_2924	Zn2062
Avge	1.173	.2782	.4221	.0749	.0888
SDev	.005	.0006	.0012	.0001	.0002
%RSD	.4591	.2172	.2835	.1054	.2507
#1	1.177	.2786	.4230	.0749	.0889
#2	1.169	.2777	.4213	.0750	.0886

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	664624	10000	--	--	--	--	--
SDev	747.4119	.0000000	--	--	--	--	--
%RSD	.1124563	.0000000	--	--	--	--	--
#1	665153	10000	--	--	--	--	--
#2	664096	10000	--	--	--	--	--

Standardization Rpt. 10/08/03 02:06:22 PM page 1

Method: DAILY1 Standard: clp_std6
Run Time: 10/08/03 14:01:23

Elem	La4086	Na5889	Pd3404	S_1820	Th2837	U_3859	W_2079
Avge	.3767	.1287	.1536	.0369	.0572	.0322	.1328
SDev	.0030	.0018	.0003	.0009	.0006	.0004	.0017
%RSD	.7966	1.366	.1598	2.496	1.060	1.202	1.253
#1	.3788	.1300	.1537	.0376	.0568	.0325	.1316
#2	.3746	.1275	.1534	.0363	.0577	.0320	.1340

Elem	Y_3710	Zr3496
Avge	1.009	1.154
SDev	.003	.001
%RSD	.2589	.0752
#1	1.011	1.155
#2	1.008	1.153

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	650626	10000	--	--	--	--	--
SDev	12316.39	.0000000	--	--	--	--	--
%RSD	1.893005	.0000000	--	--	--	--	--
#1	641917	10000	--	--	--	--	--
#2	659335	10000	--	--	--	--	--

Standardization Report 10/08/03 02:06:23 PM page 1

Method: DAILY1 Slope = Conc(SIR)/IR

Element	Wavelen	High std	Low std	Slope	Y-intercept	Date Standardized
Ag3280	328.068	clp_std4	blk	36.6178	.000280	10/08/03 02:01:23
Al3082	308.215	clp_std1	blk	397.550	-.256889	10/08/03 02:01:23
As1890	189.042	clp_std4	blk	93.6357	.004538	10/08/03 02:01:23
B_2496	249.678	clp_std5	blk	25.4206	-.017505	10/08/03 02:01:23
Ba4934	493.409	clp_std2	blk	16.1535	.000596	10/08/03 02:01:23
Be3130	313.042	clp_std2	blk	23.1633	.002777	10/08/03 02:01:23
Bi2230	223.061	clp_std5	blk	83.1253	.001651	10/08/03 02:01:23
Ca3179	317.933	clp_std1	blk	338.891	-.007291	10/08/03 02:01:23
Cd2265	226.502	clp_std3	blk	8.52126	.000255	10/08/03 02:01:23
Co2286	228.616	clp_std3	blk	35.9463	.000968	10/08/03 02:01:23
Cr2677	267.716	clp_std2	blk	33.6926	.000128	10/08/03 02:01:23
Cu3247	324.753	clp_std2	blk	31.0532	-.011239	10/08/03 02:01:23
Fe2714	271.441	clp_std1	blk	490.696	.019590	10/08/03 02:01:23
K_7664	766.491	clp_std1	blk	30.7482	-.052183	10/08/03 02:01:23
La4086	408.672	clp_std6	blk	25.6962	-.013191	10/08/03 02:01:23
Li6707	670.784	clp_std1	blk	3.12048	-.000094	10/08/03 02:01:23
Mg2790	279.078	clp_std1	blk	458.904	.002464	10/08/03 02:01:23
Mn2576	257.610	clp_std3	blk	23.6883	-.000055	10/08/03 02:01:23
Mo2020	202.030	clp_std5	blk	63.6313	.000637	10/08/03 02:01:23
Na5889	588.995	clp_std6	blk	7.34664	.054179	10/08/03 02:01:23
Na3302	330.232	clp_std1	blk	4016.27	.756355	10/08/03 02:01:23
Ni2316	231.604	clp_std2	blk	13.4346	.000897	10/08/03 02:01:23
P_1782	178.287	clp_std5	blk	375.780	-.011018	10/08/03 02:01:23
2203/1	220.351	clp_std4	blk	23.9959	-.002734	10/08/03 02:01:23
2203/2	220.352	clp_std4	blk	22.7742	.001274	10/08/03 02:01:23
Pd3404	340.458	clp_std6	blk	66.0945	.001116	10/08/03 02:01:23
S_1820	182.040	clp_std6	blk	271.435	-.008534	10/08/03 02:01:23
Sb2068	206.838	clp_std4	blk	87.9799	.000812	10/08/03 02:01:23
Sc3613	361.384	blk	dark	1.53975	-.195009	10/08/03 02:01:23
1960/1	196.021	clp_std4	blk	44.8715	.002198	10/08/03 02:01:23
1960/2	196.022	clp_std4	blk	25.6170	-.003074	10/08/03 02:01:23
Si2881	288.158	clp_std5	blk	77.9007	-.112715	10/08/03 02:01:23
Pb220	220.353	NONE	NONE	.000000	.000000	*NOT STANDARDIZED
Se196	196.026	NONE	NONE	1.00000	.000000	*NOT STANDARDIZED
Sn1899	189.989	clp_std5	blk	55.0293	.000039	10/08/03 02:01:23
Sr4215	421.552	clp_std5	blk	6.60753	-.000066	10/08/03 02:01:23
Th2837	283.730	clp_std6	blk	183.507	-.002685	10/08/03 02:01:23
Ti3372	337.280	clp_std5	blk	9.32396	.013698	10/08/03 02:01:23
Tl1908	190.864	clp_std4	blk	346.075	.015667	10/08/03 02:01:23
U_3859	385.958	clp_std6	blk	354.648	-1.44323	10/08/03 02:01:23
V_2924	292.402	clp_std3	blk	133.453	.000511	10/08/03 02:01:23
W_2079	207.910	clp_std6	blk	37.6756	-.003555	10/08/03 02:01:23
Y_3710	371.030	clp_std6	blk	9.90510	.000053	10/08/03 02:01:23
Zn2062	206.200	clp_std3	blk	112.678	-.000605	10/08/03 02:01:23
Zr3496	349.621	clp_std6	blk	9.21805	-.000831	10/08/03 02:01:23

Analysis Report QC Standard 10/08/03 02:11:33 PM page 1

Method: DAILY1 Sample Name: icv/ccv Operator:
Run Time: 10/08/03 14:06:33
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.0183	10.16	5.214	4.913	10.23	Q1.110	5.139
SDev	.0042	.07	.020	.036	.04	.008	.013
%RSD	.40931	.6931	.3790	.7275	.3596	.7622	.2557
#1	1.0154	10.11	5.200	4.888	10.21	Q1.104	5.130
#2	1.0213	10.21	5.228	4.939	10.26	Q1.116	5.148
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail	QC Pass
Value	1.0000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.000	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	20.66	1.027	5.071	2.058	2.072	10.37	18.73
SDev	.18	.010	.053	.023	.011	.11	.23
%RSD	.8505	.9378	1.052	1.115	.5393	1.078	1.246
#1	20.53	1.020	5.033	2.042	2.064	10.29	18.56
#2	20.78	1.034	5.109	2.074	2.080	10.45	18.89
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	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.125	5.001	20.65	1.044	5.118	Q46.28	27.71
SDev	.024	.050	.23	.012	.080	.62	.18
%RSD	.4755	.9952	1.118	1.161	1.566	1.330	.6325
#1	5.108	4.966	20.49	1.036	5.061	Q45.84	27.59
#2	5.142	5.036	20.81	1.053	5.174	Q46.71	27.83
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail	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	5.085	5.129	5.174	5.241	1.029	1.038	1.031
SDev	.023	.054	.049	.001	.002	.037	.004
%RSD	.4575	1.045	.9472	.0213	.2003	3.555	.4346
#1	5.069	5.091	5.139	5.242	1.028	1.064	1.028
#2	5.102	5.167	5.208	5.240	1.031	1.012	1.034
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	101.3	5.490	5.447	5.037	5.213	5.456	5.093
SDev	.1	.018	.034	.046	.016	.016	.060
%RSD	.0924	.3310	.6150	.9153	.2988	.2980	1.174
#1	101.3	5.477	5.471	5.005	5.202	5.467	5.051
#2	101.4	5.503	5.423	5.070	5.224	5.444	5.135
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	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.334	1.005	4.977	Q5.522	1.025	5.118	1.009
SDev	.014	.015	.010	.093	.015	.046	.008
%RSD	.2582	1.488	.2000	1.675	1.427	.9004	.7920
#1	5.324	.9945	4.970	5.457	1.015	5.086	1.003
#2	5.343	1.016	4.984	Q5.588	1.036	5.151	1.015
Errors	QC Pass	QC Pass	QC Pass	QC Fail	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	5.103	1.035	4.970
SDev	.008	.013	.005
%RSD	.1612	1.239	.1095
#1	5.097	1.026	4.966
#2	5.109	1.044	4.974
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	659224	10000	--	--	--	--	--
SDev	622.9611	.0000000	--	--	--	--	--
%RSD	.0944992	.0000000	--	--	--	--	--
#1	658783	10000	--	--	--	--	--
#2	659664	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: icb/ccb Operator:
Run Time: 10/08/03 14:14:03
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00005	.0018	.0023	.0012	.0005	.0002	.0023
SDev	.00015	.0044	.0008	.0014	.0002	.0001	.0005
%RSD	324.18	245.3	32.97	115.2	50.19	31.83	22.81
#1	-.00006	-.0013	.0028	.0021	.0006	.0001	.0027
#2	.00016	.0049	.0017	.0002	.0003	.0002	.0019
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.00500	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.00500	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0180	.0004	.0010	.0002	.0000	.0031	.0042
SDev	.0000	.0000	.0001	.0007	.0001	.0127	.0043
%RSD	.1574	1.979	11.23	362.4	2352.	405.9	100.9
#1	.0180	.0004	.0009	.0007	-.0001	.0121	.0012
#2	.0180	.0004	.0011	-.0003	.0001	-.0059	.0073
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	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0002	.0001	.0001	.0038	-.0050	-.0221
SDev	.0000	.0001	.0015	.0001	.0010	.0008	.0621
%RSD	2.242	51.76	1565.	119.9	26.64	16.29	281.4
#1	-.0001	.0002	-.0010	.0002	.0045	-.0044	.0218
#2	-.0001	.0001	.0011	.0000	.0031	-.0056	L-.0659
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	.0008	.0064	.0019	.0006	.0020	H.0128	.0020
SDev	.0002	.0080	.0022	.0018	.0021	.0072	.0001
%RSD	24.14	124.8	116.3	277.9	104.1	56.60	5.120
#1	.0009	H.0121	.0035	-.0006	.0034	H.0179	.0020
#2	.0006	.0008	.0003	.0019	.0005	.0077	.0019
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC High	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	102.8	.0013	.0008	-.0026	.0011	.0009	-.0016
SDev	.3	.0046	.0043	.0001	.0004	.0044	.0010
%RSD	.3129	359.8	569.9	2.492	39.22	466.0	59.77
#1	102.6	-.0020	-.0023	-.0026	.0008	-.0022	-.0010
#2	103.0	.0046	.0038	-.0027	.0014	.0041	-.0023
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	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	-.0011	.0003	.0100	.0136	.0001	.0046
SDev	.0001	.0003	.0003	.0014	.0101	.0003	.0028
%RSD	20.50	26.90	85.38	14.30	74.59	196.4	61.12
#1	.0006	-.0013	.0001	H.0110	.0064	.0003	.0026
#2	.0004	-.0009	.0005	.0090	.0207	-.0001	.0066
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	.0004	-.0000	.0005
SDev	.0002	.0004	.0003
%RSD	53.83	2027.	61.06
#1	.0005	-.0003	.0007
#2	.0002	.0002	.0003
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	668859	10000	--	--	--	--	--
SDev	2067.580	.0000000	--	--	--	--	--
%RSD	.3091205	.0000000	--	--	--	--	--
#1	667397	10000	--	--	--	--	--
#2	670321	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: pbw-K08W1 pg54-221 Operator:
Run Time: 10/08/03 14:19:13
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00001	.0240	.0011	.0018	.0001	-.0001	.0026
SDev	.00021	.0089	.0002	.0001	.0000	.0000	.0011
%RSD	3331.0	36.98	14.58	6.728	9.469	45.67	42.83
#1	.00016	.0303	.0012	.0018	.0001	-.0001	.0018
#2	-.00014	.0177	.0010	.0019	.0001	-.0001	.0034
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.00500	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.00500	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0028	.0003	.0022	.0002	.0007	.0015	.0053
SDev	.0002	.0002	.0000	.0003	.0003	.0019	.0029
%RSD	5.931	68.97	1.029	191.6	40.81	126.9	53.98
#1	.0029	.0001	.0022	.0004	.0005	.0002	.0033
#2	.0027	.0004	.0023	-.0001	.0009	.0028	.0073
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	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	.0000	.0054	.0001	.0009	-.0097	-.0395
SDev	.0004	.0000	.0020	.0000	.0000	.0011	.0052
%RSD	103.5	14.05	37.50	5.286	.4494	11.05	13.16
#1	.0007	.0000	.0040	.0001	.0009	-.0105	-.0432
#2	.0001	.0000	.0068	.0001	.0009	-.0090	-.0358
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	.0004	H.0271	.0012	.0004	.0005	-.0038	.0028
SDev	.0005	.0050	.0004	.0016	.0005	.0049	.0009
%RSD	151.7	18.24	35.03	393.1	98.88	128.3	31.96
#1	.0007	H.0236	.0009	.0016	.0002	-.0004	.0035
#2	-.0000	H.0306	.0015	-.0007	.0009	-.0073	.0022
Errors	LC Pass	LC High	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	97.54	-.0041	.0006	.0007	.0007	-.0009	.0029
SDev	1.26	.0044	.0021	.0016	.0010	.0001	.0012
%RSD	1.295	107.0	330.9	222.2	139.4	8.485	41.11
#1	96.64	-.0010	-.0008	-.0004	.0014	-.0009	.0020
#2	98.43	-.0073	.0021	.0019	.0000	-.0010	.0037
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	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	-.0010	-.0002	.0064	.0214	-.0000	.0031
SDev	.0000	.0011	.0002	.0047	.0071	.0005	.0009
%RSD	59.23	104.3	105.8	74.60	33.15	8721.	29.91
#1	.0000	-.0003	-.0003	.0030	.0164	-.0003	.0038
#2	.0000	-.0018	-.0000	.0097	.0264	.0003	.0024
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	.0004	.0005
SDev	.0000	.0001	.0003
%RSD	.8204	30.63	62.92
#1	.0001	.0003	.0003
#2	.0001	.0004	.0007
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	634649	10000	--	--	--	--	--
SDev	8232.137	.0000000	--	--	--	--	--
%RSD	1.297117	.0000000	--	--	--	--	--
#1	628828	10000	--	--	--	--	--
#2	640470	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: pbw-K08W2 pg54-222 Operator:
Run Time: 10/08/03 14:24:42
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00038	.0139	.0007	.0025	.0002	-.0002	.0004
SDev	.00034	.0065	.0023	.0009	.0001	.0002	.0029
%RSD	89.412	46.75	317.8	36.34	84.34	85.33	669.2
#1	-.00062	.0185	-.0009	.0019	.0001	-.0004	-.0016
#2	-.00014	.0093	.0024	.0031	.0002	-.0001	.0024
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.00500	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.00500	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0038	.0003	.0021	-.0000	.0003	.0070	.0036
SDev	.0006	.0001	.0001	.0008	.0003	.0109	.0001
%RSD	17.07	25.86	7.136	2945.	119.8	156.0	2.286
#1	.0034	.0003	.0020	-.0006	.0000	-.0007	.0036
#2	.0043	.0002	.0022	.0006	.0005	.0146	.0035
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	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0000	.0025	.0000	.0006	-.0162	L-.1944
SDev	.0001	.0000	.0040	.0000	.0002	.0002	.1044
%RSD	20.78	24.10	159.7	6.487	35.76	1.357	53.74
#1	-.0006	.0000	-.0003	.0000	.0007	-.0160	L-.1205
#2	-.0008	.0000	.0054	.0000	.0004	-.0163	L-.2682
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Low
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	.0004	H.0278	-.0003	-.0011	.0003	.0037	.0023
SDev	.0003	.0071	.0019	.0007	.0006	.0029	.0021
%RSD	93.72	25.40	604.9	67.19	189.5	77.06	90.89
#1	.0006	H.0328	.0010	-.0016	.0008	.0017	.0037
#2	.0001	H.0228	-.0016	-.0006	-.0001	.0058	.0008
Errors	LC Pass	LC High	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	98.33	-.0028	-.0020	-.0010	-.0008	-.0022	-.0003
SDev	1.04	.0024	.0017	.0021	.0001	.0003	.0037
%RSD	1.054	86.95	87.29	212.2	15.79	15.11	1461.
#1	97.60	-.0045	-.0008	.0005	-.0007	-.0020	.0024
#2	99.07	-.0011	-.0032	-.0024	-.0009	-.0025	-.0029
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	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	-.0013	-.0004	.0070	.0481	.0004	.0019
SDev	.0000	.0007	.0001	.0045	.0107	.0001	.0035
%RSD	296.3	53.55	23.61	64.19	22.35	34.35	183.8
#1	.0000	-.0018	-.0005	H.0102	.0557	.0003	.0043
#2	-.0000	-.0008	-.0003	.0038	.0405	.0005	-.0006
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	.0005
SDev	.0001	.0010	.0003
%RSD	91.12	978.5	67.25
#1	.0000	.0008	.0003
#2	.0001	-.0006	.0007
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	639860	10000	--	--	--	--	--
SDev	6788.225	.0000000	--	--	--	--	--
%RSD	1.060892	.0000000	--	--	--	--	--
#1	635060	10000	--	--	--	--	--
#2	644660	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: lcsw-K08W1 Operator:
Run Time: 10/08/03 14:30:11
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.05022	1.932	2.088	-.0048	2.063	.0557	.0033
SDev	.00055	.008	.006	.0017	.003	.0003	.0017
%RSD	1.1029	.4352	.2917	36.23	.1589	.5478	52.05
#1	.04983	1.926	2.084	-.0036	2.060	.0555	.0046
#2	.05061	1.938	2.092	-.0060	2.065	.0560	.0021

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	21.37	.0517	.5058	.2043	.2523	1.012	17.06
SDev	.12	.0001	.0028	.0005	.0005	.002	.04
%RSD	.5636	.1863	.5584	.2544	.1821	.1496	.2336
#1	21.28	.0517	.5038	.2040	.2519	1.011	17.04
#2	21.45	.0516	.5078	.2047	.2526	1.013	17.09

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0001	21.33	.5120	4.157	29.34	17.86
SDev	.0008	.0000	.12	.0022	.043	.11	.17
%RSD	385.1	3.584	.5692	.4395	1.045	.3850	.9563
#1	-.0008	.0001	21.24	.5104	4.126	29.26	17.98
#2	.0004	.0001	21.41	.5136	4.188	29.42	17.74

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.5159	.0051	.5232	.5212	.0015	.0200	.5091
SDev	.0029	.0147	.0079	.0019	.0005	.0012	.0098
%RSD	.5613	288.6	1.511	.3720	30.70	5.969	1.935
#1	.5139	.0154	.5176	.5226	.0019	.0192	.5021
#2	.5180	-.0053	.5288	.5198	.0012	.0209	.5161

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.68	2.149	2.129	-.0046	.5214	2.134	-.0010
SDev	.14	.023	.009	.0070	.0013	.013	.0013
%RSD	.1483	1.053	.4202	152.1	.2573	.6323	138.6
#1	97.57	2.133	2.123	-.0096	.5204	2.124	-.0000
#2	97.78	2.165	2.136	.0003	.5223	2.143	-.0019

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	-.0081	.0003	2.162	.0659	.5084	4.191
SDev	.0000	.0023	.0000	.020	.0188	.0023	.030
%RSD	10.43	27.75	1.445	.9177	28.48	.4542	.7168
#1	.0002	-.0065	.0003	2.148	.0526	.5067	4.170
#2	.0003	-.0097	.0003	2.176	.0792	.5100	4.212

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.5157	.0022
SDev	.0001	.0033	.0000
%RSD	124.6	.6458	.5358
#1	.0000	.5134	.0022
#2	.0001	.5181	.0022

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	635574	10000	--	--	--	--	--
SDev	967.3221	.0000000	--	--	--	--	--
%RSD	.1521966	.0000000	--	--	--	--	--
#1	634890	10000	--	--	--	--	--
#2	636258	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: lcsw-K08W2 Operator:
Run Time: 10/08/03 14:35:39
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.05055	1.949	2.103	-.0075	2.056	.0565	.0035
SDev	.00015	.002	.002	.0010	.006	.0002	.0002
%RSD	.30007	.1209	.1080	13.65	.3055	.4284	5.941
#1	.05066	1.947	2.101	-.0082	2.052	.0563	.0034
#2	.05044	1.951	2.105	-.0068	2.061	.0567	.0037

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.88	.0519	.5106	.2071	.2527	1.036	16.58
SDev	.08	.0003	.0012	.0011	.0012	.017	.10
%RSD	.3913	.5380	.2366	.5430	.4717	1.647	.6185
#1	20.83	.0521	.5098	.2063	.2518	1.024	16.51
#2	20.94	.0517	.5115	.2079	.2535	1.048	16.66

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0001	20.86	.5175	4.137	28.50	17.27
SDev	.0002	.0000	.04	.0011	.021	.13	.17
%RSD	780.2	24.78	.1999	.2057	.5157	.4664	1.011
#1	-.0001	.0001	20.83	.5168	4.122	28.40	17.15
#2	.0002	.0001	20.88	.5183	4.152	28.59	17.40

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.5166	.0102	.5246	.5322	.0017	.0013	.5147
SDev	.0034	.0060	.0050	.0010	.0005	.0006	.0003
%RSD	.6629	58.49	.9559	.1820	30.91	48.64	.0608
#1	.5142	.0145	.5282	.5329	.0013	.0017	.5145
#2	.5190	.0060	.5211	.5315	.0021	.0008	.5149

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.06	2.143	2.164	-.0047	.5291	2.155	-.0000
SDev	.45	.008	.006	.0046	.0023	.007	.0019
%RSD	.4643	.3667	.2710	98.16	.4375	.3027	7496.
#1	96.74	2.148	2.169	-.0080	.5308	2.160	-.0013
#2	97.37	2.137	2.160	-.0014	.5275	2.150	.0013

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	-.0071	-.0002	2.190	.0580	.5110	4.172
SDev	.0000	.0008	.0004	.005	.0063	.0006	.027
%RSD	12.55	10.62	191.7	.2338	10.86	.1250	.6538
#1	.0002	-.0077	-.0005	2.193	.0535	.5105	4.153
#2	.0002	-.0066	.0001	2.186	.0624	.5114	4.191

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.5220	.0019
SDev	.0001	.0018	.0004
%RSD	128.5	.3508	19.70
#1	.0000	.5207	.0016
#2	.0001	.5233	.0022

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	631564	10000	--	--	--	--	--
SDev	2942.979	.0000000	--	--	--	--	--
%RSD	.4659826	.0000000	--	--	--	--	--
#1	629483	10000	--	--	--	--	--
#2	633645	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235410-1 df200 Operator:
Run Time: 10/08/03 14:41:08
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00003	.0146	.0013	.0015	.0006	.0000	.0027
SDev	.00016	.0062	.0011	.0003	.0003	.0001	.0011
%RSD	639.35	42.36	89.41	19.89	55.51	6228.	40.16
#1	-.00009	.0190	.0021	.0013	.0008	.0001	.0035
#2	.00014	.0103	.0005	.0017	.0003	-.0001	.0019

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0202	.0002	.0024	.0005	.0017	.0030	1.947
SDev	.0035	.0001	.0000	.0001	.0009	.0202	.008
%RSD	17.21	59.88	.4535	27.88	49.29	673.7	.4057
#1	.0227	.0001	.0024	.0004	.0011	-.0113	1.953
#2	.0178	.0002	.0023	.0006	.0024	.0173	1.942

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0000	.0072	.0001	.0068	-.0054	-.0888
SDev	.0002	.0000	.0025	.0001	.0020	.0020	.0451
%RSD	130.5	297.9	35.00	45.06	29.14	37.82	50.82
#1	.0000	-.0000	.0090	.0002	.0082	-.0039	-.1207
#2	.0002	.0000	.0054	.0001	.0054	-.0068	-.0569

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	.0154	.0016	.0008	.0013	.0093	.0012
SDev	.0001	.0047	.0008	.0024	.0017	.0079	.0009
%RSD	12.72	30.52	47.32	280.5	131.3	85.10	81.20
#1	.0007	.0188	.0011	-.0008	.0001	.0037	.0005
#2	.0009	.0121	.0021	.0025	.0024	.0148	.0018

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.42	.0024	.0013	.0146	.0011	.0017	-.0008
SDev	.71	.0005	.0015	.0010	.0018	.0012	.0014
%RSD	.7121	21.71	117.2	6.666	167.2	71.17	176.1
#1	98.92	.0027	.0024	.0139	-.0002	.0025	.0002
#2	99.93	.0020	.0002	.0152	.0024	.0008	-.0018

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	-.0011	-.0003	.0077	.0542	.0004	.0051
SDev	.0000	.0011	.0001	.0181	.0097	.0006	.0025
%RSD	56.49	99.59	55.73	234.9	17.98	154.2	48.68
#1	.0000	-.0018	-.0004	.0205	.0473	-.0000	.0069
#2	.0000	-.0003	-.0002	-.0051	.0611	.0008	.0034

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	-.0002	.0005
SDev	.0001	.0004	.0000
%RSD	175.6	218.0	2.871
#1	-.0000	.0001	.0006
#2	.0001	-.0004	.0005

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	646933	10000	--	--	--	--	--
SDev	4665.491	.0000000	--	--	--	--	--
%RSD	.7211706	.0000000	--	--	--	--	--
#1	643634	10000	--	--	--	--	--
#2	650232	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235410-1d df200 Operator:
Run Time: 10/08/03 14:46:37
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00056	.0200	-.0021	.0012	.0001	-.0002	.0034
SDev	.00026	.0022	.0012	.0002	.0000	.0001	.0011
%RSD	47.164	11.01	55.91	19.31	9.004	34.68	33.40
#1	-.00037	.0185	-.0013	.0010	.0001	-.0003	.0042
#2	-.00075	.0216	-.0029	.0013	.0001	-.0002	.0026

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0138	.0002	.0018	-.0001	.0004	-.0110	1.988
SDev	.0002	.0001	.0003	.0000	.0004	.0057	.006
%RSD	1.334	46.37	15.25	14.68	103.0	51.69	.2886
#1	.0137	.0003	.0016	-.0001	.0006	-.0070	1.992
#2	.0139	.0002	.0020	-.0001	.0001	-.0151	1.984

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	-.0000	.0036	-.0000	.0015	-.0098	-.0844
SDev	.0001	.0000	.0005	.0000	.0001	.0007	.1061
%RSD	25.11	148.5	13.23	594.9	5.360	7.206	125.8
#1	-.0003	.0000	.0033	.0000	.0015	-.0103	-.0093
#2	-.0002	-.0000	.0040	-.0000	.0014	-.0093	-.1595

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0125	-.0014	.0014	.0014	.0044	.0024
SDev	.0006	.0081	.0037	.0016	.0008	.0116	.0034
%RSD	108.3	64.52	272.9	112.8	54.63	264.2	141.1
#1	.0009	.0068	-.0040	.0025	.0019	-.0038	.0049
#2	.0001	.0183	.0013	.0003	.0008	.0126	.0000

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.88	-.0007	.0017	.0172	.0005	.0009	.0001
SDev	1.06	.0003	.0005	.0015	.0002	.0003	.0014
%RSD	1.083	37.17	31.47	8.557	41.05	29.50	1226.
#1	97.13	-.0005	.0013	.0182	.0003	.0007	-.0008
#2	98.63	-.0009	.0020	.0161	.0006	.0011	.0011

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0009	-.0001	.0122	.0397	-.0002	.0029
SDev	.0000	.0012	.0000	.0019	.0090	.0001	.0009
%RSD	63.77	143.2	33.75	15.45	22.60	70.74	32.47
#1	.0000	-.0000	-.0002	.0135	.0461	-.0001	.0036
#2	.0000	.0017	-.0001	.0108	.0334	-.0003	.0023

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0004	.0003
SDev	.0000	.0001	.0000
%RSD	229.1	31.31	10.63
#1	.0000	.0003	.0003
#2	-.0000	.0004	.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	636883	10000	--	--	--	--	--
SDev	6895.706	.0000000	--	--	--	--	--
%RSD	1.082727	.0000000	--	--	--	--	--
#1	632007	10000	--	--	--	--	--
#2	641759	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235410-2 df200 Operator:
Run Time: 10/08/03 14:52:05
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00022	.0126	.0001	.0016	.0000	-.0001	.0010
SDev	.00088	.0092	.0014	.0004	.0001	.0001	.0013
%RSD	404.67	72.57	1916.	24.43	233.0	63.39	122.8
#1	.00084	.0191	-.0009	.0018	.0001	-.0001	.0001
#2	-.00040	.0061	.0011	.0013	-.0000	-.0001	.0019

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0228	.0002	.0022	.0003	.0018	-.0015	2.015
SDev	.0001	.0002	.0003	.0005	.0006	.0146	.000
%RSD	.5634	76.54	12.59	168.6	33.91	994.4	.0020
#1	.0228	.0004	.0024	.0007	.0022	.0089	2.015
#2	.0227	.0001	.0020	-.0001	.0014	-.0118	2.015

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0000	.0061	.0001	.0006	-.0007	-.2221
SDev	.0005	.0000	.0021	.0001	.0006	.0001	.0786
%RSD	99.53	1868.	33.75	58.41	107.1	16.79	35.38
#1	.0008	.0000	.0076	.0001	.0010	-.0006	-.1666
#2	.0001	-.0000	.0047	.0001	.0001	-.0008	-.2777

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.0322	.0032	-.0005	.0016	.0169	.0029
SDev	.0000	.0043	.0004	.0009	.0015	.0088	.0003
%RSD	.1640	13.41	13.55	181.2	92.67	51.63	10.30
#1	.0007	.0352	.0035	-.0011	.0026	.0231	.0031
#2	.0007	.0291	.0029	.0001	.0005	.0108	.0027

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.02	.0029	.0025	.0160	.0007	.0027	.0013
SDev	.44	.0005	.0021	.0015	.0004	.0016	.0022
%RSD	.4416	16.42	85.80	9.156	61.41	59.84	165.6
#1	98.71	.0026	.0010	.0171	.0004	.0015	-.0002
#2	99.32	.0033	.0040	.0150	.0011	.0038	.0029

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0012	.0001	.0127	.0447	.0002	.0023
SDev	.0000	.0003	.0004	.0057	.0150	.0007	.0009
%RSD	31.03	20.30	659.3	45.04	33.54	345.0	36.55
#1	.0001	.0011	.0004	.0087	.0553	.0007	.0029
#2	.0001	.0014	-.0002	.0168	.0341	-.0003	.0017

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0013	.0005
SDev	.0001	.0002	.0005
%RSD	163.7	18.24	109.3
#1	.0001	.0011	.0008
#2	-.0000	.0015	.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	644277	10000	--	--	--	--	--
SDev	2778.930	.0000000	--	--	--	--	--
%RSD	.4313253	.0000000	--	--	--	--	--
#1	642312	10000	--	--	--	--	--
#2	646242	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235411-1 df200 Operator:
Run Time: 10/08/03 14:57:34
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00001	.0127	.0018	.0017	.0001	-.0001	.0027
SDev	.00005	.0018	.0025	.0008	.0001	.0000	.0034
%RSD	766.13	14.44	138.1	44.20	47.95	87.69	127.5
#1	-.00004	.0114	.0036	.0023	.0002	-.0000	.0003
#2	.00003	.0140	.0000	.0012	.0001	-.0001	.0051

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0100	.0002	.0022	.0004	.0024	.0030	2.428
SDev	.0000	.0000	.0001	.0005	.0007	.0038	.009
%RSD	.0574	.1949	5.294	115.1	28.69	126.0	.3613
#1	.0100	.0002	.0021	.0008	.0029	.0057	2.434
#2	.0100	.0002	.0023	.0001	.0019	.0003	2.422

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0000	.0075	.0000	.0008	.1401	.0785
SDev	.0000	.0000	.0010	.0001	.0003	.0006	.0230
%RSD	2.213	104.4	13.08	508.0	33.52	.4131	29.34
#1	-.0001	.0001	.0068	-.0000	.0010	.1405	.0623
#2	-.0001	.0000	.0082	.0000	.0006	.1396	.0948

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.0128	-.0005	.0011	.0015	.0053	.0027
SDev	.0004	.0115	.0002	.0004	.0009	.0060	.0024
%RSD	61.43	89.66	46.40	39.80	64.93	112.2	90.66
#1	.0004	.0047	-.0006	.0008	.0021	.0095	.0044
#2	.0010	.0209	-.0003	.0015	.0008	.0011	.0010

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.36	.0015	.0031	.0172	.0006	.0026	.0005
SDev	.11	.0039	.0013	.0006	.0004	.0004	.0006
%RSD	.1146	259.6	43.12	3.224	61.57	15.91	112.0
#1	99.28	.0043	.0022	.0168	.0003	.0029	.0001
#2	99.44	-.0013	.0041	.0176	.0009	.0023	.0010

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	-.0017	-.0002	.0090	.0515	.0002	-.0010
SDev	.0000	.0005	.0001	.0087	.0048	.0004	.0009
%RSD	78.99	32.24	78.47	96.78	9.291	200.6	85.72
#1	.0000	-.0021	-.0001	.0151	.0549	.0005	-.0004
#2	.0000	-.0013	-.0003	.0028	.0482	-.0001	-.0016

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0000	.0009
SDev	.0001	.0001	.0001
%RSD	128.9	2214.	11.56
#1	.0001	-.0001	.0009
#2	.0000	.0001	.0008

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	646532	10000	--	--	--	--	--
SDev	726.1987	.0000000	--	--	--	--	--
%RSD	.1123222	.0000000	--	--	--	--	--
#1	646018	10000	--	--	--	--	--
#2	647045	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235411-1s df200 Operator:
Run Time: 10/08/03 15:03:03
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.05090	1.964	2.109	-.0072	2.076	.0559	-.0019
SDev	.00038	.008	.011	.0011	.003	.0001	.0011
%RSD	.75082	.3852	.5215	15.84	.1367	.2754	55.66
#1	.05063	1.969	2.101	-.0064	2.078	.0558	-.0012
#2	.05117	1.959	2.117	-.0080	2.074	.0560	-.0027

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	21.05	.0521	.5101	.2077	.2561	1.024	20.63
SDev	.02	.0001	.0013	.0008	.0001	.002	.01
%RSD	.1050	.2373	.2576	.3839	.0377	.1812	.0725
#1	21.04	.0521	.5111	.2082	.2561	1.026	20.62
#2	21.07	.0522	.5092	.2071	.2560	1.023	20.64

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0001	21.10	.5177	4.199	29.64	17.82
SDev	.0001	.0000	.00	.0011	.027	.00	.17
%RSD	42.23	13.70	.0014	.2069	.6437	.0165	.9508
#1	-.0002	.0001	21.10	.5184	4.180	29.64	17.70
#2	-.0001	.0001	21.10	.5169	4.218	29.65	17.94

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.5184	.0261	.5224	.5280	.0001	-.0005	.5142
SDev	.0023	.0030	.0034	.0007	.0010	.0006	.0012
%RSD	.4490	11.54	.6526	.1350	709.2	119.3	.2316
#1	.5200	.0283	.5200	.5285	-.0006	-.0009	.5133
#2	.5167	.0240	.5248	.5275	.0009	-.0001	.5150

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	98.26	2.161	2.166	.0153	.5256	2.162	.0001
SDev	.28	.008	.011	.0027	.0007	.010	.0007
%RSD	.2872	.3826	.5155	17.30	.1257	.4713	1012.
#1	98.06	2.155	2.158	.0134	.5251	2.155	-.0004
#2	98.46	2.167	2.174	.0172	.5261	2.169	.0006

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	-.0038	-.0001	2.204	.0489	.5135	4.162
SDev	.0000	.0001	.0000	.030	.0013	.0001	.018
%RSD	1.205	3.307	2.472	1.364	2.674	.0250	.4232
#1	.0002	-.0039	-.0001	2.183	.0480	.5136	4.149
#2	.0002	-.0037	-.0001	2.225	.0499	.5134	4.174

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.5182	.0022
SDev	.0001	.0047	.0006
%RSD	308.9	.9170	28.52
#1	-.0000	.5216	.0026
#2	.0001	.5148	.0017

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	639399	10000	--	--	--	--	--
SDev	1842.720	.0000000	--	--	--	--	--
%RSD	.2881957	.0000000	--	--	--	--	--
#1	638096	10000	--	--	--	--	--
#2	640702	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235411-2 df200 Operator:
Run Time: 10/08/03 15:08:31
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00016	.0156	.0022	.0013	.0006	-.0002	.0012
SDev	.00003	.0078	.0027	.0001	.0004	.0000	.0002
%RSD	19.071	50.35	125.7	10.18	63.22	25.94	15.75
#1	.00019	.0211	.0041	.0013	.0008	-.0002	.0013
#2	.00014	.0100	.0002	.0012	.0003	-.0001	.0010

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0290	.0003	.0020	.0004	.0012	-.0050	2.287
SDev	.0043	.0001	.0002	.0003	.0004	.0075	.019
%RSD	14.74	24.33	12.28	87.64	34.28	151.8	.8514
#1	.0320	.0004	.0021	.0006	.0015	-.0103	2.301
#2	.0259	.0003	.0018	.0001	.0009	.0004	2.273

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0001	.0114	.0001	.0059	.1412	.1338
SDev	.0003	.0000	.0066	.0001	.0036	.0042	.0303
%RSD	2586.	6.969	57.60	74.81	61.25	2.979	22.65
#1	.0003	.0001	.0161	.0002	.0085	.1442	.1552
#2	-.0002	.0001	.0068	.0000	.0034	.1383	.1124

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0012	.0104	.0005	.0017	.0002	.0159	.0021
SDev	.0003	.0083	.0003	.0017	.0006	.0001	.0010
%RSD	25.87	79.78	68.41	101.3	279.9	.9153	47.74
#1	.0015	.0163	.0002	.0005	.0006	.0158	.0028
#2	.0010	.0045	.0007	.0029	-.0002	.0160	.0014

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.74	.0012	.0016	.0193	.0013	.0015	.0000
SDev	.62	.0038	.0038	.0004	.0012	.0038	.0023
%RSD	.6175	316.8	232.9	2.138	97.18	253.0	6159.
#1	99.31	.0039	.0043	.0196	.0004	.0042	.0016
#2	100.2	-.0015	-.0011	.0190	.0021	-.0012	-.0016

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0020	-.0003	-.0059	.0489	-.0000	.0047
SDev	.0000	.0005	.0001	.0025	.0120	.0003	.0017
%RSD	23.00	26.60	36.72	42.63	24.51	698.7	36.27
#1	.0001	-.0024	-.0002	-.0041	.0574	.0002	.0035
#2	.0001	-.0017	-.0003	-.0077	.0404	-.0003	.0059

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0012	.0002
SDev	.0001	.0006	.0001
%RSD	775.4	49.60	48.80
#1	.0000	.0008	.0003
#2	-.0001	.0016	.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	649010	10000	--	--	--	--	--
SDev	4036.166	.0000000	--	--	--	--	--
%RSD	.6218957	.0000000	--	--	--	--	--
#1	646156	10000	--	--	--	--	--
#2	651864	10000	--	--	--	--	--

Analysis Report QC Standard 10/08/03 03:18:40 PM page 1

Method: DAILY1 Sample Name: icv/ccv Operator:
Run Time: 10/08/03 15:13:40
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.0226	10.34	5.142	4.900	10.43	1.088	5.169
SDev	.0027	.02	.018	.022	.06	.003	.019
%RSD	.26179	.1612	.3416	.4432	.5515	.2790	.3655
#1	1.0207	10.35	5.130	4.885	10.47	1.086	5.182
#2	1.0245	10.33	5.155	4.916	10.39	1.090	5.155
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.0000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.000	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	20.18	.9987	4.977	2.028	2.112	10.24	19.28
SDev	.02	.0040	.006	.002	.001	.03	.15
%RSD	.0793	.4058	.1201	.0756	.0594	.2547	.7721
#1	20.19	1.002	4.981	2.029	2.111	10.26	19.39
#2	20.17	.9959	4.972	2.027	2.113	10.22	19.18
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	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.210	5.121	20.53	1.033	5.065	Q47.46	28.23
SDev	.014	.040	.03	.001	.018	.29	.20
%RSD	.2683	.7898	.1297	.0761	.3629	.6017	.7035
#1	5.220	5.150	20.51	1.034	5.052	Q47.66	28.37
#2	5.200	5.093	20.55	1.033	5.078	Q47.25	28.09
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail	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	4.997	5.126	5.162	5.200	1.034	1.060	1.030
SDev	.027	.075	.030	.029	.001	.002	.002
%RSD	.5443	1.462	.5890	.5666	.0926	.2067	.2306
#1	5.016	5.179	5.184	5.221	1.034	1.058	1.032
#2	4.978	5.073	5.141	5.179	1.033	1.062	1.028
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	97.54	5.533	5.474	5.046	5.182	5.488	4.977
SDev	.52	.016	.024	.002	.030	.011	.007
%RSD	.5321	.2809	.4447	.0481	.5740	.2011	.1345
#1	97.17	5.522	5.491	5.048	5.203	5.496	4.972
#2	97.90	5.544	5.457	5.044	5.161	5.481	4.982
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	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.417	1.003	4.996	5.486	1.021	5.095	.9895
SDev	.026	.007	.000	.048	.004	.001	.0043
%RSD	.4822	.7083	.0026	.8676	.3723	.0114	.4355
#1	5.436	1.008	4.996	5.452	1.023	5.095	.9925
#2	5.399	.9981	4.996	Q5.519	1.018	5.096	.9864
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	5.152	.9887	5.021
SDev	.015	.0036	.002
%RSD	.2928	.3643	.0460
#1	5.163	.9862	5.020
#2	5.142	.9913	5.023
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	634684	10000	--	--	--	--	--
SDev	3417.447	.0000000	--	--	--	--	--
%RSD	.5384490	.0000000	--	--	--	--	--
#1	632267	10000	--	--	--	--	--
#2	637100	10000	--	--	--	--	--

Analysis Report Blank Sample 10/08/03 03:26:10 PM page 1

Method: DAILY1 Sample Name: icb/ccb Operator:
Run Time: 10/08/03 15:21:11
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00013	.0050	-.0008	.0009	.0005	.0001	.0028
SDev	.00070	.0068	.0020	.0005	.0000	.0000	.0002
%RSD	524.29	135.2	262.7	57.77	3.399	18.01	6.479
#1	-.00036	.0099	-.0022	.0006	.0005	.0001	.0027
#2	.00062	.0002	.0007	.0013	.0005	.0001	.0029
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.00500	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.00500	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0190	.0004	.0008	.0002	.0006	.0007	.0055
SDev	.0013	.0001	.0007	.0005	.0001	.0055	.0092
%RSD	7.039	15.70	87.07	190.8	10.82	811.6	168.1
#1	.0180	.0004	.0003	-.0001	.0005	-.0032	-.0010
#2	.0199	.0003	.0013	.0006	.0006	.0046	.0120
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	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0001	.0004	.0002	.0034	-.0053	-.0073
SDev	.0003	.0000	.0040	.0001	.0010	.0004	.0691
%RSD	102.0	13.28	1071.	30.15	28.73	7.257	941.7
#1	.0001	.0001	-.0025	.0001	.0041	-.0055	L-.0562
#2	.0006	.0001	.0032	.0002	.0027	-.0050	.0415
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	.0005	H.0249	.0006	-.0004	.0020	H.0129	.0017
SDev	.0003	.0133	.0018	.0000	.0021	.0067	.0008
%RSD	64.85	53.49	309.0	4.978	102.2	51.70	48.29
#1	.0003	H.0155	.0019	-.0004	.0006	H.0177	.0011
#2	.0007	H.0343	-.0007	-.0005	.0035	.0082	.0023
Errors	LC Pass	LC High	NOCHECK	NOCHECK	LC Pass	LC High	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	101.2	.0016	-.0001	-.0016	-.0001	.0004	.0006
SDev	1.2	.0003	.0032	.0000	.0006	.0020	.0007
%RSD	1.176	17.05	2172.	1.153	620.9	463.6	115.3
#1	100.3	.0017	-.0024	-.0016	.0003	-.0010	.0011
#2	102.0	.0014	.0021	-.0016	-.0005	.0019	.0001
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	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0003	.0001	.0073	.0113	.0001	.0026
SDev	.0000	.0047	.0002	.0059	.0119	.0000	.0003
%RSD	4.257	1740.	193.2	80.29	104.7	3.678	10.81
#1	.0005	-.0031	-.0000	H.0114	.0029	.0001	.0028
#2	.0005	.0036	.0003	.0032	.0197	.0001	.0024
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	.0003	.0001	.0007
SDev	.0001	.0007	.0003
%RSD	22.49	955.0	44.90
#1	.0003	-.0004	.0005
#2	.0002	.0006	.0009
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	658279	10000	--	--	--	--	--
SDev	7725.849	.0000000	--	--	--	--	--
%RSD	1.173644	.0000000	--	--	--	--	--
#1	652816	10000	--	--	--	--	--
#2	663742	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235412-1 df200 Operator:
Run Time: 10/08/03 15:26:20
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00038	.0103	.0020	.0043	.0001	-.0000	-.0024
SDev	.00016	.0060	.0016	.0002	.0000	.0003	.0025
%RSD	41.663	58.05	79.82	3.863	2.890	2077.	103.4
#1	-.00049	.0145	.0032	.0042	.0002	.0002	-.0042
#2	-.00027	.0061	.0009	.0044	.0001	-.0002	-.0006

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1003	.0001	.0023	-.0002	.0006	-.0004	96.82
SDev	.0013	.0002	.0002	.0001	.0001	.0049	1.29
%RSD	1.256	160.1	7.384	44.85	17.67	1324.	1.329
#1	.1012	-.0000	.0022	-.0002	.0007	-.0039	95.91
#2	.0994	.0003	.0024	-.0001	.0005	.0031	97.73

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0001	.0057	.0000	.0014	.0146	-.0826
SDev	.0005	.0000	.0015	.0000	.0002	.0058	.1249
%RSD	269.0	5.801	26.34	6.928	13.94	39.45	151.2
#1	-.0005	.0001	.0046	.0000	.0016	.0105	.0057
#2	.0002	.0001	.0068	.0000	.0013	.0187	-.1710

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0020	.0186	.0013	.0000	-.0003	.0007	.0012
SDev	.0004	.0014	.0001	.0016	.0027	.0102	.0004
%RSD	20.52	7.387	3.558	5589.	910.8	1420.	31.15
#1	.0017	.0195	.0012	.0012	-.0022	-.0065	.0010
#2	.0023	.0176	.0013	-.0011	.0016	.0079	.0015

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.59	-.0014	-.0013	.2634	.0004	-.0013	-.0023
SDev	.91	.0017	.0005	.0034	.0011	.0002	.0025
%RSD	.9131	119.4	41.61	1.300	242.1	14.44	112.5
#1	100.2	-.0026	-.0009	.2609	.0012	-.0015	-.0005
#2	98.94	-.0002	-.0017	.2658	-.0003	-.0012	-.0041

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0028	-.0004	.0045	.0567	-.0002	.0043
SDev	.0000	.0002	.0000	.0067	.0146	.0001	.0020
%RSD	7.795	5.403	2.336	148.9	25.71	72.81	46.87
#1	.0001	-.0027	-.0005	-.0002	.0670	-.0003	.0028
#2	.0001	-.0030	-.0004	.0092	.0464	-.0001	.0057

010075

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0026	.0002
SDev	.0000	.0009	.0000
%RSD	111.1	34.15	8.108
#1	.0001	.0020	.0002
#2	.0000	.0032	.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	647954	10000	--	--	--	--	--
SDev	5903.634	.0000000	--	--	--	--	--
%RSD	.9111187	.0000000	--	--	--	--	--
#1	652129	10000	--	--	--	--	--
#2	643780	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235412-2 df200 Operator:
Run Time: 10/08/03 15:31:29
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00034	.0115	.0020	.0042	.0002	.0001	.0016
SDev	.00010	.0047	.0013	.0002	.0000	.0000	.0006
%RSD	29.465	41.03	64.65	5.530	12.84	20.32	39.33
#1	.00027	.0082	.0011	.0041	.0002	.0001	.0012
#2	.00041	.0148	.0029	.0044	.0001	.0001	.0021

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0814	.0003	.0022	.0004	.0000	.0030	99.26
SDev	.0017	.0002	.0007	.0000	.0003	.0022	.64
%RSD	2.072	72.25	31.29	3.330	683.4	72.42	.6414
#1	.0802	.0001	.0017	.0004	.0002	.0046	98.81
#2	.0826	.0004	.0026	.0004	-.0002	.0015	99.71

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	.0002	.0128	.0001	.0017	.0217	-.0117
SDev	.0001	.0000	.0024	.0000	.0013	.0000	.0684
%RSD	9.954	5.612	18.75	17.32	75.82	.0174	586.0
#1	.0008	.0001	.0145	.0001	.0027	.0217	.0367
#2	.0009	.0002	.0111	.0002	.0008	.0217	-.0600

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0021	.0182	-.0015	.0011	.0009	.0158	.0028
SDev	.0001	.0133	.0025	.0012	.0016	.0014	.0026
%RSD	5.145	73.11	168.1	106.4	182.5	8.676	93.04
#1	.0021	.0277	-.0033	.0020	-.0003	.0148	.0046
#2	.0022	.0088	.0003	.0003	.0020	.0167	.0010

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.52	.0003	.0009	.2723	.0003	.0007	.0021
SDev	.70	.0002	.0027	.0024	.0000	.0019	.0019
%RSD	.7028	69.96	292.1	.8990	15.30	255.0	92.15
#1	100.0	.0002	-.0010	.2706	.0002	-.0006	.0034
#2	99.03	.0005	.0029	.2740	.0003	.0021	.0007

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0001	.0001	.0109	.0681	-.0003	.0016
SDev	.0000	.0022	.0003	.0045	.0195	.0000	.0023
%RSD	4.862	3978.	359.3	41.40	28.69	3.796	146.0
#1	.0001	.0016	.0003	.0077	.0543	-.0003	.0032
#2	.0001	-.0015	-.0001	.0141	.0819	-.0003	-.0001

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0012	.0009
SDev	.0001	.0001	.0000
%RSD	83.33	8.965	2.222
#1	.0001	.0013	.0010
#2	.0000	.0011	.0009

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	647586	10000	--	--	--	--	--
SDev	4553.768	.0000000	--	--	--	--	--
%RSD	.7031912	.0000000	--	--	--	--	--
#1	650806	10000	--	--	--	--	--
#2	644366	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235413-1 df200 Operator:
Run Time: 10/08/03 15:36:38
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00008	.0082	.0019	.0078	.0001	-.0001	.0028
SDev	.00071	.0037	.0026	.0010	.0000	.0002	.0006
%RSD	866.44	45.22	137.0	12.56	21.73	190.9	19.69
#1	.00042	.0109	.0001	.0085	.0001	.0000	.0032
#2	-.00059	.0056	.0037	.0071	.0001	-.0002	.0024

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0188	.0003	.0024	-.0001	.0010	-.0091	129.0
SDev	.0005	.0001	.0001	.0001	.0004	.0056	.6
%RSD	2.836	43.07	4.941	48.29	42.78	61.21	.4783
#1	.0192	.0004	.0025	-.0001	.0007	-.0052	129.4
#2	.0185	.0002	.0023	-.0001	.0013	-.0130	128.5

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	.0002	.0078	-.0000	.0001	.0323	.0596
SDev	.0006	.0000	.0016	.0000	.0004	.0016	.1314
%RSD	105.0	3.646	19.99	266.2	377.2	4.887	220.3
#1	.0010	.0002	.0089	.0000	.0004	.0312	.1525
#2	.0002	.0002	.0067	-.0000	-.0002	.0334	-.0333

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0013	.0083	.0018	.0004	.0009	.0044	.0029
SDev	.0007	.0085	.0031	.0010	.0006	.0136	.0011
%RSD	57.49	102.7	176.2	226.8	68.56	310.3	36.49
#1	.0018	.0023	-.0004	-.0003	.0004	.0140	.0037
#2	.0008	.0143	.0040	.0011	.0013	-.0052	.0022

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.3	.0039	-.0005	.3670	.0009	.0010	-.0024
SDev	.4	.0011	.0026	.0018	.0017	.0014	.0006
%RSD	.3764	27.33	559.6	.4967	192.9	132.0	27.34
#1	99.98	.0032	.0014	.3683	-.0003	.0020	-.0019
#2	100.5	.0047	-.0023	.3658	.0021	.0001	-.0028

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0009	-.0000	.0072	.0587	-.0002	.0038
SDev	.0000	.0013	.0005	.0038	.0174	.0001	.0002
%RSD	44.94	135.5	4882.	52.60	29.71	76.51	6.225
#1	.0001	-.0000	.0003	.0045	.0710	-.0001	.0040
#2	.0000	-.0018	-.0004	.0099	.0464	-.0003	.0036

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0010	.0003
SDev	.0000	.0004	.0002
%RSD	22.95	34.93	63.72
#1	-.0000	.0008	.0005
#2	-.0001	.0013	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	652318	10000	--	--	--	--	--
SDev	2399.920	.0000000	--	--	--	--	--
%RSD	.3679065	.0000000	--	--	--	--	--
#1	650621	10000	--	--	--	--	--
#2	654015	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235413-2 df200 Operator:
Run Time: 10/08/03 15:41:47
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00010	.0085	-.0008	.0079	.0001	-.0000	.0007
SDev	.00006	.0003	.0013	.0002	.0000	.0001	.0019
%RSD	54.116	3.632	151.7	2.746	9.325	711.0	251.1
#1	-.00014	.0087	-.0017	.0078	.0002	-.0001	-.0006
#2	-.00006	.0083	.0001	.0081	.0001	.0000	.0021

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0252	.0003	.0022	-.0001	.0023	.0016	128.1
SDev	.0002	.0000	.0005	.0000	.0010	.0022	.6
%RSD	.6191	11.87	22.67	.6197	42.69	141.6	.4604
#1	.0253	.0003	.0026	-.0001	.0016	.0031	127.7
#2	.0251	.0003	.0019	-.0001	.0030	-.0000	128.5

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0002	.0060	-.0000	.0009	.0320	.0602
SDev	.0001	.0000	.0000	.0000	.0001	.0024	.0352
%RSD	16.23	1.195	.1896	.1768	15.08	7.398	58.39
#1	.0004	.0002	.0060	-.0000	.0008	.0304	.0354
#2	.0005	.0002	.0060	-.0000	.0010	.0337	.0851

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0013	.0195	-.0030	.0021	.0005	.0004	.0004
SDev	.0001	.0058	.0042	.0015	.0013	.0041	.0010
%RSD	11.18	29.86	141.1	72.02	267.4	918.2	280.7
#1	.0014	.0236	-.0000	.0010	.0014	.0033	.0011
#2	.0012	.0154	-.0059	.0032	-.0004	-.0025	-.0004

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.2	-.0057	.0039	.3641	.0004	.0007	-.0021
SDev	.8	.0024	.0023	.0009	.0004	.0023	.0060
%RSD	.7628	42.84	59.00	.2485	83.48	328.9	283.7
#1	101.7	-.0074	.0023	.3648	.0007	-.0009	.0021
#2	102.8	-.0039	.0055	.3635	.0002	.0024	-.0064

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0002	-.0002	-.0002	.0622	-.0001	.0024
SDev	.0000	.0022	.0001	.0032	.0032	.0000	.0003
%RSD	24.69	1293.	27.46	1771.	5.204	6.404	11.66
#1	.0001	-.0017	-.0002	.0021	.0599	-.0001	.0022
#2	.0001	.0014	-.0002	-.0024	.0645	-.0001	.0026

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0020	.0008
SDev	.0000	.0001	.0002
%RSD	68.81	6.884	27.03
#1	.0001	.0021	.0010
#2	.0000	.0019	.0007

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	665168	10000	--	--	--	--	--
SDev	5065.713	.0000000	--	--	--	--	--
%RSD	.7615690	.0000000	--	--	--	--	--
#1	661586	10000	--	--	--	--	--
#2	668750	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: icv/ccv Operator:
Run Time: 10/08/03 15:51:37
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.0219	10.27	5.186	4.917	10.40	1.094	5.186
SDev	.0047	.02	.007	.016	.08	.006	.013
%RSD	.45859	.1465	.1434	.3155	.7977	.5637	.2518
#1	1.0252	10.28	5.191	4.928	10.46	1.099	5.195
#2	1.0186	10.26	5.181	4.906	10.34	1.090	5.177
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.0000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.000	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	20.24	1.007	4.987	2.026	2.105	10.23	19.16
SDev	.01	.004	.029	.009	.004	.03	.09
%RSD	.0446	.3671	.5786	.4667	.2035	.2919	.4727
#1	20.24	1.009	5.008	2.033	2.108	10.26	19.10
#2	20.23	1.004	4.967	2.019	2.102	10.21	19.23
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	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.194	5.074	20.53	1.033	5.080	Q46.92	27.94
SDev	.008	.001	.07	.005	.007	.07	.21
%RSD	.1522	.0260	.3558	.4475	.1453	.1466	.7615
#1	5.199	5.073	20.58	1.036	5.075	Q46.87	27.79
#2	5.188	5.075	20.48	1.030	5.085	Q46.97	28.09
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail	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	5.022	5.436	5.138	5.203	1.033	1.047	1.031
SDev	.020	.000	.075	.073	.001	.000	.001
%RSD	.3991	.0082	1.461	1.411	.1424	.0058	.0561
#1	5.036	5.436	5.191	5.255	1.032	1.047	1.031
#2	5.008	5.437	5.085	5.151	1.034	1.047	1.030
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	100.5	5.489	5.500	5.036	5.176	5.491	5.011
SDev	1.5	.085	.072	.028	.074	.076	.008
%RSD	1.512	1.541	1.318	.5586	1.428	1.392	.1601
#1	99.44	5.548	5.552	5.056	5.229	Q5.545	5.016
#2	101.6	5.429	5.449	5.016	5.124	5.437	5.005
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	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.400	.9999	4.987	5.490	1.019	5.092	1.001
SDev	.025	.0066	.003	.051	.025	.019	.000
%RSD	.4690	.6650	.0570	.9279	2.427	.3652	.0086
#1	5.418	1.005	4.989	5.454	1.001	5.105	1.001
#2	5.382	.9952	4.985	Q5.526	1.036	5.079	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	5.136	.9957	5.007
SDev	.007	.0004	.001
%RSD	.1311	.0401	.0237
#1	5.141	.9955	5.007
#2	5.132	.9960	5.008
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	653990	10000	--	--	--	--	--
SDev	9847.169	.0000000	--	--	--	--	--
%RSD	1.505706	.0000000	--	--	--	--	--
#1	647027	10000	--	--	--	--	--
#2	660953	10000	--	--	--	--	--

Analysis Report Blank Sample 10/08/03 04:05:04 PM page 1

Method: DAILY1 Sample Name: icb/ccb Operator:
Run Time: 10/08/03 15:59:42
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00016	.0070	.0002	-.0001	.0003	-.0001	.0021
SDev	.00015	.0103	.0014	.0004	.0001	.0000	.0028
%RSD	93.477	146.3	767.2	460.4	44.81	26.73	131.7
#1	-.00027	.0143	.0012	.0002	.0003	-.0001	.0041
#2	-.00006	-.0002	-.0008	-.0003	.0002	-.0001	.0001
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.00500	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.00500	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0348	.0002	.0005	.0001	.0005	-.0013	-.0012
SDev	.0016	.0000	.0002	.0005	.0003	.0030	.0110
%RSD	4.512	7.418	37.69	662.4	75.03	236.6	922.8
#1	.0359	.0003	.0006	.0004	.0007	.0009	.0066
#2	.0337	.0002	.0004	-.0003	.0002	-.0034	-.0090
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	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0000	-.0010	.0000	.0023	-.0060	L-.0808
SDev	.0001	.0001	.0000	.0000	.0013	.0015	.1044
%RSD	51.03	152.6	3.055	75.93	54.58	24.70	129.1
#1	.0003	.0001	-.0010	.0001	.0032	-.0049	-.0070
#2	.0001	-.0000	-.0010	.0000	.0014	-.0070	L-.1547
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Low
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	.0002	H.0158	.0013	-.0014	.0004	H.0245	.0023
SDev	.0005	.0062	.0008	.0009	.0013	.0061	.0018
%RSD	222.6	39.18	63.22	62.79	368.5	24.90	80.92
#1	-.0001	H.0115	.0019	-.0020	.0013	H.0202	.0035
#2	.0006	H.0202	.0007	-.0008	-.0006	H.0288	.0010
Errors	LC Pass	LC High	NOCHECK	NOCHECK	LC Pass	LC High	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	101.0	.0061	.0019	-.0004	-.0005	.0033	-.0032
SDev	1.0	.0018	.0057	.0024	.0003	.0032	.0021
%RSD	.9984	28.51	300.2	550.9	62.39	96.78	65.24
#1	100.2	.0074	-.0021	-.0021	-.0007	.0010	-.0017
#2	101.7	.0049	.0059	.0012	-.0003	H.0056	-.0047
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	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0008	-.0000	.0054	.0005	-.0002	.0019
SDev	.0001	.0015	.0001	.0072	.0024	.0001	.0014
%RSD	11.06	188.0	504.6	134.1	431.6	77.82	71.70
#1	.0005	.0018	-.0001	.0003	-.0011	-.0003	.0009
#2	.0005	-.0003	.0000	H.0104	.0022	-.0001	.0029
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	.0008	.0004
SDev	.0001	.0003	.0002
%RSD	200.0	33.74	62.26
#1	.0001	.0010	.0005
#2	-.0000	.0006	.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	656835	10000	--	--	--	--	--
SDev	6573.265	.0000000	--	--	--	--	--
%RSD	1.000748	.0000000	--	--	--	--	--
#1	652187	10000	--	--	--	--	--
#2	661483	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235410-1 df33 Operator:
Run Time: 10/08/03 16:05:14
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00005	.0296	.0032	.0054	.0007	-.0000	.0012
SDev	.00050	.0019	.0051	.0004	.0005	.0000	.0052
%RSD	1113.6	6.584	159.9	6.574	72.12	27.12	434.2
#1	.00031	.0310	-.0004	.0057	.0010	-.0000	.0049
#2	-.00040	.0283	.0068	.0052	.0003	-.0001	-.0025

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0649	.0004	.0023	.0010	.0007	-.0005	14.68
SDev	.0013	.0002	.0004	.0001	.0002	.0030	.07
%RSD	1.919	65.92	17.09	5.365	33.28	587.4	.4867
#1	.0658	.0005	.0026	.0009	.0009	-.0026	14.63
#2	.0641	.0002	.0021	.0010	.0005	.0016	14.73

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.0002	.0110	.0001	.0009	.0324	-.0335
SDev	.0004	.0003	.0026	.0001	.0009	.0042	.0211
%RSD	48.48	116.0	23.45	99.90	92.85	12.87	62.89
#1	.0010	.0004	.0128	.0001	.0003	.0353	-.0186
#2	.0005	.0000	.0092	.0000	.0015	.0294	-.0484

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0024	.0151	.0034	.0011	-.0000	.0391	.0010
SDev	.0000	.0267	.0012	.0008	.0001	.0012	.0015
%RSD	1.573	176.6	35.65	77.29	2364.	2.978	145.0
#1	.0024	.0340	.0026	.0005	-.0001	.0383	.0021
#2	.0024	-.0038	.0043	.0016	.0001	.0400	-.0000

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	95.80	-.0029	.0042	.0888	.0018	.0019	.0027
SDev	.44	.0002	.0017	.0001	.0009	.0012	.0024
%RSD	.4634	5.634	39.35	.1233	51.50	62.49	88.84
#1	96.11	-.0028	.0054	.0888	.0012	.0027	.0044
#2	95.48	-.0030	.0031	.0889	.0025	.0010	.0010

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	-.0020	.0002	.0023	.0459	-.0002	.0018
SDev	.0003	.0013	.0006	.0001	.0112	.0001	.0034
%RSD	83.11	65.22	343.6	2.888	24.48	67.40	191.4
#1	.0006	-.0011	.0006	.0024	.0539	-.0001	-.0006
#2	.0002	-.0030	-.0002	.0023	.0380	-.0003	.0041

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0002	.0018	.0006
SDev	.0002	.0004	.0002
%RSD	104.9	20.52	28.49
#1	.0004	.0021	.0007
#2	.0001	.0016	.0004

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	623358	10000	--	--	--	--	--
SDev	2866.611	.0000000	--	--	--	--	--
%RSD	.4598659	.0000000	--	--	--	--	--
#1	625385	10000	--	--	--	--	--
#2	621331	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235410-1d df33 Operator:
Run Time: 10/08/03 16:10:43
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00039	.0137	.0017	.0045	.0002	-.0001	.0009
SDev	.00026	.0096	.0001	.0005	.0003	.0001	.0047
%RSD	67.250	69.90	5.652	11.72	184.1	217.0	545.1
#1	.00020	.0205	.0018	.0049	-.0001	-.0002	.0042
#2	.00058	.0069	.0016	.0042	.0004	.0000	-.0025

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0637	.0004	.0020	-.0004	-.0000	-.0184	14.64
SDev	.0002	.0001	.0002	.0023	.0014	.0381	.27
%RSD	.3100	33.32	8.982	612.5	6217.	206.8	1.845
#1	.0636	.0003	.0022	-.0020	-.0010	-.0453	14.83
#2	.0639	.0004	.0019	.0012	.0010	.0085	14.44

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0001	.0105	-.0001	.0004	.0313	.0924
SDev	.0002	.0000	.0032	.0003	.0014	.0056	.0763
%RSD	36.32	.4099	30.42	224.7	347.9	17.83	82.63
#1	.0006	.0001	.0128	-.0004	-.0006	.0352	.1464
#2	.0004	.0001	.0083	.0001	.0014	.0273	.0384

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0011	.0084	.0121	-.0057	.0006	.0313	.0027
SDev	.0011	.0139	.0153	.0091	.0031	.0046	.0004
%RSD	95.88	164.4	126.9	160.0	482.2	14.79	16.81
#1	.0004	-.0014	.0229	-.0121	.0029	.0280	.0024
#2	.0019	.0183	.0012	.0007	-.0016	.0346	.0030

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.21	.0077	-.0046	.0903	.0002	-.0005	.0034
SDev	2.03	.0089	.0062	.0011	.0009	.0011	.0021
%RSD	2.093	115.7	133.7	1.179	394.9	230.0	61.78
#1	95.77	.0140	-.0090	.0896	-.0004	-.0013	.0019
#2	98.65	.0014	-.0003	.0911	.0009	.0003	.0048

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	-.0072	.0005	.0018	.0477	-.0014	.0026
SDev	.0000	.0048	.0003	.0056	.0114	.0021	.0005
%RSD	3.081	66.40	70.94	308.5	23.87	153.6	18.06
#1	.0009	-.0106	.0007	.0057	.0397	-.0029	.0022
#2	.0009	-.0038	.0002	-.0021	.0558	.0001	.0029

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0002	.0012	-.0008
SDev	.0004	.0000	.0021
%RSD	210.2	3.190	280.5
#1	-.0005	.0012	-.0022
#2	.0001	.0011	.0007

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	632549	10000	--	--	--	--	--
SDev	13167.74	.0000000	--	--	--	--	--
%RSD	2.081695	.0000000	--	--	--	--	--
#1	623238	10000	--	--	--	--	--
#2	641860	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235410-2 df33 Operator:
Run Time: 10/08/03 16:16:11
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00009	.0198	.0018	.0048	.0004	.0000	.0051
SDev	.00040	.0032	.0034	.0005	.0000	.0002	.0001
%RSD	441.99	16.36	190.0	9.619	4.742	638.1	2.240
#1	.00037	.0221	-.0006	.0044	.0004	.0001	.0052
#2	-.00019	.0175	.0041	.0051	.0004	-.0001	.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0708	.0004	.0021	.0013	.0080	.0036	14.52
SDev	.0006	.0002	.0001	.0001	.0001	.0029	.09
%RSD	.9107	49.63	5.824	6.976	1.270	82.17	.6020
#1	.0713	.0006	.0021	.0012	.0079	.0015	14.58
#2	.0704	.0003	.0020	.0013	.0081	.0057	14.45

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.0001	.0100	.0001	.0011	.0514	.0410
SDev	.0010	.0000	.0036	.0000	.0004	.0005	.0142
%RSD	136.6	48.83	35.69	23.12	37.33	1.005	34.59
#1	.0014	.0001	.0126	.0001	.0008	.0510	.0510
#2	.0000	.0000	.0075	.0001	.0014	.0517	.0309

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0028	.0249	.0023	.0029	.0000	.0449	.0039
SDev	.0005	.0096	.0032	.0019	.0024	.0207	.0018
%RSD	16.93	38.59	141.3	67.63	72870.	46.10	47.27
#1	.0031	.0316	.0046	.0015	.0017	.0303	.0052
#2	.0025	.0181	.0000	.0043	-.0017	.0595	.0026

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.03	.0032	.0002	.0900	.0027	.0012	.0026
SDev	.31	.0029	.0047	.0005	.0002	.0022	.0005
%RSD	.3116	90.16	2824.	.5669	8.024	182.1	18.55
#1	98.82	.0053	-.0032	.0896	.0025	-.0003	.0023
#2	99.25	.0012	.0035	.0903	.0028	.0027	.0029

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0002	.0001	-.0039	.0593	.0003	.0022
SDev	.0000	.0004	.0004	.0035	.0201	.0003	.0010
%RSD	24.04	194.3	349.7	88.17	33.96	90.85	44.50
#1	.0002	.0005	.0004	-.0064	.0736	.0001	.0015
#2	.0001	-.0001	-.0002	-.0015	.0451	.0005	.0029

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0048	.0005
SDev	.0001	.0000	.0002
%RSD	379.4	.3395	41.60
#1	-.0000	.0048	.0007
#2	.0001	.0048	.0004

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	644383	10000	--	--	--	--	--
SDev	1967.171	.0000000	--	--	--	--	--
%RSD	.3052798	.0000000	--	--	--	--	--
#1	642992	10000	--	--	--	--	--
#2	645774	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235411-1 df33 Operator:
Run Time: 10/08/03 16:21:41
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00064	.0080	.0012	.0064	.0004	-.0001	.0016
SDev	.00016	.0015	.0020	.0007	.0000	.0000	.0025
%RSD	24.666	18.81	160.0	10.77	.3916	14.27	158.4
#1	.00076	.0090	.0026	.0069	.0004	-.0001	.0034
#2	.00053	.0069	-.0002	.0059	.0004	-.0001	-.0002

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0482	.0004	.0020	.0011	.0032	.0056	17.53
SDev	.0002	.0001	.0000	.0000	.0001	.0060	.08
%RSD	.3956	25.54	.5864	1.671	1.674	106.6	.4382
#1	.0480	.0003	.0020	.0010	.0032	.0098	17.58
#2	.0483	.0005	.0019	.0011	.0032	.0014	17.48

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0011	.0001	.0106	.0001	.0003	1.105	.6833
SDev	.0006	.0000	.0034	.0000	.0004	.005	.0175
%RSD	60.86	2.207	32.07	3.458	122.7	.4507	2.562
#1	.0015	.0001	.0082	.0001	.0006	1.108	.6709
#2	.0006	.0001	.0131	.0001	.0000	1.101	.6956

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0025	.0216	.0024	.0034	.0012	.0408	.0030
SDev	.0007	.0203	.0022	.0019	.0010	.0048	.0010
%RSD	28.71	94.02	91.20	55.04	87.90	11.66	33.01
#1	.0020	.0359	.0039	.0021	.0019	.0374	.0037
#2	.0030	.0072	.0008	.0047	.0004	.0442	.0023

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.5	.0053	.0002	.1121	.0030	.0019	.0029
SDev	1.1	.0014	.0018	.0016	.0005	.0017	.0011
%RSD	1.097	26.31	726.1	1.454	17.09	86.22	37.46
#1	99.74	.0062	.0015	.1133	.0027	.0031	.0022
#2	101.3	.0043	-.0010	.1110	.0034	.0008	.0037

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	-.0001	.0001	.0104	.0747	.0002	.0032
SDev	.0000	.0010	.0001	.0112	.0098	.0004	.0007
%RSD	6.566	1832.	62.31	106.8	13.11	193.1	21.38
#1	.0002	-.0008	.0002	.0183	.0678	.0005	.0037
#2	.0002	.0007	.0001	.0026	.0816	-.0001	.0027

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0017	.0009
SDev	.0001	.0001	.0001
%RSD	50.92	5.545	9.089
#1	.0001	.0017	.0010
#2	.0001	.0018	.0009

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	654059	10000	--	--	--	--	--
SDev	7174.305	.0000000	--	--	--	--	--
%RSD	1.096890	.0000000	--	--	--	--	--
#1	648986	10000	--	--	--	--	--
#2	659132	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235411-1s df33 Operator:
Run Time: 10/08/03 16:27:10
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.05118	1.980	2.107	.0001	2.069	.0561	.0010
SDev	.00051	.004	.016	.0019	.001	.0001	.0004
%RSD	1.0025	.2173	.7675	1602.	.0560	.1043	42.33
#1	.05082	1.977	2.096	-.0012	2.070	.0561	.0013
#2	.05154	1.983	2.118	.0015	2.068	.0560	.0007

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	21.10	.0520	.5100	.2073	.2571	1.035	39.44
SDev	.09	.0000	.0032	.0009	.0005	.001	.03
%RSD	.4378	.0054	.6198	.4340	.1931	.1372	.0814
#1	21.04	.0520	.5077	.2067	.2567	1.034	39.42
#2	21.17	.0520	.5122	.2080	.2574	1.036	39.47

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	.0002	21.14	.5133	4.179	32.41	19.34
SDev	.0000	.0000	.10	.0035	.038	.03	.04
%RSD	1.760	14.80	.4696	.6759	.9127	.0801	.2085
#1	.0009	.0002	21.07	.5109	4.152	32.39	19.31
#2	.0009	.0002	21.21	.5158	4.206	32.43	19.36

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.5191	.0300	.5281	.5268	.0022	.0406	.5152
SDev	.0019	.0014	.0001	.0029	.0017	.0091	.0063
%RSD	.3730	4.677	.0216	.5479	76.27	22.41	1.223
#1	.5204	.0310	.5280	.5288	.0010	.0342	.5107
#2	.5177	.0290	.5282	.5248	.0034	.0470	.5196

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	98.80	2.162	2.170	.1309	.5267	2.165	.0030
SDev	.39	.009	.033	.0054	.0019	.019	.0033
%RSD	.3958	.4117	1.502	4.127	.3578	.8657	109.2
#1	98.53	2.168	2.147	.1271	.5280	2.152	.0007
#2	99.08	2.156	2.193	.1348	.5254	2.178	.0053

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	-.0087	.0003	2.195	.0685	.5123	4.168
SDev	.0000	.0012	.0000	.009	.0052	.0025	.028
%RSD	.4716	14.03	5.739	.4047	7.517	.4944	.6797
#1	.0004	-.0078	.0003	2.189	.0648	.5105	4.148
#2	.0004	-.0096	.0003	2.201	.0721	.5140	4.188

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.5212	.0031
SDev	.0000	.0067	.0001
%RSD	18.00	1.288	4.968
#1	.0001	.5165	.0032
#2	.0001	.5260	.0030

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	642912	10000	--	--	--	--	--
SDev	2541.342	.0000000	--	--	--	--	--
%RSD	.3952861	.0000000	--	--	--	--	--
#1	641115	10000	--	--	--	--	--
#2	644709	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235411-2 df33 Operator:
Run Time: 10/08/03 16:32:40
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00022	.0290	-.0002	.0059	.0009	.0000	.0036
SDev	.00007	.0031	.0011	.0005	.0003	.0001	.0009
%RSD	33.835	10.71	579.5	8.424	32.49	803.1	24.72
#1	-.00027	.0312	.0006	.0063	.0012	.0001	.0030
#2	-.00017	.0268	-.0009	.0056	.0007	-.0001	.0042

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0679	.0002	.0019	.0031	.0020	.0139	16.84
SDev	.0034	.0000	.0001	.0002	.0003	.0011	.01
%RSD	4.961	14.80	8.005	5.847	16.50	7.613	.0597
#1	.0703	.0002	.0017	.0032	.0022	.0147	16.83
#2	.0655	.0002	.0020	.0030	.0017	.0132	16.85

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0001	.0111	.0003	.0059	1.117	.8463
SDev	.0004	.0001	.0041	.0001	.0019	.003	.3180
%RSD	372.6	49.50	36.93	25.73	31.80	.3020	37.58
#1	-.0002	.0002	.0140	.0004	.0072	1.120	1.071
#2	.0004	.0001	.0082	.0003	.0045	1.115	.6214

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0041	.0212	-.0002	.0038	.0013	.0513	.0016
SDev	.0001	.0059	.0007	.0020	.0006	.0021	.0013
%RSD	2.130	27.59	323.4	53.51	45.44	4.021	79.32
#1	.0040	.0171	-.0007	.0052	.0017	.0528	.0025
#2	.0042	.0254	.0003	.0024	.0009	.0499	.0007

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.27	.0036	.0018	.1112	.0024	.0024	-.0007
SDev	.96	.0028	.0005	.0023	.0011	.0013	.0007
%RSD	.9628	76.20	28.86	2.091	45.19	52.30	95.70
#1	98.59	.0056	.0022	.1129	.0032	.0033	-.0002
#2	99.94	.0017	.0014	.1096	.0017	.0015	-.0012

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	-.0039	.0001	.0135	.0592	-.0004	.0052
SDev	.0000	.0013	.0001	.0038	.0046	.0002	.0009
%RSD	5.324	34.27	128.4	27.83	7.712	42.16	17.32
#1	.0002	-.0030	.0000	.0162	.0560	-.0003	.0059
#2	.0002	-.0049	.0001	.0109	.0625	-.0005	.0046

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0021	.0004
SDev	.0000	.0001	.0001
%RSD	238.9	7.087	27.40
#1	.0000	.0022	.0004
#2	-.0000	.0020	.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	645926	10000	--	--	--	--	--
SDev	6213.347	.0000000	--	--	--	--	--
%RSD	.9619279	.0000000	--	--	--	--	--
#1	641533	10000	--	--	--	--	--
#2	650320	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235412-1 df33 Operator:
Run Time: 10/08/03 16:38:11
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00012	.0192	.0016	.0251	.0007	-.0001	.0006
SDev	.00028	.0111	.0074	.0009	.0002	.0000	.0046
%RSD	223.30	57.93	459.1	3.431	25.93	4.186	794.2
#1	.00032	.0113	.0069	.0257	.0008	-.0001	.0038
#2	-.00007	.0271	-.0036	.0245	.0005	-.0001	-.0027

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4655	.0002	.0038	.0016	.0028	.0142	615.6
SDev	.0045	.0001	.0006	.0008	.0000	.0125	2.0
%RSD	.9709	49.60	16.63	53.34	1.333	87.72	.3284
#1	.4687	.0003	.0042	.0022	.0028	.0231	614.1
#2	.4623	.0001	.0033	.0010	.0027	.0054	617.0

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	.0004	.0228	.0004	.0020	.2199	.0750
SDev	.0003	.0000	.0003	.0001	.0001	.0070	.0967
%RSD	31.00	6.461	1.431	39.49	2.758	3.192	128.9
#1	.0011	.0004	.0231	.0005	.0020	.2150	.1434
#2	.0007	.0005	.0226	.0003	.0019	.2249	.0066

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0116	.0244	.0025	.0011	.0008	.0123	.0011
SDev	.0007	.0167	.0038	.0001	.0039	.0042	.0038
%RSD	5.970	68.26	156.1	9.041	467.0	33.80	353.2
#1	.0120	.0362	.0052	.0012	.0036	.0153	.0037
#2	.0111	.0126	-.0003	.0010	-.0019	.0094	-.0016

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.8	.0020	.0003	1.627	.0016	.0009	-.0009
SDev	1.0	.0052	.0001	.006	.0013	.0016	.0001
%RSD	.9844	257.3	45.28	.3512	86.36	188.0	6.068
#1	101.5	-.0017	.0004	1.623	.0025	-.0003	-.0009
#2	100.1	.0057	.0002	1.631	.0006	.0020	-.0009

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0003	-.0001	.0050	.0377	.0008	.0003
SDev	.0000	.0010	.0001	.0120	.0160	.0007	.0017
%RSD	2.950	319.9	150.5	238.7	42.55	85.96	565.6
#1	.0005	.0011	.0000	.0135	.0491	.0013	.0015
#2	.0005	-.0004	-.0001	-.0035	.0264	.0003	-.0009

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0002	.0101	.0015
SDev	.0002	.0003	.0008
%RSD	101.4	2.579	50.49
#1	.0004	.0103	.0020
#2	.0001	.0099	.0009

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	656126	10000	--	--	--	--	--
SDev	6441.743	.0000000	--	--	--	--	--
%RSD	.9817844	.0000000	--	--	--	--	--
#1	660681	10000	--	--	--	--	--
#2	651571	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235412-2 df33 Operator:
Run Time: 10/08/03 16:44:11
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00038	.0255	.0026	.0258	.0004	-.0002	.0019
SDev	.00050	.0126	.0050	.0003	.0001	.0002	.0001
%RSD	131.40	49.49	188.4	1.238	34.91	124.3	6.206
#1	-.00073	.0344	.0062	.0260	.0003	-.0000	.0018
#2	-.00003	.0166	-.0009	.0255	.0005	-.0003	.0020

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4602	.0003	.0030	.0006	.0012	-.0018	632.0
SDev	.0011	.0001	.0008	.0006	.0004	.0018	2.1
%RSD	.2475	52.45	25.50	101.7	33.75	102.1	.3281
#1	.4594	.0002	.0025	.0002	.0009	-.0031	633.4
#2	.4610	.0004	.0035	.0010	.0015	-.0005	630.5

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0014	.0005	.0193	.0002	.0015	.2102	.0198
SDev	.0011	.0000	.0016	.0001	.0000	.0006	.1164
%RSD	77.63	4.204	8.203	32.11	.0287	.2744	587.3
#1	.0006	.0005	.0182	.0001	.0015	.2098	.1022
#2	.0021	.0005	.0204	.0002	.0015	.2106	-.0625

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0098	.0281	-.0025	.0042	.0008	.0029	.0001
SDev	.0007	.0004	.0071	.0024	.0015	.0027	.0013
%RSD	7.515	1.595	285.4	56.32	179.8	95.67	2299.
#1	.0092	.0284	.0025	.0025	-.0002	.0009	.0010
#2	.0103	.0277	-.0075	.0059	.0019	.0048	-.0009

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.78	.0022	.0053	1.651	.0020	.0043	.0007
SDev	.06	.0090	.0010	.004	.0008	.0023	.0008
%RSD	.0620	408.7	18.73	.2307	40.64	54.93	109.9
#1	96.74	.0086	.0046	1.653	.0025	.0059	.0002
#2	96.82	-.0042	.0060	1.648	.0014	.0026	.0013

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0031	-.0005	.0025	.0246	-.0001	.0004
SDev	.0000	.0077	.0004	.0016	.0106	.0003	.0031
%RSD	7.057	246.5	89.80	63.14	43.18	268.6	764.4
#1	.0005	-.0023	-.0008	.0014	.0171	-.0003	-.0018
#2	.0005	.0086	-.0002	.0036	.0321	.0001	.0026

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0099	.0003
SDev	.0001	.0001	.0008
%RSD	440.2	1.206	314.3
#1	-.0001	.0098	-.0003
#2	.0001	.0099	.0008

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	629772	10000	--	--	--	--	--
SDev	402.3438	.0000000	--	--	--	--	--
%RSD	.0638872	.0000000	--	--	--	--	--
#1	629488	10000	--	--	--	--	--
#2	630057	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235413-1 df33 Operator:
Run Time: 10/08/03 16:49:21
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00021	.0171	-.0021	.0494	.0004	-.0003	.0032
SDev	.00130	.0049	.0015	.0001	.0001	.0000	.0035
%RSD	606.45	28.74	73.23	.3120	20.48	9.131	110.7
#1	.00070	.0206	-.0010	.0493	.0004	-.0003	.0057
#2	-.00113	.0136	-.0032	.0495	.0003	-.0003	.0007

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1025	.0002	.0028	.0002	.0014	-.0056	803.2
SDev	.0025	.0002	.0012	.0009	.0007	.0078	1.6
%RSD	2.418	105.2	44.33	573.3	50.34	138.8	.2040
#1	.1043	.0003	.0036	.0008	.0020	-.0001	802.0
#2	.1008	.0000	.0019	-.0005	.0009	-.0111	804.4

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0014	.0005	.0116	.0000	.0003	.3120	-.0613
SDev	.0011	.0000	.0063	.0000	.0004	.0080	.3190
%RSD	82.23	2.990	54.65	56.57	146.4	2.572	520.2
#1	.0022	.0005	.0161	.0001	.0006	.3063	.1643
#2	.0006	.0005	.0071	.0000	-.0000	.3176	-.2869

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0053	.0093	-.0007	.0004	.0007	.0020	.0015
SDev	.0001	.0176	.0002	.0006	.0037	.0043	.0042
%RSD	2.933	189.0	23.56	160.3	548.1	218.8	276.6
#1	.0054	.0218	-.0006	-.0000	.0033	.0050	.0045
#2	.0051	-.0031	-.0008	.0008	-.0020	-.0011	-.0015

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	95.17	.0015	-.0001	2.195	.0000	.0004	-.0011
SDev	.05	.0040	.0000	.002	.0003	.0013	.0041
%RSD	.0525	269.6	.0576	.0881	2277.	296.3	376.9
#1	95.13	.0043	-.0001	2.196	-.0002	.0014	.0018
#2	95.20	-.0013	-.0001	2.194	.0003	-.0005	-.0040

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0008	-.0004	-.0017	-.0084	-.0002	-.0016
SDev	.0000	.0025	.0010	.0071	.0278	.0008	.0006
%RSD	22.50	299.6	232.4	427.9	329.3	317.3	38.07
#1	.0002	.0026	.0003	.0034	.0112	.0003	-.0011
#2	.0002	-.0009	-.0011	-.0067	-.0281	-.0008	-.0020

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0080	.0001
SDev	.0002	.0006	.0009
%RSD	586.4	8.077	1322.
#1	.0001	.0085	.0007
#2	-.0001	.0076	-.0005

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	619304	10000	--	--	--	--	--
SDev	294.1564	.0000000	--	--	--	--	--
%RSD	.0474979	.0000000	--	--	--	--	--
#1	619096	10000	--	--	--	--	--
#2	619512	10000	--	--	--	--	--

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Method: DAILY1 Sample Name: 235413-2 df33 Operator:
Run Time: 10/08/03 16:54:30
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00095	.0287	.0026	.0492	.0004	-.0001	.0011
SDev	.00069	.0047	.0007	.0012	.0000	.0002	.0051
%RSD	73.040	16.23	26.50	2.453	9.261	172.4	476.5
#1	.00144	.0254	.0021	.0500	.0004	-.0003	.0047
#2	.00046	.0320	.0031	.0483	.0004	.0000	-.0025

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0773	.0003	.0039	-.0004	.0044	-.0132	807.5
SDev	.0007	.0001	.0009	.0005	.0002	.0043	5.2
%RSD	.9277	41.78	22.54	128.5	4.231	32.66	.6476
#1	.0768	.0002	.0033	-.0007	.0046	-.0162	803.8
#2	.0778	.0004	.0046	-.0000	.0043	-.0101	811.2

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0024	.0006	.0144	-.0000	.0001	.3239	.0330
SDev	.0007	.0001	.0021	.0001	.0004	.0095	.1674
%RSD	28.30	14.99	14.47	299.4	436.7	2.932	507.4
#1	.0029	.0005	.0158	-.0001	.0004	.3172	-.0854
#2	.0019	.0007	.0129	.0000	-.0002	.3307	.1514

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0055	.0175	.0032	.0003	.0010	.0093	.0020
SDev	.0008	.0092	.0002	.0011	.0031	.0034	.0001
%RSD	14.60	52.67	6.314	393.3	315.7	36.23	5.411
#1	.0049	.0110	.0031	-.0005	-.0012	.0117	.0021
#2	.0060	.0241	.0034	.0010	.0032	.0069	.0019

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.04	-.0030	.0005	2.190	.0013	-.0006	.0019
SDev	.06	.0007	.0029	.004	.0008	.0022	.0004
%RSD	.0625	21.57	538.7	.1748	62.58	343.1	19.00
#1	97.00	-.0026	.0026	2.187	.0007	.0009	.0022
#2	97.08	-.0035	-.0015	2.192	.0018	-.0022	.0017

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0003	.0002	.0033	.0061	-.0009	.0023
SDev	.0000	.0006	.0002	.0244	.0060	.0001	.0023
%RSD	4.715	172.6	69.20	729.4	98.75	16.90	100.1
#1	.0002	-.0001	.0003	.0206	.0104	-.0010	.0039
#2	.0002	.0008	.0001	-.0139	.0018	-.0008	.0007

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0064	-.0003
SDev	.0000	.0004	.0002
%RSD	68.04	5.797	87.19
#1	-.0001	.0062	-.0004
#2	-.0000	.0067	-.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	631440	10000	--	--	--	--	--
SDev	374.0595	.0000000	--	--	--	--	--
%RSD	.0592392	.0000000	--	--	--	--	--
#1	631175	10000	--	--	--	--	--
#2	631704	10000	--	--	--	--	--

Analysis Report QC Standard 10/08/03 05:09:20 PM page 1

Method: DAILY1 Sample Name: icv/ccv Operator:
Run Time: 10/08/03 17:04:20
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.0343	10.29	5.225	4.964	10.44	Q1.113	5.235
SDev	.0028	.00	.031	.042	.03	.007	.023
%RSD	.26951	.0128	.6021	.8470	.2449	.6044	.4398
#1	1.0324	10.29	5.203	4.935	10.42	Q1.108	5.219
#2	1.0363	10.29	5.247	4.994	10.45	Q1.117	5.251
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail	QC Pass
Value	1.0000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.000	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	20.39	1.021	5.027	2.041	2.117	10.35	18.99
SDev	.11	.006	.040	.010	.010	.04	.05
%RSD	.5226	.5890	.8006	.5027	.4851	.3648	.2421
#1	20.32	1.017	4.998	2.034	2.110	10.32	18.95
#2	20.47	1.025	5.055	2.048	2.125	10.38	19.02
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	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.189	5.032	20.70	1.040	5.145	Q46.43	27.73
SDev	.004	.015	.12	.008	.056	.21	.07
%RSD	.0824	.2940	.5629	.7286	1.080	.4514	.2525
#1	5.192	5.022	20.62	1.035	5.105	Q46.28	27.68
#2	5.186	5.043	20.78	1.046	5.184	Q46.58	27.77
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail	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	5.081	5.260	5.199	5.240	1.037	1.058	1.039
SDev	.027	.057	.003	.043	.003	.022	.006
%RSD	.5366	1.087	.0631	.8260	.2587	2.058	.5894
#1	5.062	5.220	5.201	5.210	1.035	1.073	1.034
#2	5.100	5.300	5.196	5.271	1.039	1.042	1.043
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	96.76	5.550	5.485	5.094	5.221	Q5.501	5.059
SDev	.09	.010	.067	.020	.028	.048	.051
%RSD	.0958	.1760	1.218	.4013	.5312	.8679	1.001
#1	96.70	5.543	5.438	5.079	5.202	5.467	5.023
#2	96.83	5.557	5.532	5.108	5.241	Q5.535	5.094
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Fail	QC Pass
Value				5.000	5.000	5.000	5.000
Range				10.00	10.00	10.00	10.00

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.409	1.005	5.008	5.495	1.024	5.138	1.002
SDev	.001	.006	.012	.035	.006	.016	.009
%RSD	.0229	.6281	.2343	.6400	.5858	.3019	.8807
#1	5.408	1.000	5.000	5.470	1.028	5.127	.9961
#2	5.409	1.009	5.016	Q5.519	1.020	5.149	1.009
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	5.144	1.008	5.012
SDev	.006	.008	.003
%RSD	.1190	.8386	.0581
#1	5.149	1.002	5.014
#2	5.140	1.014	5.009
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	629690	10000	--	--	--	--	--
SDev	581.9488	.0000000	--	--	--	--	--
%RSD	.0924184	.0000000	--	--	--	--	--
#1	629278	10000	--	--	--	--	--
#2	630101	10000	--	--	--	--	--

Analysis Report Blank Sample 10/08/03 05:16:49 PM page 1

Method: DAILY1 Sample Name: icb/ccb Operator:
Run Time: 10/08/03 17:11:49
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00035	.0025	.0023	-.0003	.0004	.0001	-.0000
SDev	.00029	.0037	.0043	.0010	.0002	.0000	.0033
%RSD	82.633	150.1	186.0	329.8	46.56	42.92	7812.
#1	.00056	.0051	H.0054	.0004	.0005	.0001	.0023
#2	.00015	-.0002	-.0007	-.0010	.0003	.0001	-.0024
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.00500	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.00500	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0355	.0002	.0008	.0000	.0004	.0049	.0116
SDev	.0014	.0001	.0006	.0001	.0001	.0032	.0014
%RSD	4.073	60.79	75.20	422.1	28.04	66.28	11.74
#1	.0366	.0003	.0012	.0001	.0003	.0072	.0126
#2	.0345	.0001	.0004	-.0001	.0004	.0026	.0107
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	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0001	.0039	.0001	.0023	-.0065	.0472
SDev	.0009	.0001	.0030	.0000	.0007	.0003	.0569
%RSD	302.8	33.94	76.29	1.941	30.48	3.854	120.5
#1	.0010	.0002	.0061	.0001	.0028	-.0063	H.0875
#2	-.0004	.0001	.0018	.0001	.0018	-.0067	.0070
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	.0006	H.0126	-.0010	.0020	.0005	H.0127	.0041
SDev	.0007	.0007	.0000	.0007	.0014	.0060	.0021
%RSD	115.3	5.310	.8107	33.05	275.7	47.38	52.08
#1	.0011	H.0121	-.0010	.0025	.0015	H.0169	.0056
#2	.0001	H.0131	-.0010	.0016	-.0005	.0084	.0026
Errors	LC Pass	LC High	NOCHECK	NOCHECK	LC Pass	LC High	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	100.3	.0040	.0035	.0014	.0010	.0037	.0028
SDev	.6	.0028	.0005	.0007	.0004	.0012	.0026
%RSD	.6238	69.48	13.11	53.47	43.03	33.39	92.77
#1	99.89	.0020	.0032	.0009	.0013	.0028	.0046
#2	100.8	.0059	.0038	.0019	.0007	.0045	.0010
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	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	-.0002	.0001	.0059	.0255	.0001	.0016
SDev	.0001	.0022	.0000	.0086	.0004	.0000	.0008
%RSD	20.76	981.5	4.386	145.4	1.761	.9363	48.62
#1	.0007	.0013	.0001	H.0119	.0252	.0001	.0021
#2	.0005	-.0018	.0001	-.0002	.0258	.0001	.0010
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	-.0001	.0003
SDev	.0001	.0005	.0001
%RSD	45.88	532.1	27.75
#1	.0003	-.0004	.0004
#2	.0001	.0003	.0003
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	652806	10000	--	--	--	--	--
SDev	4070.107	.0000000	--	--	--	--	--
%RSD	.6234788	.0000000	--	--	--	--	--
#1	649928	10000	--	--	--	--	--
#2	655684	10000	--	--	--	--	--

010114

Analysis Report 10/08/03 05:26:39 PM page 1

Method: DAILY1 Sample Name: Na 3ppm Operator:
Run Time: 10/08/03 17:21:39
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00064	.0112	-.0008	-.0034	.0000	-.0001	.0035
SDev	.00015	.0020	.0011	.0006	.0001	.0001	.0001
%RSD	22.850	17.49	141.1	18.93	273.5	68.53	2.793
#1	-.00054	.0126	-.0000	-.0029	.0001	-.0000	.0035
#2	-.00075	.0098	-.0016	-.0038	-.0000	-.0001	.0036

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0012	.0004	.0017	-.0000	-.0000	-.0069	-.0029
SDev	.0005	.0001	.0001	.0002	.0002	.0145	.0090
%RSD	39.43	13.54	6.994	563.3	532.9	209.3	306.2
#1	-.0016	.0003	.0018	.0001	-.0002	.0033	.0034
#2	-.0009	.0004	.0016	-.0002	.0001	-.0172	-.0093

Elem	La4086	Li6707	Mg2790	Mn2576	Mo2020	Na5889	Na3302
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	-.0001	.0010	.0001	-.0002	2.960	1.974
SDev	.0001	.0000	.0020	.0001	.0004	.016	.068
%RSD	23.58	64.27	196.2	80.22	265.0	.5407	3.423
#1	-.0003	-.0000	.0025	.0002	.0001	2.948	2.022
#2	-.0004	-.0001	-.0004	.0001	-.0005	2.971	1.926

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0069	.0019	.0000	-.0001	-.0007	.0017
SDev	.0003	.0020	.0015	.0003	.0014	.0099	.0034
%RSD	414.1	29.43	79.89	1976.	1768.	1411.	199.2
#1	.0003	.0083	.0030	-.0002	.0009	.0063	-.0007
#2	-.0002	.0055	.0008	.0003	-.0011	-.0077	.0041

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	98.25	-.0001	.0004	-.0004	.0007	.0003	-.0022
SDev	.26	.0016	.0017	.0012	.0003	.0016	.0033
%RSD	.2616	2681.	389.1	297.1	42.68	587.6	149.3
#1	98.43	-.0012	-.0008	-.0012	.0009	-.0009	.0001
#2	98.07	.0011	.0016	.0004	.0005	.0014	-.0045

Elem	Sr4215	Th2837	Ti3372	Tl1908	U_3859	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	-.0008	-.0002	-.0033	.0087	-.0004	.0004
SDev	.0000	.0023	.0002	.0053	.0021	.0004	.0000
%RSD	26.02	296.1	122.6	163.2	23.90	105.4	8.627
#1	-.0000	-.0024	-.0000	-.0070	.0102	-.0001	.0005
#2	-.0001	.0009	-.0004	.0005	.0072	-.0007	.0004

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	-.0003	-.0001
SDev	.0001	.0005	.0005
%RSD	234.8	199.3	368.6
#1	.0000	-.0006	.0002
#2	-.0001	.0001	-.0005

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	639344	10000	--	--	--	--	--
SDev	1677.964	.0000000	--	--	--	--	--
%RSD	.2624508	.0000000	--	--	--	--	--
#1	640531	10000	--	--	--	--	--
#2	638158	10000	--	--	--	--	--

ICP Calibration Standards

010116

Date Prepared: ~~9-31-03~~ 10-1-03 Prepared By: [illegible]

HNO3 INORG #: 4237 HCl INORG #: 4249

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
~~9-31-03~~ 10-1-03	STD1- ~~03-31-04~~ 03301	Al	50	2.50	✓	INORVENT	4220	10000	9-1-04
		Ca	50	2.50	✓	INORVENT	3900	10000	2-1-04
		Fe	50	2.50	✓	INORVENT	3963	10000	3-1-04
		K	50	2.50	✓	INORVENT	3734	10000	11-1-03
		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
~~9-31-03~~ 10-1-03	STD2- ~~03-31-04~~ 03301	Ba	10	5.00	✓	INORVENT	3971	1000	3-1-04
		Be	5	2.50	✓	INORVENT	4062	1000	6-1-04
		Cr	10	5.00	✓	INORVENT	3732	1000	11-1-03
		Cu	10	5.00	✓	INORVENT	3955	1000	3-1-04
		Ni	10	5.00	✓	INORVENT	3957	1000	3-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
~~9-31-03~~ 10-1-03	STD3- ~~03-31-04~~ 03301	Cd	10	5.00	✓	INORVENT	3972	1000	3-1-04
		Co	10	5.00	✓	INORVENT	3973	1000	3-1-04
		Mn	10	5.00	✓	INORVENT	3921	1000	2-1-04
		V	10	5.00	✓	INORVENT	3740	1000	11-1-03
		Zn	10	5.00	✓	INORVENT	3741	1000	11-1-03
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
~~9-31-03~~ 10-1-03	STD4- ~~03-31-04~~ 03301	Ag	2	1.00	✓	INORVENT	4222	1000	9-1-04
		As	10	5.00	✓	INORVENT	3499	1000	2-1-04
		Pb	10	5.00	✓	INORVENT	3735	1000	11-1-03
		Sb	10	5.00	✓	INORVENT	3953	1000	3-1-04
		Se	10	5.00	✓	INORVENT	4152	1000	7-1-04
		TL	10	5.00	✓	INORVENT	3922	1000	2-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
~~9-31-03~~ 10-1-03	STD5- ~~03-31-04~~ 03301	B	10	5.00	✓	INORVENT	3954	1000	3-1-04
		Mo	10	5.00	✓	INORVENT	3956	1000	3-1-04
		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	3762	1000	12-1-03
		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
10-1-03	STD6- 03301	La	10	5.00	✓	INORVENT	4221	1000	9-1-04
		Na	1	0.05	42 ✓	INORVENT	4205	10000	8-1-04
		Pd	10	5.00	✓	INORVENT	3964	1000	3-1-04
		S	10	5.00	✓	INORVENT	3739	1000	11-1-03
		Th	10	5.00	✓	INORVENT	3681	1000	10-1-03
		U	10	5.00	✓	INORVENT	3974	1000	3-1-04
		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	3958	1000	3-1-04
		SC	10	0.500	✓	INORVENT	4262	10000	10-1-04

OH Exp. order

Expiration Dates:

STD1: 11-1-03 STD4: 11-1-03

STD2: 11-1-03 STD5: 12-1-03

STD3: 11-1-03 STD6: ~~11-1-03~~ 10-1-03

Trace Metals Reagent Logbook 010117

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 02 031

Reagent I.D.:	Preparation Description:	Prep Date:	Exp Date:	Initials:
10-8-03	1% HNO_3 / 5% HCL	10-8-03	1-8-04	JW
RLB-02-031-01	add 100mL di H_2O to a 250mL			
	Nalgene bottle, add 2.5mls HNO_3 - inorg#			
	4238, add 12.5mls HCL inorg # 4250			
	F.V. to 250mls with di H_2O			

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010118

SOUTHWEST RESEARCH INSTITUTE®

6220 Culebra Rd
San Antonio, Texas 78228

TJA TRACE ICP DAILY LOG

ANALYST DL DATE 10-8-03

As 189.042 Profile Line As Intensity: 454.633

PEAK POSITION -.00782

VERNIER POSITION 303

AUTOSAMPLER Yes X No

QC PREP DATE:	
CCV/ICV	03I25
CRI	DL 10-8-03
ICSA	
ICSAB	

STDs PREP DATE:	
CLP_STD1_SC	03501
CLP_STD2_SC	03501
CLP_STD3_SC	03501
CLP_STD4_SC	03501
CLP_STD5_SC	03501
CLP_STD6_SC	03501
BLK_SC	03501

COMMENTS	FILE	CLIENT	TO#	PROJECT NO.	METHOD
	Daily 31	IOL	NA	0D1401.113	Daily1 N/A
A309307	Daily 31	Div 20	030930-7	06002.01.081	Daily1 54 221
A309307	Daily 31	Div 20	030930-7	06002.01.081	Daily1 54 221
		DL	10-8-03		

COMMENTS:

MAINTENANCE:

REVIEWED BY: [signature] DATE: 10/13/03

ICP Calibration Blank/ICB/CCB Solution

010119

ID: BLK- 03J02

Date Prepared: 9-2-03 Prepared By: D

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4197

Added ✓ 50 ml HCL INORG #: 4190

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: 10-1-03 INORG #: 3683

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 03J25

Date Prepared: 9-25-03 Prepared By: D

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4237

Added ✓ 50 ml HCL INORG #: 4247

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

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- ~~03J31~~ DH 10-1-03 03J01

Date Prepared: ~~9-31-03~~ DH 10-1-03 Prepared By: D

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4237

Added ✓ 50 ml HCL INORG #: 4249

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

010120

CCV- 03125

Date Prepared: 9-25-03 Prepared By: [illegible]

HNO3 INORG #: 4237 HCl INORG #: 4247

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	4065	1000	5-15-04
Mo	5	5ml	✓	SPEX	4066	1000	5-15-04
P	5	5ml	✓	SPEX	3927	1000	1-15-04
Si	5	5ml	✓	SPEX	4232	1000	8-30-04
Ti	5	5ml	✓	SPEX	4234	1000	8-30-04
Sr	5	5ml	✓	SPEX	3961	1000	2-15-04
Sn	5	5ml	✓	SPEX	4141	1000	6-30-04
Bi	5	5ml	✓	SPEX	4138	1000	6-30-04
La	5	5ml	✓	SPEX	4064	1000	5-15-04
Y	5	5ml	✓	SPEX	4067	1000	5-15-04
Pd	1	1ml	✓	SPEX	3928	1000	1-15-04
S	1	1ml	✓	SPEX	4140	1000	6-30-04
Th	1	1ml	✓	SPEX	4233	1000	8-30-04 ~~04~~ 9-25-03
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	3951	10000	2-15-04
ICV-2A	vary	10ml	✓	SPEX	3773	mix	11-30-03
ICV-2B	vary	1ml	✓	SPEX	3774	mix	11-30-03
ICV-2C	vary	10ml	✓	SPEX	3775	mix	11-30-03

Expiration Date: 11-30-03

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 54 221

CLIENT(S): DIV 20
TASK ORDER(S): 030930-7 SDG(S): 235410
PROJECT NO(S): ~~03~~09 10-8-03 06002.01.081 010121
METHOD: 3005A ___ 3050B ___ 3050B-7.5 ___ 3010A ___ 3020A ___ 7760A ___ 7740A ___ $HClO_4$ ___ H_2SO_4 Sb ___
Microwave ___ Fusion ___ Teflon ___ Rock ___ OTHER df 33.3 dilutions
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# 4261 EXP: 10/04 AMT: 50nL
Oven/Hotplate ID: ___ Temperature (°C): ___

SAMPLE IDENTIFICATION	pH	WT (g)	I.V. (mL)	F.V. (mL)	
PBW-K08W1			5	5	
LCSW-K08W1 *			5	↓	
235410-1			150nL	↓	
5410-1d			↓	↓	
5410-2			↓	↓	
5411-1			↓	↓	
5411-1 ⊗ *			↓	↓	
5411-2			↓	↓	
5412-1			↓	↓	
5412-2			↓	↓	
5413-1			↓	↓	
5413-2			↓	↓	
* Spike 50nL Spike 1		Spex #4074	Exp. 5/04		
↓ 20nL I-CAL 1		Spex # 3748	Exp. 10-31-03		
↓ 20nL W @ 1kppm		IV# 4203	Exp. 8/04		
↓ 20nL Mo ↓		IV# 3956	Exp. 5/04		
** RLB-02-031-01 1%	HNO_3/5% HCL		Exp. 1/04		
PBW and LCSW are prepared as		5mL —	**		
df 33.3 dilutions are prepared as 150nL			sample:	4.850mL — **	
		10-8-03			
					LOCATION: N/A

PREPARED BY: John Willis DATE: 10-8-03
REVIEWED BY: [signature] DATE: 10-8-03
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: 54 222

010122

CLIENT(S): DIV 20
TASK ORDER(S): 030930-7 SDG(S): 235410
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 200 dilutions
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# 4261 EXP: 10/04 AMT: 50 uL
Oven/Hotplate ID: — Temperature (°C): —

SAMPLE IDENTIFICATION	pH	WT (g)	I.V. (mL)	F.V. (mL)	
PBW-K08W2			5	5	
LCSW-K08W2 *			5	↑	
235410-1			25 uL		
5410-1d			↓	↓	
5410-2					
5411-1					
5411-1S *					
5411-2					
5412-1					
5412-2					
5413-1					
✓ 5413-2			↓	↓	
* Spike 50 uL Spike1		Spex# 4074	Exp. 5/04		
↓ 20 uL I-CAL1		Spex# 3748	Exp 10-31-03		
↓ 20 uL W @ 1kppm		IV # 4203	Exp. 8/04		
↓ 20 uL Mo ↓		IV# 3956	Exp. 5/04		
** -RLB-02-031-01	1%	HNO_3/5% HCL		Exp. 1/04	
PBW and LCSW are prepared as 5mLs - **					
df 200 dilutions are prepared at 25 uL sample: 4.975 mL - **					
					LOCATION:
					N/A

PREPARED BY: [signature] DATE: 10-8-03
REVIEWED BY: [signature] DATE: 10-8-03
DISPOSAL INT/DATE/LOC: ___

FRM-191 (Rev 2/Mar 03)

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030930-7
SRR: 25032
SDG: 235410
CASE: CNWRA
VTSR: September 30, 2003
PROJECT#: 06002.01.081

Certificates of Analysis

010123

FISHER SCIENTIFIC
TRACEMETAL GRADE NITRIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A509 **Lot No: 1103050**
Date: May, 2003

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: 09/09/03
DATE EXPIRED: 09/09/2003
DATE OPENED: 09/09/03
INORG: 4335-4240 PO: E52225

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

010124

FISHER SCIENTIFIC
TRACEMETAL GRADE HYDROCHLORIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A508 **Lot No: 4102110**
Date: December, 2002

Tests	Units	Value
Assay	%	36%
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

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/10/03
DATE EXPIRED: 09/19/2013
DATE OPENED: 09/17/03
INORG: 4247-4252 PO: F52228

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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SPEXertificate™ 010125

Certificate of Reference Material

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 05/15/03
DATE EXPIRED: 05/15/2004
DATE OPENED: 05/15/03
INORG: 4074 PO: F52351

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: MAY '03 Certifying Officer: N. Kocherlakota

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010126

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Certificate of Reference Material

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/31/03
DATE EXPIRED: 10/31/2003
DATE OPENED: 10/31/03
INORG: 3748 PO: F52056

Catalog Number: ICAL-1 **Lot No.:** 6-104VY
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: OCT. -- '02 Certifying Officer: N. Kocherlakota

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inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010127

certificate of analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Scandium IN 5% HNO_3 (abs)

Catalog Number: CGSC1-1and CGSC1-5

Lot Number: **W-SC02055**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/04/03
DATE EXPIRED: 10/01/2004
DATE OPENED: 09/24/03
INORG: 4261 PO: E52232

Starting Material:	Sc_2O_3
Starting Material Purity:	99.99%
Starting Material Lot No:	632-5721

CERTIFIED CONCENTRATION: 1000 ± 5 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: 1000 ± 5 μg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 995 ± 5 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	<0.00060	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	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	0.0028
M	Be	<0.000050	M	Ga	<0.00010	O	Hg	i	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	0.0043	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
O	B	<0.020	M	Au	<0.00030	M	Nd	<0.00020	s	Sc		M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	0.0030	O	Ni	<0.084	O	Se	<0.67	M	W	<0.0010
O	Ca	0.016	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.034	M	U	<0.00020
M	Ce	<0.00050	M	In	<0.00010	n	Os		M	Ag	0.0050	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.16	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.16	O	P	i	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	0.0075
M	Cu	<0.00060	M	Pb	0.00050	O	K	<5.01	M	Ta	<0.00070	M	Zr	0.032

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): 1.038 g/mL

QA:KL Rev.031303JTS

Paul R. Haines

Quality Assurance Manager Expires: EXPIRES 01 02 004

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

010128

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: E52232

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

010129

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/09/03
DATE EXPIRED: 06/30/2004
DATE OPENED: 06/23/03
INORG: 4139 PO: F52370

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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SPEXertificate™

Certificate of Reference Material

010130

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 05/12/03
DATE EXPIRED: 05/15/2004
DATE OPENED: 05/12/03
INORG: 4065 PO: F52181

Catalog Number: PLLI2-2X/2Y **Lot No.** 9-102LI
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: 1002 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 Carbonate Lot# 03021A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1002 mg/L

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

Instrumentation Analysis By ICP spectrometer: 1002 mg/L

Uncertified Properties:

Density: 1.014 @ 24.5 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.009	Cu	0.01	Pb	0.001
As	0.004	Fe	0.045	Re	0.002
Ag	<0.001	Ga	<0.001	Rb	<0.001
B	<0.004	In	<0.001	Sr	0.001
Ba	0.004	K	0.05	Sb	0.002
Be	0.002	Mn	<0.001	Sn	<0.001
Bi	<0.001	Mo	0.002	Ti	0.005
Ca	0.03	Mg	0.003	Tl	<0.001
Cr	<0.001	Na	0.02	V	<0.001
Cd	<0.001	Ni	<0.001	Zr	<0.001
Co	0.002			Zn	0.20

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: PLMO9-2X/2Y/2T **Lot No.** 9-49MO

Description: 1000 mg/L Molybdenum

Matrix: H2O

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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 3134

The CRM is prepared gravimetrically using high purity Ammonium Molybdate 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: 999 mg/L

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

Instrumentation Analysis By ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 0.9987 @ 24.6 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.001	Cu	0.004	Pb	0.001
As	0.04	Fe	<0.01	Re	0.03
Ag	<0.001	Ga	<0.001	Rb	<0.001
B	<0.003	In	<0.001	Sr	<0.001
Ba	<0.001	K	0.02	Sb	<0.001
Be	<0.001	Li	<0.001	Sn	<0.001
Bi	<0.001	Mg	0.007	Ti	0.004
Ca	0.006	Mn	<0.001	Tl	<0.001
Cr	<0.005	Na	0.009	V	0.004
Cd	<0.05	Ni	<0.001	Zr	<0.001
Co	<0.001			Zn	<0.001

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

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Catalog Number: PLP9-2X/2Y/2T **Lot No.** 9-29P

Description: 1000 mg/L Phosphorus

Matrix: H2O

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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: 1003.5 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# A158. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1004 mg/L

Method: Precipitation using Magnesia mixture. Filter, ignite, and weigh as Mg2O2.

Instrumentation Analysis By ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 0.9997 @ 22.9 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.05	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.019	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.005	In	<0.001	Sn	0.006
Ba	<0.001	K	0.17	Sr	0.004
Be	<0.001	Li	0.004	Sb	0.01
Bi	<0.001	Mg	0.3	Ti	0.016
Ca	0.65	Mn	<0.001	Tl	<0.001
Cr	<0.001	Mo	<0.001	V	<0.001
Cd	<0.001	Na	0.5	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	6.7

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: 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.

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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.

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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.

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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 SnO2.

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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Certificate of Reference Material

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.** 10-17LA

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: 996.5 mg/L

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

Certified Value is Traceable to: NIST SRM 3127a

The CRM is prepared gravimetrically using high purity Lanthanum Oxide Lot# 06981D. 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: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against Pb(NO3)2 NIST SRM #928.

Instrumentation Analysis By ICP spectrometer: 995 mg/L

Uncertified Properties:

Density: 1.010 @ 23.8 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Ce	0.009	Lu	<0.001	Tm	<0.001
Ca	0.05	Mn	<0.001	Ti	<0.001
Dy	<0.001	Mo	<0.001	Tb	<0.001
Er	<0.001	Nd	<0.001	Ta	<0.001
Eu	<0.001	Ni	<0.001	Tl	<0.001
Fe	0.006	Na	0.006	V	<0.001
Gd	<0.2	Pr	<0.001	W	<0.001
Ga	<0.001	Rb	<0.001	Y	<0.001
Hf	<0.001	Sc	<0.003	Yb	<0.001
Ho	<0.001	Sm	<0.001	Zr	<0.001
In	<0.001	Th	<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.

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Catalog Number: PLPD3-2X/2Y **Lot No.** 9-74PD

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 relevent to the certified properties listed below.

Certified Value: 995 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# 07991E. 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: 990 mg/L

Method: Precipitation using dimethyl glyoxime,filter,dry and weigh as Pd(C4H702N2)2.

Instrumentation Analysis By ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.025 @ 26.3 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	<0.004	Cr	<0.009	Pt	<0.004
Au	0.03	Fe	0.02	Re	<0.001
Ag	0.007	Ga	<0.001	Rh	0.002
B	<0.05	Ir	<0.001	Rb	<0.001
Be	<0.002	In	<0.001	Ru	<0.001
Bi	<0.001	Mg	<0.005	Sn	0.08
Ca	0.02	Mn	<0.001	Te	<0.001
Cd	<0.001	Na	<0.03	Ti	<0.001
Co	<0.001	Ni	0.004	W	<0.001
Cu	<0.006	Pb	<0.04	Zr	<0.001
				Zn	0.16

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 -- '03 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.

Date of Certification: JUN '03 Certifying Officer: N. Kocherlakota

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Certificate of Reference Material

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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/05/03
DATE EXPIRED: 08/30/2004
DATE OPENED: 09/05/03
INORG: 4233 PO: F5225

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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DATE RECEIVED: 06/20/03
DATE EXPIRED: 06/30/2004
DATE OPENED: 06/23/03
INORG: 4142 PO: F52370

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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DATE RECEIVED: 08/11/03
DATE EXPIRED: 08/15/2004
DATE OPENED: 08/13/03
INORG: 4212 PO: E5218

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.

Date of Certification: AUG '03 Certifying Officer: N. Kocherakota

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Certificate of Reference Material

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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DATE EXPIRED: 08/15/2004
DATE OPENED: 08/13/03
INORG: 4213 PO: E52218

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010146

Catalog Number: PLNA2-3X/3Y **Lot No.** T8-73NA

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: 10,036.5 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: 10,039 mg/L

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

Instrumentation Analysis By ICP spectrometer: 10,034 mg/ L

Uncertified Properties:

Density: 1.048 @ 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	<0.002	Pb	<0.001
As	<0.08	Fe	0.03	Re	<0.001
Ag	<0.02	Ga	<0.001	Rb	<0.001
B	<0.1	In	<0.001	Sr	<0.001
Ba	0.008	K	1.36	Sb	<0.001
Be	<0.01	Li	<0.002	Sn	<0.001
Bi	<0.001	Mg	0.60	Ti	<0.03
Ca	0.60	Mn	<0.02	Tl	<0.001
Cr	0.002	Mo	<0.001	V	<0.001
Cd	<0.01	Ni	<0.003	Zr	<0.001
Co	<0.001			Zn	<0.05

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

Date of Certification: FEB -- '03 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RANCHEM LABS
DATE RECEIVED: 02/13/03
DATE EXPIRED: 02/15/2004
DATE OPENED: 02/13/03
INORG: 3951 PO: E58060

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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/19/02
DATE EXPIRED: 11/30/2003
DATE OPENED: 11/19/02 DK
INORG: 3723 PO: F52064

Catalog Number: ICV-2A **Lot No.:** 22-12AS
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 -- '02 Certifying Officer: N. Kocherlakota

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Catalog Number: PLSB7-2X/2Y/2T **Lot No.:** 8-175SB-X/Y/T
Description: 1000 mg/L Antimony
Matrix: Water/0.6% Tartaric Acid/tr HNO_3

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: Antimony(Sb): 999 mg/L ± 3 mg/L
Traceable to: NIST SRM 3102a

The CRM is prepared gravimetrically using high purity Antimony Metal (Sb) Lot#R1198A. 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: Gravimetric analysis by evaporating to dryness, fuming with Nitric Acid, igniting and weighing as Sb_2O_4.
Instrumental Analysis by ICP spectrometer: 1000 mg/L
Uncertified Properties:
Density: 1.007 at 24.0°C

Trace Metallic Impurities in the Actual Solution via ICP Analysis:

Element	mg/L	Element	mg/L	Element	mg/L
Ag	<0.001	Cu	<0.001	Pb	<0.001
Al	0.030	Fe	0.013	Rb	<0.001
As	0.001	Ga	<0.001	Re	<0.001
B	<0.001	In	<0.001	Sn	<0.001
Ba	<0.001	K	0.030	Sr	<0.001
Be	<0.001	Li	<0.001	Ti	0.001
Bi	<0.001	Mg	0.003	Tl	<0.001
Ca	0.012	Mn	<0.001	V	<0.001
Cd	<0.001	Mo	<0.001	Zn	<0.010
Co	<0.001	Na	0.005	Zr	<0.001
Cr	<0.001	Ni	<0.001		

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable to +/- 0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: NOV -- '02 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/19/02
DATE EXPIRED: 11/30/2003 DK
DATE OPENED: 11/19/02
INDEX: 3724 PO: E52064

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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/19/02
DATE EXPIRED: 11/30/2003
DATE OPENED: 11/19/02
INORG: 3775 PO: F54064

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Catalog Number: ICV-2C **Lot No.:** 22-13AS
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 -- '02 Certifying Officer: N. Kocherlakota

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inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

010150

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 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:

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

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

$\bar{x}$ = 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.)

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

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 $Al(OH)_4(H_2O)_2^{1-}$ 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^0); γ- Al_2O_3 (Soluble in acids such as HCl); Ores (Carbonate fusion in Pt^0 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 ppm levels.)
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^+	$^{12}C^{15}N$, $^{13}C^{14}N$, $^{1}H^{13}C^{14}N$, $^{11}B^{16}O$, $^{54}Cr^{2+}$, $^{54}Fe^{2+}$

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

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 FEB 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

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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 Calcium in 1.4% (abs) HNO_3**

Catalog Number:	CGCA10-1 AND CGCA10-5
Lot Number:	**T-CA03010**
Starting Material:	CaO
Starting Material Purity (%):	99.9981
Starting Material Lot No	C27L01
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 01/09/03
DATE EXPIRED: 02/01/2004
DATE OPENED: 01/10/03
INORG: 3900 PO: F52071

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10,007 ± 22 µg/mL

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

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

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

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

$(\bar{x})$ = 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** **10,034 ± 25 µg/mL**
ICP Assay NIST SRM 3109a Lot Number: 000622

Assay Method #2 **10,007 ± 22 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		0.00064	M	Dy	<	0.02560	O	Li	<	0.00002	M	Pr	<	0.00128	M	Te	<	0.12798
M	Sb	<	0.00213	M	Er	<	0.02133	M	Lu	<	0.00171	M	Re	<	0.00427	M	Tb	<	0.00128
M	As	<	0.04266	M	Eu	<	0.01280	O	Mg		0.07143	M	Rh	<	0.00427	M	Tl	<	0.00427
O	Ba		0.00071	M	Gd	<	0.00427	O	Mn		0.00041	M	Rb	<	0.00427	M	Th	<	0.00427
O	Be	<	0.00009	M	Ga	<	0.00427	O	Hg	<	0.01100	M	Ru	<	0.00853	M	Tm	<	0.00171
M	Bi	<	0.00171	M	Ge	<	0.02560	M	Mo	<	0.00853	M	Sm	<	0.00427	M	Sn	<	0.02133
O	B	<	0.00054	M	Au	<	0.01280	M	Nd	<	0.00853	O	Sc	<	0.00002	M	Ti	<	0.21329
O	Cd	<	0.00450	M	Hf	<	0.00853	O	Ni	<	0.00230	O	Se	<	0.00620	M	W	<	0.04266
S	Ca			M	Ho	<	0.00213	M	Nb	<	0.00213	O	Si		0.00214	M	U	<	0.00853
M	Ce	<	0.02133	O	In	<	0.00200	n	Os			O	Ag	<	0.04000	O	V	<	0.00090
M	Cs	<	0.00128	M	Ir	<	0.02133	M	Pd	<	0.02133	O	Na		0.00571	M	Yb	<	0.00427
O	Cr		0.00238	O	Fe	<	0.00110	O	P	<	0.00480	O	Sr		0.08095	M	Y	<	0.17064
O	Co	<	0.00120	M	La	<	0.00213	M	Pt	<	0.00853	O	S		0.04048	O	Zn		0.07381
O	Cu		0.00405	M	Pb	<	0.01280	O	K	<	0.00170	M	Ta	<	0.02986	M	Zr	<	0.02133

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 010153

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* followed by HCl dissolution); Organic Matrices (dry ash and dissolution in dilute HCl. Do not heat when dissolving to avoid precipitation of SiO_2) .The oxide, hydroxide, carbonate, phosphate, and fluoride of calcium are soluble in % levels of HCl or HNO_3. The sulfates (gypsum, anhydrite, etc.), certain silicates and complex compounds require fusion with Na_2CO_3 followed by HCl / water dissolution. Contamination is a very real problem when analyzing for trace levels.

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

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at= concs.)
ICP-OES	393.366 nm	0.0002 / 0.00004 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, $^{28}Si^{16}O$, $^{44}Sr^{++}$

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: 01/09/03
DATE EXPIRED: 02/01/2004
DATE OPENED: 01/10/03
INORG: 3900 PO: F52071

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 26, 2002

Expiration Date: EXPIRES 1 FEB 2004

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

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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."*

010154

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

Catalog Number:	CGFE10-1 and CGFE10-5
Lot Number:	**T-FE03028**
Starting Material:	Fe metal
Starting Material Purity (%):	99.9992
Starting Material Lot No	23024
Matrix:	3.5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 2/28/03
DATE EXPIRED: 3/01/2004
DATE OPENED: 2/28/03
INORG: 3963 PO: E52064

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 9920 ± 22 µg/mL

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

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

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

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. (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** **9920 ± 22 µg/mL**
ICP Assay NIST SRM 3126a Lot Number: 000606

Assay Method #2 **9962 ± 41 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	<	0.00270	M	Dy	<	0.02421	O	Li	<	0.00003	M	Pr	<	0.00121	M	Te	<	0.12103
M	Sb	<	0.00202	M	Er	<	0.02017	M	Lu	<	0.00161	M	Re	<	0.00403	M	Tb	<	0.00121
M	As	<	0.04034	M	Eu	<	0.01210	O	Mg	<	0.00006	M	Rh	<	0.00403	M	Tl	<	0.00403
M	Ba	<	0.04034	M	Gd	<	0.00403	O	Mn	<	0.05000	M	Rb	<	0.00403	M	Th	<	0.00403
O	Be	<	0.00005	M	Ga		0.00394	O	Hg	<	0.01100	M	Ru	<	0.00807	M	Tm	<	0.00161
M	Bi	<	0.00161	i	Ge			M	Mo	<	0.00807	M	Sm	<	0.00403	M	Sn		0.04920
O	B	<	0.00090	M	Au	<	0.01210	M	Nd	<	0.00807	M	Sc	<	0.04034	M	Ti	<	0.20172
M	Cd	<	0.01210	M	Hf	<	0.00807	O	Ni	<	0.00230	M	Se	<	0.03228	M	W	<	0.04034
O	Ca		0.00707	M	Ho	<	0.00202	M	Nb	<	0.00202	O	Si		0.00781	M	U	<	0.00807
M	Ce	<	0.02017	M	In	<	0.04034	n	Os			M	Ag	<	0.00807	M	V	<	0.00807
M	Cs	<	0.00121	M	Ir	<	0.02017	M	Pd	<	0.02017	O	Na		0.00756	M	Yb	<	0.00403
M	Cr		0.00541	s	Fe			i	P			M	Sr	<	0.00202	M	Y	<	0.16138
O	Co	<	0.00110	M	La	<	0.00202	M	Pt	<	0.00807	O	S	<	0.07200	M	Zn		0.03739
M	Cu	<	0.02421	M	Pb	<	0.01210	O	K	<	0.00170	M	Ta	<	0.02824	M	Zr	<	0.02017

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

010155

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 ≈ concs.)
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^+	$^{40}Ar^{15}N^1H$, $^{40}Ar^{16}O$, $^{36}Ar^{17}O^1H$, $^{38}Ar^{18}O$, $^{37}Cl^{18}O^1H$, $^{40}Ca^{16}O$

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)

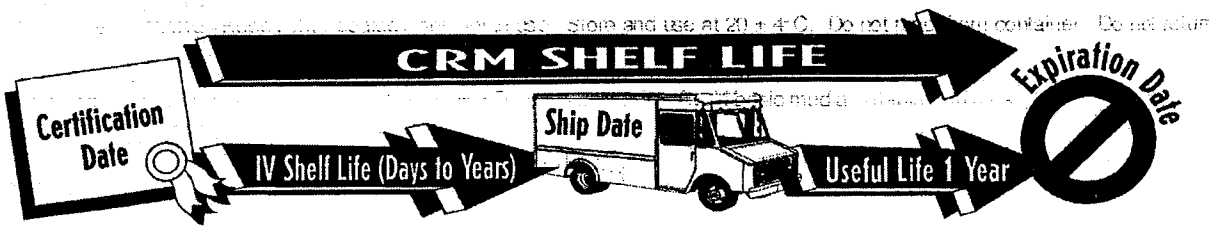
10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

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: 2/28/03
DATE EXPIRED: 3/01/2004
DATE OPENED: 2/28/03
INORG: 3963 PO: F52064

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



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

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

Certification Date: October 11, 2002

Expiration Date: EXPIRES 1 MAR 2004

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

Certificate of Analysis

CUSTOM-GRADE SOLUTION

10,000 μg/mL Potassium in 1.4% HNO_3 (abs) 010156

Catalog Number: CGK10-1and CGK10-5

Lot Number: **T-K02102**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/22/02
DATE EXPIRED: 11/01/2003
DATE OPENED: 10/23/02
INORG: 3738 PO: F52057

Starting Material:	Potassium Nitrate
Starting Material Purity:	99.996%
Starting Material Lot No:	K18J19

CERTIFIED CONCENTRATION: 9999 ± 7 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: 9999 ± 7 μg/mL
Method: Gravimetric as the Sulfate vs NIST weights #822/254143-94.

Instrument Analysis: 10,002 ± 27 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3141a.

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	<0.0060	O	Li	<0.000030	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	O	Mg	0.00015	M	Rh	<0.0010	M	Tl	<0.0010
M	Ba	<0.010	M	Gd	<0.0010	O	Mn	<0.000030	M	Rb	0.50	M	Th	<0.0010
O	Be	<0.00020	M	Ga	<0.0010	O	Hg	<0.015	M	Ru	<0.0020	M	Tm	<0.00040
M	Bi	<0.00040	O	Ge	<0.0015	M	Mo	<0.0020	M	Sm	<0.0010	M	Sn	<0.0050
O	B	<0.00060	O	Au	<0.0030	M	Nd	<0.0020	O	Sc	<0.000020	O	Ti	<0.00070
M	Cd	<0.0030	M	Hf	<0.0020	O	Ni	<0.0023	O	Se	<0.05	M	W	<0.0010
O	Ca	0.0016	M	Ho	<0.00050	M	Nb	<0.00050	O	Si	0.0025	M	U	<0.0020
M	Ce	<0.0050	M	In	<0.0010	n	Os		M	Ag	<0.0020	O	V	<0.00090
M	Cs	<0.00030	M	Ir	<0.0050	M	Pd	<0.0050	O	Na	0.61	M	Yb	<0.0010
M	Cr	<0.0050	O	Fe	0.0024	O	P	<0.0025	M	Sr	<0.00050	M	Y	<0.040
M	Co	<0.0030	M	La	<0.00050	M	Pt	<0.0020	O	S	0.021	O	Zn	0.0021
M	Cu	<0.0060	M	Pb	<0.0030	s	K		M	Ta	<0.0070	M	Zr	<0.0050

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): **1.023 g/mL** **(over)**

QA:KL Rev.032702DN

Paul R. Haines

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES 1/2003

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:

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

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

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

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^0 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

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

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."*

010159

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:	Na_2CO_3
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.

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 ppbs.)
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

010160

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

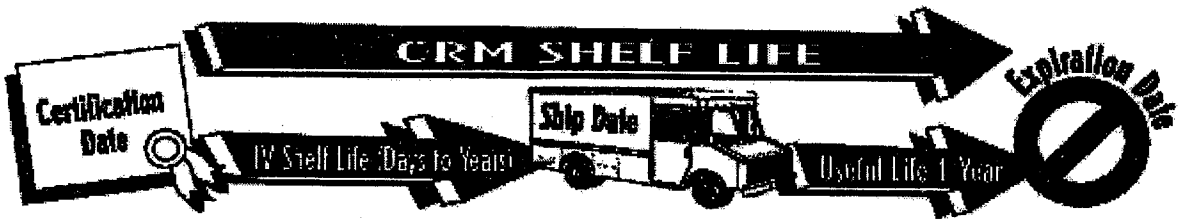
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), 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 01/2004

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

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

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

010161

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: E52370

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 R. Haines

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES 01/2004

Certificate of Analysis

010162

CUSTOM-GRADE SOLUTION 1000 µg/mL Barium in 0.1% HNO_3 (abs)

Catalog Number: CGBA1-1, CGBA1-2, and CGBA1-5

Lot Number: **T-BA02021**

Starting Material:	$Ba(NO_3)_2$
Starting Material Purity:	99.999%
Starting Material Lot No:	21879

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 3/03/03
DATE EXPIRED: 3/01/2004
DATE OPENED: 3/04/03
INORG: 3971 PO: E52064

CERTIFIED CONCENTRATION: 1003 ± 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: 1003 ± 2 µg/mL
Method: Gravimetric as the Sulfate vs NIST weights #822/254143-94.

Instrument Analysis: 1002 ± 3 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3104a.

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	n	Pr		i	Te				
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	M	Mg	<0.0030	M	Rh	<0.00010	M	Tl	<0.00010			
s	Ba		M	Gd	0.0020	M	Mn	<0.00040	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	0.0010	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050			
M	B	<0.0070	M	Au	<0.00030	M	Nd	0.0020	M	Sc	<0.0010	M	Ti	<0.0050			
M	Cd	<0.00030	M	Hf	<0.00020	i	Ni		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			
n	Ce		i	In		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	0.0040	M	Y	<0.0040			
M	Co	<0.00030	n	La		M	Pt	<0.00020	n	S		O	Zn	<0.030			
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): **1.000 g/mL** **(over)**

QA:KL Rev.112702DN

Paul R. Haines

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Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES 1 MAR 2004

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

010163

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: 4062 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; $Be^{+2}(H_2O)_4$
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 conc.)
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

010164

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: E52181

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 Chromium^{+3} in 1.4% HNO_3 (abs) 010165

Catalog Number: CGCR(3)1-1, CGCR(3)1-2 and CGCR(3)1-5

Lot Number: **T-CR02125**

Starting Material:	Chromium Metal
Starting Material Purity:	99.995%
Starting Material Lot No:	F16I22

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/22/02
DATE EXPIRED: 11/01/2003
DATE OPENED: 10/23/02
INORG: 3732 PO: F52057

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.092502DN

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
1/2003

Certificate of Analysis

010166

CUSTOM-GRADE SOLUTION 1000 µg/mL Copper in 2% HNO_3 (abs)

Catalog Number: CGCU1-1, CGCU1-2 and CGCU1-5

Lot Number: **T-CU02060**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 02/13/03
DATE EXPIRED: 03/01/2004
DATE OPENED: 02/13/03
INORG: 3955 PO: F52060

Starting Material:	Copper Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	K09C13

CERTIFIED CONCENTRATION: 1005 ± 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: 1005 ± 2 µg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 1003 ± 5 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3114.

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	O	Li	<0.0050	M	Pr	<0.000030	O	Te	<0.031
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.00004	M	Re	<0.00010	M	Tb	<0.000030
O	As	<0.044	M	Eu	<0.00030	O	Mg	0.00080	M	Rh	0.0010	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	<0.00020	O	Ga	<0.0070	O	Hg	<0.0070	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	0.000090	O	Ge	<0.010	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	0.0013
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	<0.0060	O	Se	<0.020	M	W	<0.0010
O	Ca	0.00058	M	Ho	<0.000050	M	Nb	<0.00005	O	Si	<0.0033	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.030	n	Os		O	Ag	<0.0040	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	0.0024	O	Na	<0.10	M	Yb	<0.00010
O	Cr	<0.0020	O	Fe	<0.0020	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	<0.050	O	Zn	i
s	Cu		M	Pb	0.0029	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): 1.015 g/mL

QA:KSL Rev.070302DN

(over)

Paul R. Haines

Inorganic Ventures, Inc.
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Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES 1 MAR 2004

010167

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 **1000 µg/mL Nickel in 1.4% (abs) HNO_3**

Catalog Number:	CGNI1-1, CGNI1-2, and CGNI1-5
Lot Number:	**T-NI02028**
Starting Material:	Ni pieces
Starting Material Purity (%):	99.9994
Starting Material Lot No	L06L02
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 02/13/03
DATE EXPIRED: 03/01/2004
DATE OPENED: 02/13/03
INORG: 3957 PO: E52060

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 998 ± 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:

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S_i$ = 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 ± 3 µg/mL**
ICP Assay NIST SRM 3136 Lot Number: 000612

Assay Method #2 **998 ± 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	< 0.00938	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 ≈ concs.)
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^+	$^{43}Ca^{16}O^1H$, $^{44}Ca^{16}O$, $^{23}Na^{37}Cl$

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

010168

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

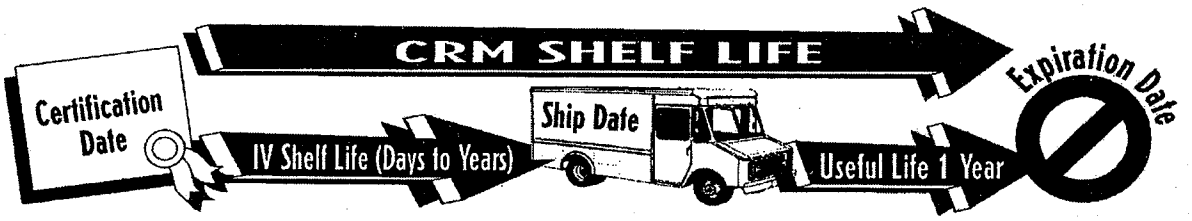
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), 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 11, 2002

Expiration Date: EXPIRES 1 MAR 2004

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/13/03
DATE EXPIRED: 03/01/2004
DATE OPENED: 02/13/03
INORG: 3957 PO: F52060

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

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Cadmium in 2% HNO_3 (abs)

Catalog Number: CGCD1-1, CGCD1-2 and CGCD1-5

010169

Lot Number: **T-CD01125**

Starting Material:	Cadmium Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	H02K40A

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 3/03/03
DATE EXPIRED: 3/01/2004
DATE OPENED: 3/04/03
INORG: 3972 PO: F52064

CERTIFIED CONCENTRATION: 1003 ± 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: 1003 ± 3 μg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 1003 ± 3 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3108.

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	<0.00030	M	Dy	<0.00060	O	Li	<0.0050	M	Pr	<0.000030	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	<0.12	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
s	Cd		M	Hf	<0.00020	O	Ni	<0.0060	O	Se	<0.020	M	W	<0.0010
O	Ca	0.0018	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.010	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.030	n	Os		O	Ag	<0.27	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	O	Pd	<0.053	O	Na	<0.10	M	Yb	<0.00010
O	Cr	<0.0040	O	Fe	<0.0020	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	<0.030
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): 1.015 g/mL

(over)

QA:KL Rev.080102DN

Paul R. Haines

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Quality Assurance Manager

EXPIRES 1 MAR 2004

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."*

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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:	**T-CO01120**
Starting Material:	Co powder
Starting Material Purity (%):	99.9957
Starting Material Lot No	22897
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 3/03/03
DATE EXPIRED: 3/01/2004
DATE OPENED: 3/04/03
INORG: 3973 PO: E52064

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:

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

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

$(\bar{x})$ = 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 ± 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.

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 ≈ concs.)
ICP-OES	238.892 nm	0.01/.002 µg/mL	1	ion	Fe, W, Ta
ICP-OES	228.616 nm	0.01/.001µg/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^+	$^{42}Ca^{16}O^1H$, $^{40}Ar^{18}O^1H$, $^{36}Ar^{23}Na$, $^{43}Ca^{16}O$, $^{24}Mg^{35}Cl$

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

010171

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

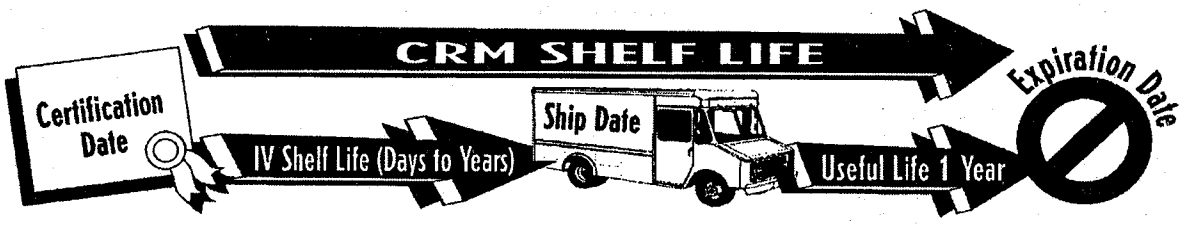
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), 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: September 05, 2002

Expiration Date: EXPIRES 1 MAR 2004

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 3/03/03
DATE EXPIRED: 3/01/2004
DATE OPENED: 3/04/03
INORG: 3973 PO: F52064

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

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Manganese in 2% HNO_3 (abs)

010172

Catalog Number: CGMN1-1, CGMN1-2, and CGMN1-5

Lot Number: **T-MN02033**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/16/03
DATE EXPIRED: 02/01/2004
DATE OPENED: 01/16/03
INORG: 3921 PO: F52073

Starting Material:	Manganese Metal
Starting Material Purity:	99.998%
Starting Material Lot No:	21563

CERTIFIED CONCENTRATION: 1004 ± 3 μg/mL

The Certified Value is the wet assay 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.

Classical Wet Assay: 1004 ± 3 μg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 1001 ± 3 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3132.

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	<0.00090	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	M	Mg	0.0040	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	s	Mn		M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	i	Ga		O	Hg	<0.030	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	0.00024	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	<0.0010
O	Ca	<0.010	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.020	M	U	<0.00020
M	Ce	<0.00050	i	In		n	Os		M	Ag	<0.00020	i	V	
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010
M	Cr	<0.00050	i	Fe		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	<0.0020
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): 1.015 g/mL

(over)

QA:KL Rev.082202DN

Paul R. Haines

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Quality Assurance Manager

EXPIRES 1 FEB 2004

Certificate of Analysis

010173

CUSTOM-GRADE SOLUTION 1000 μg/mL Vanadium in 1.4% HNO_3 (abs)

Catalog Number: CGV1-1, CGV1-2 and CGV1-5

Lot Number: **S-QV01080**

Starting Material:	Vanadium Pentoxide
Starting Material Purity:	99.999%
Starting Material Lot No:	46

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/23/03
DATE EXPIRED: 11/01/2003
DATE OPENED: 10/23/03
INORG: 3740 PO: F52057

CERTIFIED VALUE: 995 μg/mL

The certified value is the average of the classical wet assay and instrument analysis unless otherwise specified. All standards are accurate to a relative precision of ± 0.5% at the 95% confidence level for a period of 1 year. (See expiration date below)

Classical Wet Assay: 999 μg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate
Sufficient number of sample measurements were made to give a minimum relative precision of ± 0.3% at the 95% confidence level.

Instrument Analysis: 991 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3165
Sufficient number of sample measurements were made to give a minimum relative precision of ± 0.5% at the 95% confidence level.

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	<0.0006	M	Li	<0.001	M	Pr	<0.00003	M	Te	<0.003
M	Sb	0.042	M	Er	<0.0005	M	Lu	<0.00004	M	Re	<0.0001	M	Tb	<0.00003
M	As	<0.001	M	Eu	<0.0003	M	Mg	0.0089	M	Rh	<0.0001	M	Tl	<0.0001
M	Ba	<0.001	M	Gd	<0.0001	O	Mn	i	M	Rb	<0.0001	M	Th	<0.0001
M	Be	<0.00005	M	Ga	<0.0001	O	Hg	i	M	Ru	<0.0002	M	Tm	<0.00004
M	Bi	<0.00004	M	Ge	<0.0006	M	Mo	0.016	M	Sm	<0.0001	M	Sn	<0.0005
M	B	<0.007	M	Au	<0.0003	M	Nd	<0.0002	M	Sc	<0.001	M	Ti	<0.005
M	Cd	<0.0003	M	Hf	<0.0002	O	Ni	<0.05	O	Se	<0.4	M	W	0.00055
O	Ca	<0.01	M	Ho	<0.00005	M	Nb	0.00024	O	Si	<0.03	M	U	0.0011
M	Ce	<0.0005	O	In	<0.07	n	Os		M	Ag	0.00044	s	V	
M	Cs	<0.00003	M	Ir	<0.0005	M	Pd	<0.0005	O	Na	<0.09	M	Yb	<0.0001
O	Cr	<0.02	O	Fe	<0.05	O	P	i	M	Sr	<0.00005	M	Y	<0.004
O	Co	<0.05	M	La	<0.00005	M	Pt	<0.0002	n	S		M	Zn	0.0041
M	Cu	<0.0006	M	Pb	<0.0003	n	K		M	Ta	<0.0007	M	Zr	<0.0005

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): 1.013 g/mL

QA:KL Rev.011002DN

(over)

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Paul R. Haines
Quality Assurance Manager

EXPIRES
1 2003

Certificate of Analysis

010174

CUSTOM-GRADE SOLUTION 1000 μg/mL Zinc in 1.4% HNO_3 (abs)

Catalog Number: CGZN1-1, CGZN1-2, and CGZN1-5

Lot Number: **T-ZN02015**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/22/02
DATE EXPIRED: 11/01/2003
DATE OPENED: 10/22/02
INORG: 3741 PO: F52057

Starting Material:	Zinc Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	J17L26

CERTIFIED CONCENTRATION: 1007 ± 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: 1007 ± 2 μg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate

Instrument Analysis: 1006 ± 4 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3168a

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	<0.0020	M	Dy	<0.025	O	Li	0.0000050	M	Pr	<0.0013	M	Te	<0.13
M	Sb	<0.0021	M	Er	<0.021	M	Lu	<0.0017	M	Re	<0.0041	M	Tb	<0.0013
M	As	<0.041	M	Eu	<0.013	O	Mg	0.00011	M	Rh	<0.0041	M	Tl	<0.0041
M	Ba	<0.041	M	Gd	<0.0041	M	Mn	<0.017	M	Rb	<0.0041	M	Th	<0.0041
M	Be	<0.0021	M	Ga	<0.0041	O	Hg	<0.010	M	Ru	<0.0082	M	Tm	<0.0017
M	Bi	<0.0017	M	Ge	<0.025	M	Mo	<0.0082	M	Sm	<0.0041	M	Sn	<0.021
O	B	0.00015	M	Au	<0.013	M	Nd	<0.0082	M	Sc	<0.041	M	Ti	<0.21
M	Cd	<0.013	M	Hf	<0.0082	O	Ni	0.000085	M	Se	<0.033	M	W	<0.041
O	Ca	0.00022	M	Ho	<0.0021	M	Nb	<0.0021	O	Si	<0.0040	M	U	<0.0082
M	Ce	<0.021	M	In	<0.041	n	Os		M	Ag	<0.0082	M	V	<0.0082
M	Cs	<0.0013	M	Ir	<0.021	M	Pd	<0.021	O	Na	0.00055	M	Yb	<0.0041
O	Cr	<0.0010	O	Fe	0.000045	O	P	<0.0030	M	Sr	<0.0021	M	Y	<0.17
M	Co	<0.013	M	La	<0.0021	M	Pt	<0.0082	O	S	<0.020	s	Zn	
O	Cu	<0.00050	M	Pb	<0.013	O	K	0.00018	M	Ta	<0.029	M	Zr	<0.021

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 21°C): 1.011 g/mL

QA:KL Rev.051702DN

(over)

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Paul R. Haines
Quality Assurance Manager

EXPIRES
1/2003

inorganic ventures / iv labs

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certificate of analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Silver in 3.5% HNO_3 (abs)

010175

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 2004

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Arsenic in 1.4% HNO_3 (abs) 010176

Catalog Number: CGAS1-1, CGAS1-2 and CGAS1-5

Lot Number: **T-AS02019**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/09/03
DATE EXPIRED: 02/01/2004 DR
DATE OPENED: 01/10/03
INORG: 3899 PO: F52071

Starting Material:	Arsenic Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	23014

CERTIFIED CONCENTRATION: 1006 ± 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: 1003 μg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 1006 ± 3 μg/mL (Average of 3 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3103a.

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	0.00030	M	Dy	<0.012	O	Li	<0.000020	M	Pr	<0.00060	M	Te	<0.060
O	Sb	<0.010	M	Er	<0.010	M	Lu	<0.00080	O	Re	<0.010	M	Tb	<0.00060
s	As		M	Eu	<0.0060	O	Mg	<0.000030	M	Rh	<0.0020	M	Tl	<0.0020
M	Ba	<0.020	M	Gd	<0.0020	O	Mn	<0.000030	M	Rb	<0.0020	M	Th	<0.0020
M	Be	<0.0010	M	Ga	<0.0020	O	Hg	<0.012	M	Ru	<0.0040	M	Tm	<0.00080
M	Bi	<0.00080	M	Ge	<0.012	M	Mo	<0.0040	M	Sm	<0.0020	O	Sn	0.00053
O	B	<0.012	M	Au	<0.0060	M	Nd	<0.0040	M	Sc	<0.020	M	Ti	<0.10
M	Cd	<0.0060	M	Hf	<0.0040	M	Ni	<0.016	M	Se	<0.016	M	W	<0.020
O	Ca	<0.0015	M	Ho	<0.0010	O	Nb	<0.0020	O	Si	0.0077	M	U	<0.0040
M	Ce	<0.010	M	In	<0.020	n	Os		M	Ag	<0.0040	M	V	<0.0040
M	Cs	<0.00060	M	Ir	<0.010	M	Pd	<0.010	O	Na	0.00096	M	Yb	<0.0020
M	Cr	<0.010	O	Fe	<0.0011	O	P	<0.0026	M	Sr	<0.0010	M	Y	<0.080
M	Co	<0.0060	M	La	<0.0010	M	Pt	<0.0040	O	S	<0.025	O	Zn	0.00019
M	Cu	<0.012	M	Pb	<0.0060	O	K	0.00096	M	Ta	<0.014	M	Zr	<0.010

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

QA:KSL Rev.061202DN

(over)

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Quality Assurance Manager

EXPIRES 1 FEB 2004

Certificate of Analysis

010177

CUSTOM-GRADE SOLUTION 1000 μg/mL Lead in 0.35% HNO_3 (abs)

Catalog Number: CGPB1-1, CGPB1-2 and CGPB1-5

Lot Number: **T-PB02110**

Starting Material:	Lead Nitrate
Starting Material Purity:	99.995%
Starting Material Lot No:	22150

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/22/02
DATE EXPIRED: 11/01/2003
DATE OPENED: 10/23/02
INORG: 3735 PO: F52057

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: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 995 ± 8 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3128.

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	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	<0.0030	M	Rh	<0.020	M	Tl	<0.0050
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	<0.00010	O	Hg	<0.090	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.0010	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	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	<0.000050	M	Nb	<0.000050	O	Si	<0.020	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.030	n	Os		i	Na		M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	M	Sr	0.00034	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.050	O	P	<0.050	n	S		M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	M	Ta	<0.00070	M	Zn	<0.0020
M	Cu	<0.00060	s	Pb		n	K					M	Zr	0.00120

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): 1.002 g/mL

(over)

QA:KSL Rev.061702JTS

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EXPIRES
1/2003

010178

Certificate of Analysis

CUSTOM-GRADE SOLUTION **1000 μg/mL Antimony** in 0.7% HNO_3 (abs) / 3% Tartaric Acid

Catalog Number: CGSB1-1, CGSB1-2 and CGSB1-5

Lot Number: **T-SB02074**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 02/13/03
DATE EXPIRED: 03/01/2004
DATE OPENED: 02/13/03
INORG: 3953 PO: F52060

Starting Material:	Antimony Metal
Starting Material Purity:	99.995%
Starting Material Lot No:	E14H25

CERTIFIED CONCENTRATION: 1003 ± 2 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.

Calculated Value: 999 μg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 1003 ± 2 μg/mL (Average of 2 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3102a.

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	<0.0050	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	n	Te				
s	Sb		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	0.00030			
O	Ba	<0.020	M	Gd	<0.00010	M	Mn	0.0080	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	0.00070	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	n	Sn				
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	<0.0010			
O	Ca	<0.020	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.020	M	U	<0.00020			
M	Ce	0.0018	O	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	0.031	O	Fe	<0.050	O	P	<0.050	M	Sr	<0.000050	M	Y	<0.0040			
M	Co	<0.00030	M	La	<0.040	M	Pt	<0.00020	n	S		M	Zn	<0.0020			
M	Cu	0.0016	M	Pb	0.0011	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): 1.019 g/mL

(over)

QA:KL Rev.082202DN

Paul R. Haines

Quality Assurance Manager

Expires:

EXPIRES 1 MAR 2004

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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."*

010179

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: F52370

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:

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** **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

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 - 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.)
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)

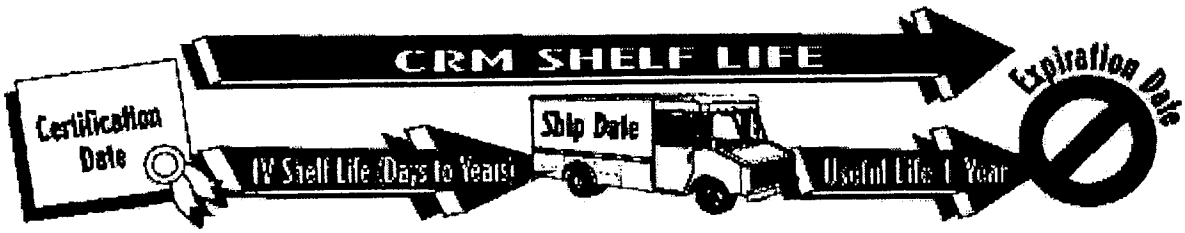
10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

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

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

INORGANIC LABS/RADCHEM LABS 3 of 3
DATE RECEIVED: 06/20/03
DATE EXPIRED: 07/01/2004
DATE OPENED: 06/23/03
INORG: 4152 PO: E52370

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: November 27, 2002

Expiration Date: EXPIRES 01/2004

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

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Thallium in 0.5% HNO_3 (abs)

Catalog Number: CGTL1-1, CGTL1-2 and CGTL1-5

010181

Lot Number: **T-TL01075**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/16/03
DATE EXPIRED: 02/01/2004
DATE OPENED: 01/16/03
INORG: 3922 PO: F52073

Starting Material:	Thallium Nitrate
Starting Material Purity:	99.999%
Starting Material Lot No:	59001

CERTIFIED CONCENTRATION: 997 ± 1 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: 1000 μg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 997 ± 1 μg/mL (Average of 2 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3158.

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	0.000080	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	s	Tl	
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	<0.00010	O	Hg	i	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	0.00060
O	B	<0.020	M	Au	<0.00030	M	Nd	<0.00020	M	Sc	<0.0010	M	Ti	<0.0050
M	Cd	0.00090	M	Hf	0.0010	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	O	In	i	n	Os		M	Ag	<0.00020	M	V	<0.00020
M	Cs	0.00010	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	i	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	0.015
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): 1.002 g/mL

QA:KL Rev.031402DN

(over)

Paul R. Haines

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Quality Assurance Manager

EXPIRES 1 FEB 2004

Certificate of Analysis

CUSTOM GRADE SOLUTION 1000 μg/mL Boron in H_2O

Catalog Number: CGB1-1, CGB1-2 and CGB1-5

010182

Lot Number: **T-B02038**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 02/13/03
DATE EXPIRED: 03/01/2004
DATE OPENED: 02/13/03
INORG: 3954 PO: F52060

Starting Material:	H_3BO_3
Starting Material Purity:	99.999%
Starting Material Lot No:	S-B02032

CERTIFIED CONCENTRATION: 1001 ± 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: 1001 ± 3 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3107.

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	<0.0060	O	Li	<0.000024	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	O	Mg	<0.000060	M	Rh	<0.0010	M	Tl	<0.0010
O	Ba	<0.00010	M	Gd	<0.0010	O	Mn	<0.000023	M	Rb	<0.0010	M	Th	<0.0010
O	Be	<0.00017	O	Ga	<0.0016	O	Hg	<0.015	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
s	B		M	Au	<0.0030	M	Nd	<0.0020	O	Sc	<0.000023	M	Ti	<0.050
M	Cd	<0.0030	M	Hf	<0.0020	O	Ni	<0.0023	O	Se	<0.0062	M	W	<0.010
O	Ca	<0.000070	M	Ho	<0.00050	M	Nb	<0.00050	O	Si	0.00067	M	U	<0.0020
O	Ce	<0.0030	M	In	<0.010	n	Os		M	Ag	<0.0020	O	V	<0.00083
M	Cs	<0.00030	M	Ir	<0.0050	M	Pd	<0.0050	O	Na	<0.00010	M	Yb	<0.0010
M	Cr	<0.0050	O	Fe	<0.0011	O	P	<0.0025	M	Sr	<0.00050	M	Y	<0.040
O	Co	<0.0011	M	La	<0.00050	M	Pt	<0.0020	O	S	<0.10	O	Zn	<0.00019
M	Cu	<0.0060	M	Pb	<0.0030	O	K	<0.0030	M	Ta	<0.0070	M	Zr	<0.0050

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

QA:KL Rev.073102DN

(over)

Paul R. Haines

Quality Assurance Manager

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Technical Support: 800-569-6799

EXPIRES
1 MAR 2004

Certificate of Analysis

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 02/13/03
DATE EXPIRED: 03/01/2004
DATE OPENED: 02/13/03
INORG: 3956 PO: F52060

CUSTOM-GRADE SOLUTION 1000 μg/mL Molybdenum in H_2O tr. NH_4OH

Catalog Number: CGMO1-1, CGMO1-2 and CGMO1-5

010183

Lot Number: **T-MO01130**

Starting Material:	Ammonium Molybdenum Oxide
Starting Material Purity:	99.9943%
Starting Material Lot No:	21410

CERTIFIED CONCENTRATION: 997 ± 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: 1000 μg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 997 ± 3 μg/mL (Average of 2 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3134.

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	<0.050	M	Dy	<0.012	O	Li	<0.010	O	Pr	<0.10	i	Te	
M	Sb	0.0094	M	Er	<0.010	M	Lu	<0.00080	M	Re	<0.0020	M	Tb	<0.00060
M	As	<0.020	M	Eu	<0.0060	O	Mg	<0.050	M	Rh	<0.0020	M	Tl	<0.0020
M	Ba	<0.020	M	Gd	<0.0020	M	Mn	<0.0080	M	Rb	0.025	M	Th	<0.0020
M	Be	<0.0010	M	Ga	<0.0020	i	Hg		M	Ru	<0.0040	M	Tm	<0.00080
M	Bi	<0.00080	M	Ge	<0.012	s	Mo		M	Sm	<0.0020	M	Sn	<0.010
O	B	<0.50	M	Au	<0.0060	O	Nd	<0.050	O	Sc	<0.050	O	Ti	<0.0050
O	Cd	<0.50	M	Hf	<0.0040	M	Ni	<0.016	M	Se	<0.016	M	W	0.056*
O	Ca	0.00026	M	Ho	<0.0010	O	Nb	<0.10	O	Si	<0.10	M	U	<0.0040
O	Ce	<0.050	M	In	0.0024	n	Os		M	Ag	<0.0040	M	V	<0.0040
M	Cs	<0.00060	M	Ir	<0.010	M	Pd	<0.010	O	Na	<0.10	M	Yb	<0.0020
M	Cr	<0.010	O	Fe	<0.50	i	P		M	Sr	<0.0010	M	Y	<0.080
M	Co	<0.0060	M	La	<0.0010	M	Pt	<0.0040	i	S		M	Zn	<0.040
M	Cu	<0.012	M	Pb	< 0.0060	O	K	0.0098	M	Ta	<0.014	M	Zr	<0.010

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

*W impurity may be due to Mo doubly charged ion and represents the maximum concentration possible.

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 0.999 g/mL **(over)**

QA:KL Rev.073102DN

Paul R. Haines
Quality Assurance Manager

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EXPIRES 1 MAR 2004

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Phosphorus in H_2O 010184

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. Haines

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EXPIRES 01 02 2004

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."*

010185

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:	SiO_2
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 (□) = $\frac{\Sigma x_i}{n}$

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.)

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.

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 010186

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^0 with Na_2CO_3); Geological Samples (Fuse in Pt^0 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^0 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 ≤5 ppm conc.)
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

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	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

010187

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: 11/12/02
DATE EXPIRED: 12/1/2003 PR
DATE OPENED: 11/13/02
INORG: 3762 PO: F52061

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

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 DEC 2003

inorganic ventures / iv labs

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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010188

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
$\sum S_i$ = 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 ± 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.

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

010189

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

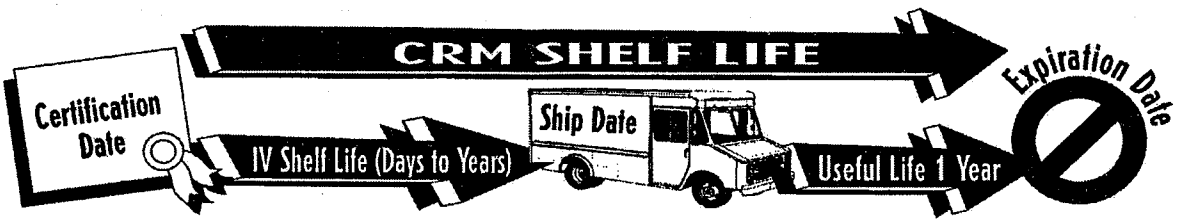
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), 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: F52370

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

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."*

010190

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.

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 010191

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 $Sn(OH)_4F_2^{2-}$

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 $Sn(OH)_4F_2^{2-}$ for 1 year in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $Sn(OH)_4F_2^{2-}$ 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 ≥10ppm conc.)
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^+	^{120}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: E52167

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: December 17, 2002

Expiration Date: EXPIRES 12/2004

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

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 **1000 µg/mL Bismuth in 3.5% (abs) HNO_3** 010192

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.

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 010193

Used for testing can be actually compared to Certified 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 - 208.9804; +3; 6 ;$Bi(O)(H_2O)_5^{3+}$

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 ≥50ppm conc.)
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

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 1/2004

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)

Catalog Number: CGLA1-1 and CGLA1-5

010194

Lot Number: **T-QLA01057**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 08/26/03
DATE EXPIRED: 09/01/2004
DATE OPENED: 08/26/03
INORG: 4221 PO: F52224

Starting Material:	Lanthanum Oxide
Starting Material Purity:	99.999%
Starting Material Lot No:	LA-0-5-017

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 R Haines

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Quality Assurance Manager

EXPIRES 1/2004

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Palladium in 3.3% HCl (abs) 010195

Catalog Number: CGPD1-1 and CGPD1-5

Lot Number: **T-PD02014**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/03
DATE EXPIRED: 3/01/2004
DATE OPENED: 2/28/03
INORG: 3964 PO: F52064

Starting Material:	Palladium Nitrate
Starting Material Purity:	99.999%
Starting Material Lot No:	00614

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.

Calculated Value: 1002 μg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 1001 ± 3 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3138.

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	<0.00090	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	0.0017	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.060	M	Eu	<0.00030	M	Mg	0.0090	O	Rh	<0.020	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	0.00026	O	Hg	<0.030	O	Ru	<0.010	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	0.0058	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	0.00090	M	Nd	0.00090	M	Sc	<0.0010	M	Ti	<0.0050
O	Cd	<0.010	M	Hf	<0.00020	O	Ni	<0.050	O	Se	<0.40	M	W	<0.0010
O	Ca	0.040	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.020	M	U	<0.00020
M	Ce	<0.00050	O	In	<0.030	n	Os		O	Ag	0.26	O	V	<0.010
i	Cs		M	Ir	<0.00050	s	Pd		O	Na	<0.090	M	Yb	<0.00010
O	Cr	<0.020	O	Fe	<0.050	O	P	<0.050	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	0.016	n	S		M	Zn	0.0030
M	Cu	0.0023	M	Pb	0.0022	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): 1.022 g/mL

QA:KSL Rev.050202DN

(over)

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Paul R. Haines
Quality Assurance Manager

EXPIRES 1 MAR 2004

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Sulfur in H_2O

010196

Catalog Number: CGS1-1, CGS1-2, and CGS1-5

Lot Number: **T-S01058**

Starting Material:	H_2SO_4
Starting Material Purity:	99.999%
Starting Material Lot No:	N38818

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/22/02
DATE EXPIRED: 11/01/2003
DATE OPENED: 10/23/02
INORG: 3739 PO: F52057

CERTIFIED CONCENTRATION: 1000 ± 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: 1000 ± 2 μg/mL
Method: Acidimetric Titration vs NIST SRM KHP 84k.

Instrument Analysis: 1003 ± 4 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3154.

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	<0.0030	M	Dy	<0.012	O	Li	<0.00016	M	Pr	<0.00060	M	Te	<0.060
M	Sb	<0.0010	M	Er	<0.010	M	Lu	<0.00080	M	Re	<0.0020	M	Tb	<0.00060
M	As	<0.020	M	Eu	<0.0060	O	Mg	<0.000040	M	Rh	<0.0020	M	Tl	<0.0020
M	Ba	<0.020	M	Gd	<0.0020	M	Mn	<0.0080	M	Rb	<0.0020	M	Th	<0.0020
O	Be	<0.0020	M	Ga	<0.0020	O	Hg	<0.011	M	Ru	<0.0040	M	Tm	<0.00080
M	Bi	<0.00080	M	Ge	<0.012	M	Mo	<0.0040	M	Sm	<0.0020	M	Sn	<0.010
O	B	<0.010	M	Au	<0.0060	M	Nd	<0.0040	M	Sc	<0.020	M	Ti	<0.10
M	Cd	<0.0060	M	Hf	<0.0040	O	Ni	<0.0023	O	Se	<0.0062	M	W	<0.020
O	Ca	<0.0037	M	Ho	<0.0010	M	Nb	<0.0010	O	Si	<0.0041	M	U	<0.0040
M	Ce	<0.010	M	In	<0.020	n	Os		M	Ag	<0.0040	M	V	<0.0040
M	Cs	<0.00060	M	Ir	<0.010	M	Pd	<0.010	O	Na	<0.00010	M	Yb	<0.0020
M	Cr	<0.010	O	Fe	<0.0011	O	P	<0.0048	M	Sr	<0.0010	M	Y	<0.080
M	Co	<0.0060	M	La	<0.0010	M	Pt	<0.0040	s	S		O	Zn	0.0019
M	Cu	<0.012	M	Pb	<0.0060	O	K	<0.0017	M	Ta	<0.014	M	Zr	<0.010

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)

OA-KL

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Paul R. Haines
Quality Assurance Manager

EXPIRES 1 Nov 2003

Certificate of Analysis

CUSTOM-GRADE SOLUTION

1000 μg/mL Thorium in 3% HNO_3 (abs)

Catalog Number: CGTH1-1 and CGTH1-5

010197

Lot Number: **T-TH01059**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 9/4/02
DATE EXPIRED: 10/1/2003 PR
DATE OPENED: 9/4/02
INORG: 3681 PO: F52048

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.0508020N

(over)

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Paul R. Haines
Quality Assurance Manager

EXPIRES 1 Oct 2003

Certificate of Analysis

CUSTOM-GRADE SOLUTION

1000 μg/mL Uranium in 1% HNO_3 (abs)

Catalog Number: CGU1-1 and CGU1-5

010198

Lot Number: **T-U01056**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 3/03/03
DATE EXPIRED: 3/01/2004
DATE OPENED: 3/04/03
INORG: 3974 PO: E52064

Starting Material:	Uranium Oxynitrate*
Starting Material Purity:	99.95%
Starting Material Lot No:	E14L40

CERTIFIED CONCENTRATION: 1001 ± 1 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.

Instrument Analysis: 1001 ± 1 μg/mL (Avg. 2 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3164.

Calculated Value: 1000 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	<0.20	M	Dy	<0.0060	O	Li	<0.010	M	Pr	<0.00030	M	Te	<0.030
M	Sb	0.00020	M	Er	<0.0050	M	Lu	<0.00040	M	Re	<0.0010	M	Tb	<0.00030
i	As	<0.010	M	Eu	<0.0030	O	Mg	0.012	M	Rh	<0.0010	M	Tl	<0.0010
M	Ba	0.0022	M	Gd	<0.0010	M	Mn	<0.0040	M	Rb	<0.0010	M	Th	<0.0010
O	Be	<0.10	M	Ga	<0.0010	i	Hg		M	Ru	<0.0020	M	Tm	<0.00040
M	Bi	0.00030	M	Ge	<0.0060	M	Mo	<0.0020	M	Sm	<0.0010	M	Sn	0.043
O	B	0.0020	M	Au	<0.0030	M	Nd	<0.0020	M	Sc	0.00080	M	Ti	0.029
M	Cd	<0.0030	M	Hf	<0.0020	i	Ni		M	Se	<0.0080	M	W	<0.010
O	Ca	0.11	M	Ho	<0.00050	M	Nb	<0.00050	i	Si		s	U	
M	Ce	<0.0050	M	In	<0.010	n	Os		M	Ag	<0.0020	M	V	0.00040
M	Cs	<0.00030	M	Ir	<0.0050	M	Pd	<0.0050	O	Na	0.19	M	Yb	<0.0010
M	Cr	0.0047	i	Fe		i	P		M	Sr	0.0011	M	Y	0.56
M	Co	0.014	M	La	0.0014	M	Pt	<0.0020	i	S		M	Zn	0.020
M	Cu	0.022	M	Pb	0.0025	i	K		M	Ta	<0.0070	M	Zr	0.00060

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

****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	0.195 ± 0.005

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.008 g/mL

(over) QA:KSL Rev.092502DN

Paul R Haines

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EXPIRES 1 MAR 2004

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."*

010199

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	INORGANIC LABS/RADCHEM LABS Pg 1 of 2
Lot Number:	**W-W01080**	DATE RECEIVED: 07/31/03
Starting Material:	W Powder	DATE EXPIRED: 08/01/2004
Starting Material Purity (%):	99.990703	DATE OPENED: 08/01/03
Starting Material Lot No	21418,C31H46,D02J21,E03K06,D11F29	INORG: 4203 PO: E52383
Matrix:	1% (abs) HNO_3/1% (abs) HF	

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 (□) = $\frac{\Sigma x_i}{n}$

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

(□) = mean
x_i = individual results
n = number of measurements
Σs_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.

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

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_4OH) ; Organic Matrices (Dry ash at 450 °C in Pt° 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 ≥50ppm)
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⁺	$^{166}Er^{16}O$

010200

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

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 1/2004

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 **Yttrium** in 1.4% HNO_3 (abs)

Catalog Number: CGY1-1 and CGY1-5

Lot Number: **T-Y01086**

010201
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

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Orders: 800-669-6799 • FAX (732) 901-1903
Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES
1 JUN 2004

Certificate of Analysis

CUSTOM-GRADE SOLUTION

1000 μg/mL Zirconium in H_2O tr. HF tr. HNO_3

Catalog Number: CGZR1-1 and CGZR1-5
This standard should **not** be prepared or stored in glass.

010202

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 02/13/03
DATE EXPIRED: 03/01/2004
DATE OPENED: 02/13/03
INORG: 3958 PO: F52060

Lot Number: **T-QZR01062**

Starting Material:	Zirconium Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	SP4811A

CERTIFIED CONCENTRATION: 1005 ± 6 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.

Instrument Analysis: 1005 ± 6 μg/mL (Average of 2 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3169

Calculated Value: 1000 μg/mL (For informational purposes)
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	0.055	M	Dy	<0.012	O	Li	<0.000030	M	Pr	<0.00059	M	Te	<0.059
M	Sb	0.00017	M	Er	<0.0098	M	Lu	<0.00079	M	Re	<0.0020	M	Tb	<0.00059
M	As	<0.020	M	Eu	<0.0059	O	Mg	<0.000030	M	Rh	<0.0020	M	Tl	<0.0020
M	Ba	0.013	M	Gd	<0.0020	O	Mn	0.0020	M	Rb	<0.0020	M	Th	<0.0020
O	Be	<0.10	M	Ga	<0.0020	O	Hg	<0.011	M	Ru	<0.0040	M	Tm	<0.00079
M	Bi	<0.00079	M	Ge	<0.012	O	Mo	<0.10	M	Sm	<0.0020	M	Sn	0.0011
i	B		M	Au	<0.0059	M	Nd	<0.0040	O	Sc	<0.00016	O	Ti	0.0031
O	Cd	<0.0053	M	Hf	0.087	O	Ni	0.014	M	Se	<0.016	M	W	0.0016
O	Ca	0.0020	M	Ho	<0.00098	i	Nb		i	Si		M	U	0.00040
M	Ce	<0.0098	M	In	<0.020	n	Os		i	Ag		M	V	0.0016
M	Cs	<0.00059	M	Ir	<0.0098	i	Pd		O	Na	0.041	M	Yb	<0.0020
O	Cr	0.034	O	Fe	0.45	O	P	<0.0048	M	Sr	<0.00098	O	Y	<0.0010
M	Co	<0.0059	M	La	<0.00098	M	Pt	<0.0040	i	S		O	Zn	0.0057
M	Cu	0.013	M	Pb	<0.0059	O	K	0.013	M	Ta	0.0011	s	Zr	

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): 1.000 g/mL

QA:KL Rev.100302DN

(over)

Paul R. Haines

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Quality Assurance Manager

EXPIRES 1 MAR 2004

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030930-7
SRR: 25032
SDG: 235410
CASE: CNWRA
VTSR: September 30, 2003
PROJECT#: 06002.01.081

MA 10-21-03
~~010203~~

Pipette Calibrations

Book/Page: 03 017

~~010204~~ MA 10-21-03

SwRI - Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

(Space provide for Inorganic Laboratories' Fixed Volume Pipette Verification Spreadsheet) 010230

9-25-03

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	1.0152	1.0155	1.0158	1.02	101.55
TMA1	1000	1.0113	1.0096	1.0083	1.01	100.97
TMA2	1000	1.0033	1.0087	1.0067	1.01	100.62
TMA3	1000	OUT	OF	SERVICE		
TMA6	1000	1.0024	1.0001	1.0001	1.00	100.09
TMB1	900	0.9026	0.9044	0.9025	0.90	100.35
TMC1	800	0.8012	0.7989	0.7991	0.80	99.97
TMDD1	750	0.7498	0.7493	0.7496	0.75	99.94
TMD1	700	0.7004	0.7018	0.7011	0.70	100.16
TMD2	700	0.7071	0.7047	0.7011	0.70	100.61
TME1	600	0.6021	0.6009	0.6005	0.60	100.19
TMF2	500	0.4981	0.4938	0.4961	0.50	99.20
TMF5	500	0.5029	0.5056	0.5057	0.50	100.95
ICF1	500	0.5078	0.5029	0.5041	0.50	100.99
L30-500	500	0.5042	0.5059	0.5037	0.50	100.92
TMG3	400	0.3992	0.3991	0.3993	0.40	99.80
TMH1	300	0.3052	0.3037	0.3027	0.30	101.29
TMH2	300	0.3001	0.2997	0.2995	0.30	99.92
TMJ1	250	0.2518	0.2502	0.2486	0.25	100.08
TMJ2	250	0.2531	0.2487	0.2501	0.25	100.25
TMJ3	250	0.2518	0.2502	0.2508	0.25	100.37
TMK2	200	0.2022	0.2026	0.2031	0.20	101.32
TML1	150	0.1521	0.1517	0.1511	0.15	101.09
TMM1	120	0.1206	0.1203	0.1201	0.12	100.28
TMN3	100	0.1006	0.1008	0.1003	0.10	100.57
ICN1	100	0.1012	0.1004	0.1008	0.10	100.80
TMQ1	80	0.0802	0.0811	0.0805	0.08	100.75
TMR1	70	OUT	OF	SERVICE		
TMS1	60	OUT	OF	SERVICE		
LAB-30A	50	0.0501	0.0499	0.0498	0.05	99.87
TMU1	40	0.0401	0.0399	0.0399	0.04	99.92
TMU2	40	0.04	0.0399	0.04	0.04	99.92
TMV1	30	0.0301	0.0301	0.0299	0.03	100.11
L30-20	20	0.0201	0.0201	0.0201	0.02	100.50
TMW1	25	0.0251	0.0251	0.0249	0.03	100.13
TMY1	15	OUT	OF	SERVICE		

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SwRI - Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

Balance #: 16 Thermometer #: 6011 diH20 Temperature (°C): 21

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
Lab30	1000	1.0152	1.0155	1.0158
TMA1	1000	1.0113	1.0096	1.0083
TMA2	1000	1.0033	1.0087	1.0067
TMA3	1000	OUT	OF	SERVICE
TMA6	1000	1.0024	1.0001	1.0001
TMB1	900	.9026	.9044	.9025
TMC1	800	.8012	.7989	.7991
TMDD1	750	.7498	.7493	.7496
TMD1	700	.7004	.7018	.7011
TMD2	700	.7071	.7047	.7011
TME1	600	.6021	.6009	.6005
TMF2	500	.4981	.4938	.4961
TMF5	500	.5059	.5056	.5057
ICF1	500	.5078	.5029	.5041
L30-500	500	.5042	.5059	.5037
TMG3	400	.3992	.3991	.3993
TMH1	300	.3052	.3037	.3027
TMH2	300	.3001	.2997	.2995
TMJ1	250	.2518	.2502	.2486
TMJ2	250	.2531	.2487	.2501
TMJ3	250	.2578	.2502	.2508
TMK2	200	.2022	.2026	.2031
TML1	150	.1521	.1517	.1511
TMM1	120	.1206	.1203	.1201
TMN3	100	.1006	.1008	.1003
ICN1	100	.1012	.1004	.1008
TMQ1	80	.0802	.0811	.0805
TMR1	70	OUT	OF	SERVICE
TMS1	60	OUT	OF	SERVICE
LAB-30A	50	.0501	.0499	.0498
TMU1	40	.0401	.0399	.0399
TMU2	40	.0400	.0399	.0400
TMV1	30	.0301	.0301	.0299
L30-20	20	.0201	.0201	.0201
TMW1	25	.0251	.0251	.0249
TMY1	15	OUT	OF	SERVICE

Analyst: John Willes Date: 9-25-03

Reviewed by: Laura Wright Date: 9/25/03

FRM-243b (Rev 3/Mar 03)

Book/page: 04 001

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

10-2-03

010205

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	0.0201	0.0202	0.0201	0.020	100.67
ADJ200-A	100	0.0989	0.0991	0.0988	0.099	98.93
	200	0.1982	0.1995	0.1987	0.199	99.40
	20	0.0200	0.0203	0.0204	0.020	101.17
ADJ200-C	100	0.0986	0.0992	0.0990	0.099	98.93
	200	0.1990	0.1997	0.1991	0.199	99.63
	20	0.0204	0.0204	0.0201	0.020	101.50
ADJ200-D	100	0.0990	0.0993	0.0989	0.099	99.06
	200	0.1988	0.1991	0.1992	0.199	99.52
	20	0.0200	0.0199	0.0200	0.020	99.83
ADJ200-G	100	0.0980	0.0986	0.0991	0.099	98.57
	200	0.1989	0.1988	0.1989	0.199	99.43
	20	0.0202	0.0202	0.0203	0.020	101.17
ADJ200-H	100	0.0998	0.0997	0.0993	0.100	99.60
	200	0.2015	0.2012	0.2002	0.201	100.48
	20	0.0203	0.0200	0.0203	0.020	101.00
ADJ200-J	100	0.0990	0.0995	0.0996	0.099	99.37
	200	0.2010	0.2002	0.1998	0.200	100.17
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					

10-2-03

FRM-247a (Rev 3/Oct 03)

010206

Book/page: 04 002

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G011 diH20 Temperature (° C) 21

	Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
20 µL – 200 µL		20	.0201	.0202	.0201
	ADJ200-A	100	.0989	.0991	.0988
		200	.1982	.1995	.1987
		20	.0200	.0203	.0204
	ADJ200-C	100	.0986	.0992	.0990
		200	.1990	.1997	.1991
		20	.0204	.0204	.0201
	ADJ200-D	100	.0990	.0993	.0989
		200	.1988	.1991	.1992
		20	.0200	.0199	.0200
	ADJ200-G	100	.0980	.0986	.0991
		200	.1989	.1988	.1989
		20	.0202	.0202	.0203
	ADJ200-H	100	.0998	.0997	.0993
		200	.2015	.2012	.2002
		20	.0203	.0200	.0203
	ADJ200-J	100	.0990	.0995	.0996
		200	.2010	.2002	.1998
		20			
	ADJ200	100			
		200			
		20		J.S 10-2-03	
	ADJ200	100			
		200			

Analyst: John Wills Date: 10-2-03.

Reviewed by: Laura Wright Date: 10/2/03

Book/page: 04 055

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010207

10-2-03

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100	0.1006	0.0995	0.0997	0.100	99.93
ADJ1000-C	500	0.4934	0.4938	0.4927	0.493	98.66
	1000	0.9933	0.9958	0.9923	0.994	99.38
	100	0.1010	0.1009	0.1011	0.101	101.00
ADJ1000-D	500	0.4932	0.4946	0.4941	0.494	98.79
	1000	0.9931	0.9973	0.9934	0.995	99.46
	100	0.0991	0.0993	0.0984	0.099	98.93
ADJ1000-E	500	0.4986	0.4921	0.4976	0.496	99.22
	1000	0.9958	0.9955	0.9969	0.996	99.61
	100	0.1002	0.1017	0.0999	0.101	100.60
ADJ1000-F	500	0.4957	0.4977	0.4964	0.497	99.32
	1000	0.9952	0.9987	0.9972	0.997	99.70
	100	0.0998	0.0997	0.0981	0.099	99.20
ADJ1000-G	500	0.4927	0.4996	0.4929	0.495	99.01
	1000	1.0049	0.9948	0.9956	0.998	99.84
	100	0.1006	0.0998	0.1001	0.100	100.17
ADJ1000-H	500	0.4954	0.4945	0.4920	0.494	98.79
	1000	0.9914	0.9927	0.9933	0.992	99.25
	100	0.1018	0.1001	0.1016	0.102	101.60
ADJ1000-J	500	0.4964	0.4967	0.4974	0.497	99.37
	1000	1.0018	0.9961	0.9952	0.998	99.77
	100					
ADJ1000	500					
	1000					
	100					
ADJ1000	500					
	1000					

10-2-03

FRM-247b (Rev 2/Oct 03)

010208

Book/page: 04 056

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: 6011 diH20 Temperature (° C) 21

	Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
100 µL – 1000 µL		100	.1006	.0995	.0997
	ADJ1000-C	500	.4934	.4938	.4927
		1000	.9933	.9958	.9923
		100	.1010	.1009	.1011
	ADJ1000-D	500	.4932	.4946	.4941
		1000	.9931	.9973	.9934
		100	.0991	.0993	.0984
	ADJ1000-E	500	.4986	.4921	.4976
		1000	.9958	.9955	.9969
		100	.1002	.1017	.0999
	ADJ1000-F	500	.4957	.4977	.4964
		1000	.9952	.9987	.9972
		100	.0998	.0997	.0981
	ADJ1000-G	500	.4927	.4996	.4929
		1000	1.0049	.9948	.9956
		100	.1006	.0998	.1001
	ADJ1000-H	500	.4954	.4945	.4920
		1000	.9914	.9927	.9933
		100	.1018	.1001	.1016
	ADJ1000-J	500	.4964	.4967	.4974
		1000	1.0018	.9961	.9952
		100			
	ADJ1000	500			
		1000			
		100			
	ADJ1000	500			
		1000			

10-2-03

Analyst: John Wilber Date: 10-2-03

Reviewed by: Dawna Wright Date: 10/2/03

Book/page: 04 109

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

10-2-03

010209

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	0.5022	0.5084	0.5093	0.507	101.33
ADJ5000-C	2500	2.5084	2.4944	2.5060	2.503	100.12
	5000	5.0171	5.0053	5.0024	5.008	100.17
	500	0.5062	0.5078	0.5032	0.506	101.15
ADJ5000-G	2500	2.5049	2.5087	2.5025	2.505	100.21
	5000	5.0270	5.0220	5.0173	5.022	100.44
	500	0.5017	0.5082	0.5052	0.505	101.01
ADJ5000-H	2500	2.4989	2.4980	2.4942	2.497	99.88
	5000	5.0258	5.0043	5.0103	5.013	100.27
	500	0.4988	0.4985	0.4973	0.498	99.64
ADJ5000-I	2500	2.4954	2.4944	2.4949	2.495	99.80
	5000	5.0137	4.9989	5.0016	5.005	100.09
	500	0.5007	0.5011	0.4985	0.500	100.02
ADJ5000-J	2500	2.4989	2.4991	2.4962	2.498	99.92
	5000	5.0447	5.0181	5.0080	5.024	100.47
	500	0.5080	0.5061	0.5076	0.507	101.45
ADJ5000-K	2500	2.4992	2.4971	2.5022	2.500	99.98
	5000	5.0286	5.0071	5.0046	5.013	100.27
	500	0.5064	0.4970	0.5040	0.502	100.49
ADJ5000-L	2500	2.4966	2.4994	2.4944	2.497	99.87
	5000	5.0075	4.9936	4.9940	4.998	99.97
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500			10-9-03		
	5000					
	500					
ADJ5000	2500					
	5000					

FRM-247c (Rev 2/Mar 03)

010210 Book/page: 04 110

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	.5022	.5084	.5093
ADJ5000-C	2500	2.5084	2.4944	2.5060
	5000	5.0171	5.0053	5.0024
	500	.5062	.5078	.5032
ADJ5000-G	2500	2.5049	2.5087	2.5025
	5000	5.0270	5.0220	5.0173
	500	.5017	.5082	.5052
ADJ5000-H	2500	2.4989	2.4980	2.4942
	5000	5.0258	5.0043	5.0103
	500	.4988	.4985	.4973
ADJ5000-I	2500	2.4954	2.4944	2.4949
	5000	5.0137	4.9989	5.0016
	500	.5007	.5011	.4985
ADJ5000-J	2500	2.4989	2.4991	2.4962
	5000	5.0447	5.0181	5.0080
	500	.5080	.5061	.5076
ADJ5000-K	2500	2.4992	2.4971	2.5022
	5000	5.0286	5.0071	5.0046
	500	.5064	.4970	.5040
ADJ5000-L	2500	2.4966	2.4994	2.4944
	5000	5.0075	4.9936	4.9940
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

10-2-03

Analyst: John Willis Date: 10-2-03

Reviewed by: Laura Wright Date: 10/2/03

FRM-244 (c) (Rev 3/Mar 03)

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030930-7
SRR: 25032
SDG: 235410
CASE: CNWRA
VTSR: September 30, 2003
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	
10-3-03	2.0000	1.9999	JW	SN: 99J50526-15
10/6/03	2.0000	1.9999	JW	"
10-7-03	2.0000	2.0000	JW	"
10/8/03	2.0000	2.0000	JW	"
10-9-03	2.0000	2.0000	JW	"
10-10-03	2.0000	2.0000	JW	"
10-13-03	2.0000	2.0000	JW	"

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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010211

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	
10/8/03	10.00	10.00	LW	sn:99-J50624-5
10-9-03	10.00	10.00	[illegible]	"
10-10-03	10.00	10.01	[illegible]	"
10-13-03	10.00	10.00	[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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FRM-112 (Rev 1/Dec 99)

010212

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	
10/2/03	2.0000	2.0000	MW	Sn:99-J50526-15
10-3-03	2.0000	2.0000	JW	"
10/6/03	2.0000	2.0000	MW	"
10-7-03	2.0000	1.9999	JW	"
10/8/03	2.0000	2.0000	MW	"
10-9-03	2.0000	2.0000	JW	"
10-10-03	2.0000	2.0001	JW	"
10-13-03	2.0000	2.0000	JW	"

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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FRM-112 (Rev 1/Dec 99)

010213

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030930-7
SRR: 25032
SDG: 235410
CASE: CNWRA
VTSR: September 30, 2003
PROJECT#: 06002.01.081

DI Water Verification

D.I. WATER SYSTEM NOTEBOOK
METALS LAB
SOUTHWEST RESEARCH INSTITUTE

01 028

010214

DATE	INITIALS	READING (M OHMS)	SET PT./ QC LT. Green=OK	CALL FOR Service LT. Green=OK	USAGE (GALS)	COMMENTS
9/23/03	DR	18.0	✓	✓	51391.3	5:47pm
9/24/03	DR	18.0	✓	✓	51398.6	5:26pm
9/25/03	area under construction, unable to read.				DR 9/25/03	
9/26/03	DR	18.0	✓	✓	51419.0	6:43pm
9/29/03	DR	18.0	✓	✓	51416.8	8:40pm
9/30/03	DR	18.0	✓	✓	51420.3	7:42pm
10/1/03	DR	18.0	✓	✓	51424.2	7:30pm
10/2/03	DR	18.0	✓	✓	51431.3	6:20pm
10/3/03	DR	18.0	✓	✓	51434.5	5:32pm
10/6/03	DR	18.0	✓	✓	51445.0	5:46pm
10/7/03	DR	18.0	✓	✓	51448.9	7:22pm
10/8/03	DR	18.0	✓	✓	51454.0	6:38pm
10/9/03	DR	18.0	✓	✓	51458.8	8pm
10/10/03	DR	18.0	✓	✓	51464.0	6:07pm
←		VDJ 10/13/03				→

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030930-7
SRR: 25032
SDG: 235410
CASE: CNWRA
VTSR: September 30, 2003
PROJECT#: 06002.01.081

SURVEILLANCE REPORTS
From Division 30