SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030306-12
SRR: 23945
SDG: 221526
CASE: Division 20
VTSR: MARCH 06, 2003
PROJECT#: 06002.01.081

FINAL REPORT

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010001

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 03/06/03

Matrix: Liquid

Project No.: 20.06002.01.081

Work Order: 23945

Sample ID	Lab System ID	Lead Results (mg/L)	Chloride Results (mg/L)
Prep Blank	----	<0.003	<0.1
Lab Control	----	0.497	208
True Value	----	0.500	200
Recovery	----	99.4%	104%
Solution # 1	221526	1620	2099
Duplicate result	221526	1620	2101
RPD	221526	0.00%	0.10%
Spike result	221526	2080	2472
Spike added	221526	500	400
Recovery	221526	92.0%	93.3%
Solution # 2	221527	1110	1398

Reporting Limit: 0.003 mg/L 0.1 mg/L

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SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
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TASK ORDER: 030306-12
SRR: 23945
SDG: 221526
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VTSR: MARCH 06, 2003
PROJECT#: 06002.01.081

Work Orders/01-QPP-015

Southwest Research Institute

Laboratory Task Order

010002

TO #: 030306-12 Revision: 0

SDG: 221526

SRR #'s: 23945
Client(s): DIV 20

Project(s): 06002.01.081
Manager(s): DAMMANN, MIKE
To PM:
To QA: 03/18/03
To Client: 03/19/03

Instructions

See original SRR #23945

Documents Related to this task order: 4755[COC 23945]

Test: CHLORIDE
Section: OLDINORG

Holding: 28 days from CED

ANALYSIS FOR CHLORIDE

Cnt: 2

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
221526		1	Liquid	Solution # 1		
221527		1	Liquid	Solution # 2		

Test: PB
Section: OLDINORG

Holding: 180 days from CED

LEAD ANALYSIS

Cnt: 2

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
221526		1	Liquid	Solution # 1		
221527		1	Liquid	Solution # 2		

ver 2/27/2004

010003

Sample Receipt

Southwest Research Institute

Sample Receipt Number: 23945

VTSR: 03/06/03

Time: 09:45:00

Project: 06002.01.081
Case #: Div.20
Client: DIV 20

Manager: DAMMANN, MIKE
Logged in by: kedrisi
Creation Date: 03/06/03

Notes

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

QC Note: As per method.

Parameters: Analysis for Pb and Cl. As per COC.

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

Note: Turnaround time is 14 days from VTSR.

Note: Samples were received intact.
*** kedrisi Mar 6 2003 7:42PM ***

System ID	Customer ID	CED	Matrix	Containers
221526	Solution # 1		Liquid	1
221527	Solution # 2		Liquid	1
Containers: 2				Samples: 2

These documents are associated with this receipt: 4755

Thermometer: 026
Temperature: 22.0

Client: DIV 20

SR#: 23945

FRM-002

Page Printed: 10 Mar 2003 16:21:22
ver (03/08/2003)

01-QPP-015 010004
Division 01
Revision 4
November 2002

Document No. 3

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IF STAMP IS NOT RED, THIS DOCUMENT IS UNCONTROLLED

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

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

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

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

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

1.0 INTRODUCTION

This Quality Project Plan (QPP) defines the Quality Assurance (QA) program requirements for personnel providing the chemical analyses for commercial nuclear power plants. Southwest Research Institute (SwRI) ***Program Quality Plan (PQP-Nuclear)***, *Nuclear Services* shall implement the QA requirements. Project activities controlled by the PQP-Nuclear shall be accomplished as specified by the appropriate sections of **01-QAP-004**, *Quality Assurance Plan for Analytical and Environmental Services* and/or nationally recognized testing methods as specified on individual purchase orders. This QPP shall be applied to all projects initiated for nuclear utilities in the Department of Analytical and Environmental Chemistry. If, as a result of complexity, duration, or other factors, it is determined that a unique, project-specific quality plan is required, the project QAE shall notify the Project Manager and a project-specific quality plan shall be generated in accordance with **SOP-01-5.2**, *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
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PROJECT#: 06002.01.081

Chain of Custody/Login Paperwork

4755

SAMPLE LIST/CHAIN OF CUSTODY

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

Shipper Name/Address:

Client: Div 20

Client Purchase Order/Other ID:

Site/Zone ID:

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

SwRI Contact: Rangel

ORIGINAL

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Pb x Q										REMARKS
Solution #1			Liq		1	✓									**	Nuclear Safety Related
Solution #2			Liq		1	✓										

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°C

Therm #: 026

Comments: 3/6/03

Relinquished by (Print/Signature)	Date	Time
Brian Derby	3/6/03	9:45
Received by (Print/Signature)	**Date**	**Time**
J Rangel	3/6/03	9:45
Relinquished by (Print/Signature)	**Date**	**Time**
J Rangel	3/6/03	9:45
Received by (Print/Signature)	**Date**	**Time**
Relinquished by (Print/Signature)	**Date**	**Time**

SwRI Project#: 06002.01.081

Received by SwRI Lab: (Signature)

Date	Time
3/6/03	0945

Samples Disposed:

Date	Time

Samples Disposed by:

010013

Southwest Research Institute

LOG-IN CHECKLIST

Work Order No.: 23945

010014

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).				
VSCR/SCR in descending order in laboratory notebook or clipboard	Yes	☒	No	☐
Sample(s) in designated location	Yes	☒	No	☐
Work Order All copies must be legible.				
Computerized work order with original documents	Yes	☒	No	☐
Sample custodian signature and date on all original documents.	Yes	☒	No	☐
Copy of work order to PM	Yes	☒	No	☐
PM work order 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 Documents must consist of project number, case, sample delivery group (SDG), and validated time sample received (VTSR).				
Sample Custodian's Signature [illegible]	Date 3/7/03		Time 0945	

FRM-012 (Rev 1/Oct 01)

SAMPLE LOG-IN SHEET

010015

Lab Name
Southwest Research Institute

Page 1 of 1

Received By (Print Name)
Khaled Edrisi

Log-in Date
03/06/2003

Received By (Signature)
Khaled E

Case Number
Div.20

Sample Delivery Group No.
221526

SAS Number
N/A

Remarks: 06002.01.081

			EPA Sample #	Sample Tag #	Corresponding Assigned Lab #	Remarks: Condition of Sample Shipment, etc
1	Custody Seal(s)	Present/Absent* Intact/Broken	Solution # 1	None	221526	Intact
			Solution # 2	None	221527	Intact
2.	Custody Seal Nos.	N/A				
3.	Chain-of Custody Records	Present/Absent*				
4.	Traffic Reports or Packing Lists	Present/Absent				
5	Airbill	Airbill/Sticker Present/Absent*				
6.	Airbill No.	HAND DELIVERED				
7.	Sample Tags	Present/Absent				
	Sample Tag Numbers	Listed/Not listed on Chain of Custody				
8.	Sample Condition	Intact/Broken*/ Leaking				
9.	Cooler Temperature	22.0C				
10.	Does Information on custody records, traffic reports, and sample tags agree?	Yes/No*				
11.	Date Received at Lab	03/06/2003				
12	Time Received	09:45:00				

Sample Transfer

Fraction	Fraction
Metals, Wetchem	
Area # Inorg 1	Area # 3/6/03
By KE	By KE
On 3/6/03	On

* Contact SMO and attach record of resolution

Reviewed By CYNTHIA A. SALCEDA

Date 03/12/03

Logbook No. Work Order (23945)

Logbook Page No. 4637 5 of 7

FORM DC-1

OLMO4.2

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030306-12
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VTSR: MARCH 06, 2003
PROJECT#: 06002.01.081

Copies of Login Book

Sample Login Book

Mar 06, 2003

010016

SwRI Login Area
Division 1

Sample Receipt: 23943	Project: 06232.08.00X	Client: NFT, Inc
VTSR Date: Mar 06, 2003	VTSR Time: 09:25:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
221513	EMWCW0185	Water

Sample Receipt: 23944	Project: 05935.08.00X	Client: JACADS
VTSR Date: Mar 06, 2003	VTSR Time: 14:50:00	Manager: BOYD, JO ANN

System ID	Customer Sample ID	Matrix
221533	13712	Sludge

Sample Receipt: 23945	Project: 06002.01.081	Client: DIV 20
VTSR Date: Mar 06, 2003	VTSR Time: 09:45:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
221526	Solution # 1	Liquid
221527	Solution # 2	Liquid

Sample Receipt: 23946	Project: OHD01.114	Client: PERFORMANCE EVAL
VTSR Date: Mar 06, 2003	VTSR Time: 09:25:00	Manager: BOYD, JOANN

System ID	Customer Sample ID	Matrix
221528	0303GA Blank	Filter
221529	0303GA84	Filter
221530	0303SO	Soil
221531	0303VE	Vegetation
221532	114 Al	Filter

Sample Receipt: 23947	Project: 05935.07.00Y	Client: JACADS
VTSR Date: Mar 06, 2003	VTSR Time: 14:50:00	Manager: BREWER, JOE

System ID	Customer Sample ID	Matrix
221534	13911	Paint

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030306-12
SRR: 23945
SDG: 221526
CASE: Division 20
VTSR: MARCH 06, 2003
PROJECT#: 06002.01.081

RAW DATA

Client: Div 20
WO#: 23945
Project: 06002.01.081
SDG: 221526

y:\metals\terry\spreadsheets\div20 23945.wb3

010017

Sample ID	Elem	Result	Qual	RL	Units	TV	Rec/RPD
pbw	Pb220	0.003	U	0.003	mg/L		
lcsw	Pb220	0.497		0.003	mg/L	0.5	99.4%
221526	Pb220	1620		3	mg/L		
221526d	Pb220	1620		3	mg/L		0.0%
221526s	Pb220	2080		3	mg/L	500	92.0%
221527	Pb220	1110		3	mg/L		

T O'Brien
3/11/03

SMRN 54 QA 19 MAR 03

3/11/03

010018

HNO3 INORG # 3918
HCL INORG. # 3948

ICP ANALYSIS

Report Pb only

PROJ. NO.	PROJECT	WO#	DATE	MATRIX	LOGBK PG
06002.01.081	Div. 20	23945	3-11-03	Liquid	N/A

INSTRUMENT: TRACE 2 FILENAME: B23945A

INSTRUMENT DL _____

Standardization Rpt. 03/11/03 11:46:35 AM page 1

Method: DAILY2 Standard: blk
Run Time: 03/11/03 11:42:07

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Avge	-.0000	.0004	-.0001	.0001	-.0000	.0000	-.0000
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	51.09	.7711	.6657	13.03	57.13	46.55	94.65
#1	-.0000	.0004	-.0001	.0001	-.0000	.0000	-.0000
#2	-.0000	.0004	-.0001	.0001	-.0000	.0000	-.0000

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Avge	.0000	-.0000	-.0000	-.0000	.0005	.0000	.0002
SDev	.0000	.0000	.0000	.0001	.0000	.0000	.0000
%RSD	10.22	104.8	126.3	145.9	2.818	57.30	22.92
#1	.0000	-.0000	-.0000	-.0001	.0004	.0000	.0001
#2	.0000	-.0000	-.0000	.0000	.0005	.0000	.0002

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Avge	-.0000	.0000	-.0000	-.0000	-.0001	-.0003	-.0071
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0001
%RSD	133.8	84.43	62.03	870.4	59.19	6.813	1.619
#1	-.0000	.0000	-.0000	-.0000	-.0001	-.0003	-.0072
#2	-.0000	.0000	-.0000	.0000	-.0000	-.0002	-.0071

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Avge	-.0000	.0000	.0001	.0000	.0000	.0000	-.0013
SDev	.0000	.0000	.0001	.0000	.0000	.0000	.0001
%RSD	1351.	22.80	124.8	111.9	236.9	10.22	6.527
#1	-.0000	.0001	.0001	.0000	-.0000	.0000	-.0014
#2	.0000	.0000	.0000	.0000	.0000	.0000	-.0013

Elem	Sc3613	1960/1	1960/2	Si2881	Sn1899	Sr4215	Th2837
Avge	89.27	-.0003	.0002	.0024	.0000	-.0000	.0000
SDev	.60	.0001	.0001	.0001	.0000	.0000	.0000
%RSD	.6670	17.73	40.49	2.403	.6657	30040.	383.8
#1	88.85	-.0003	.0002	.0024	.0000	-.0000	-.0000
#2	89.69	-.0004	.0003	.0023	.0000	.0000	.0000

Elem	Ti3349	Tl1908	U_4090	V_2924	W_2079	Y_3710	Zn2062
Avge	-.0000	-.0004	-.0003	-.0000	.0002	-.0000	-.0000
SDev	.0002	.0001	.0001	.0000	.0000	.0000	.0000
%RSD	14870.	21.41	37.69	24.22	16.12	211.3	16.37
#1	.0001	-.0005	-.0004	-.0001	.0002	-.0000	-.0000
#2	-.0001	-.0003	-.0002	-.0000	.0002	.0000	-.0000

Elem	Zr3496
Avge	.0002
SDev	.0001
%RSD	46.25
#1	.0001
#2	.0002

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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	892582	10000	--	--	--	--	--
SDev	5941.818	.0000000	--	--	--	--	--
%RSD	.6656892	.0000000	--	--	--	--	--
#1	888380	10000	--	--	--	--	--
#2	896783	10000	--	--	--	--	--

Standardization Rpt. 03/11/03 11:50:54 AM

Method: DAILY2 Standard: clp_std4
Run Time: 03/11/03 11:46:47

Elem	Ag3280	As1890	2203/1	2203/2	Sb2068	1960/1	1960/2
Avge	.0874	.1425	.3636	.3057	.2246	.3574	.3442
SDev	.0000	.0002	.0019	.0011	.0002	.0030	.0030
%RSD	.0473	.1484	.5262	.3596	.0940	.8514	.8640
#1	.0874	.1426	.3650	.3050	.2248	.3596	.3421
#2	.0874	.1423	.3623	.3065	.2245	.3553	.3463

Elem	Tl1908
Avge	.2814
SDev	.0005
%RSD	.1715
#1	.2810
#2	.2817

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	883028	10000	--	--	--	--	--
SDev	5642.712	.0000000	--	--	--	--	--
%RSD	.6390185	.0000000	--	--	--	--	--
#1	887018	10000	--	--	--	--	--
#2	879038	10000	--	--	--	--	--

Standardization Rpt. 03/11/03 11:54:30 AM

Method: DAILY2 Standard: clp_std1
Run Time: 03/11/03 11:51:06

Elem	Al3082	Ca3179	Fe2714	K_7664	Li6707	Mg2790	Na3302
Avge	.1284	.1907	.1037	.1983	3.254	.0934	.0107
SDev	.0001	.0008	.0003	.0001	.003	.0002	.0001
%RSD	.0503	.4170	.2783	.0777	.0813	.1915	.4630
#1	.1285	.1913	.1039	.1982	3.256	.0935	.0107
#2	.1284	.1902	.1035	.1984	3.252	.0933	.0106

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	862528	10000	--	--	--	--	--
SDev	4657.005	.0000000	--	--	--	--	--
%RSD	.5399251	.0000000	--	--	--	--	--
#1	859235	10000	--	--	--	--	--
#2	865821	10000	--	--	--	--	--

Standardization Rpt. 03/11/03 11:58:06 AM

Method: DAILY2 Standard: clp_std5
Run Time: 03/11/03 11:54:42

Elem	B_2496	Bi2230	Mo2020	P_1782	Si2881	Sn1899	Sr4215
Avge	.2027	.0460	.4692	.0216	.1894	.1997	2.556
SDev	.0009	.0001	.0034	.0002	.0008	.0003	.005
%RSD	.4640	.1660	.7199	.7875	.4110	.1486	.1840
#1	.2021	.0461	.4668	.0215	.1899	.1994	2.559
#2	.2034	.0460	.4716	.0217	.1888	.1999	2.552

Elem	Ti3349
Avge	2.844
SDev	.001
%RSD	.0498
#1	2.843
#2	2.845

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	870894	10000	--	--	--	--	--
SDev	8299.312	.0000000	--	--	--	--	--
%RSD	.9529653	.0000000	--	--	--	--	--
#1	876762	10000	--	--	--	--	--
#2	865025	10000	--	--	--	--	--

Standardization Rpt. 03/11/03 12:01:20 PM

Method: DAILY2 Standard: clp_std2
Run Time: 03/11/03 11:58:18

Elem	Ba4934	Be3130	Cr2677	Cu3247	Ni2316
Avge	1.186	1.224	.4328	.3619	.3934
SDev	.000	.001	.0015	.0012	.0004
%RSD	.0029	.0674	.3446	.3416	.1141
#1	1.187	1.224	.4339	.3628	.3937
#2	1.186	1.223	.4318	.3610	.3931

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	865307	10000	--	--	--	--	--
SDev	5755.849	.0000000	--	--	--	--	--
%RSD	.6651800	.0000000	--	--	--	--	--
#1	861237	10000	--	--	--	--	--
#2	869377	10000	--	--	--	--	--

Standardization Rpt. 03/11/03 12:04:56 PM page 1

Method: DAILY2 Standard: clp_std3
Run Time: 03/11/03 12:01:32

Elem	Cd2265	Co2286	Mn2576	V_2924	Zn2062
Avge	1.119	.2564	.9700	.2041	.3283
SDev	.000	.0004	.0013	.0001	.0001
%RSD	.0084	.1623	.1364	.0347	.0242
#1	1.119	.2567	.9709	.2041	.3284
#2	1.119	.2561	.9691	.2040	.3283

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	872796	10000	--	--	--	--	--
SDev	1443.205	.0000000	--	--	--	--	--
%RSD	.1653543	.0000000	--	--	--	--	--
#1	873816	10000	--	--	--	--	--
#2	871775	10000	--	--	--	--	--

Standardization Rpt. 03/11/03 12:08:54 PM

Method: DAILY2 Standard: clp_std6
Run Time: 03/11/03 12:05:08

Elem	La3988	Na5889	Pd3404	S_1820	Th2837	U_4090	W_2079
Avge	.4887	.0615	.2327	.0437	.1206	.0886	.2139
SDev	.0005	.0001	.0002	.0002	.0001	.0002	.0003
%RSD	.1023	.1465	.0786	.4000	.0722	.2250	.1487
#1	.4890	.0614	.2325	.0436	.1206	.0888	.2141
#2	.4883	.0615	.2328	.0438	.1205	.0885	.2137

Elem	Y_3710	Zr3496
Avge	.8133	2.032
SDev	.0008	.003
%RSD	.1010	.1456
#1	.8139	2.034
#2	.8127	2.030

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	881699	10000	--	--	--	--	--
SDev	7263.401	.0000000	--	--	--	--	--
%RSD	.8237960	.0000000	--	--	--	--	--
#1	886835	10000	--	--	--	--	--
#2	876563	10000	--	--	--	--	--

Standardization Report 03/11/03 12:08:54 PM page 1

Method: DAILY2 Slope = Conc(SIR)/IR

Element	Wavelen	High std	Low std	Slope	Y-intercept	Date Standardized
Ag3280	328.068	clp_std4	blk	22.8766	.000719	03/11/03 12:05:08
Al3082	308.215	clp_std1	blk	390.529	-.150724	03/11/03 12:05:08
As1890	189.042	clp_std4	blk	70.1329	.006993	03/11/03 12:05:08
B_2496	249.678	clp_std5	blk	49.3568	-.005997	03/11/03 12:05:08
Ba4934	493.409	clp_std2	blk	8.42808	.000237	03/11/03 12:05:08
Be3130	313.042	clp_std2	blk	4.08566	-.000082	03/11/03 12:05:08
Bi2230	223.061	clp_std5	blk	107.729	.001453	03/11/03 12:05:08
Ca3179	317.933	clp_std1	blk	262.220	-.005727	03/11/03 12:05:08
Cd2265	226.502	clp_std3	blk	8.93461	.000116	03/11/03 12:05:08
Co2286	228.616	clp_std3	blk	38.9978	.000812	03/11/03 12:05:08
Cr2677	267.716	clp_std2	blk	23.1029	.000819	03/11/03 12:05:08
Cu3247	324.753	clp_std2	blk	27.6651	-.012583	03/11/03 12:05:08
Fe2714	271.441	clp_std1	blk	482.371	-.011867	03/11/03 12:05:08
K_7664	766.491	clp_std1	blk	252.346	-.044070	03/11/03 12:05:08
La3988	398.853	clp_std6	blk	20.4807	.000426	03/11/03 12:05:08
Li6707	670.784	clp_std1	blk	3.07291	-.000026	03/11/03 12:05:08
Mg2790	279.078	clp_std1	blk	267.501	.006907	03/11/03 12:05:08
Mn2576	257.610	clp_std3	blk	10.3100	.000018	03/11/03 12:05:08
Mo2020	202.030	clp_std5	blk	21.3141	.001471	03/11/03 12:05:08
Na3302	330.232	clp_std1	blk	4576.38	1.17951	03/11/03 12:05:08
Na5889	588.991	clp_std6	blk	14.6541	.104701	03/11/03 12:05:08
Ni2316	231.604	clp_std2	blk	25.4184	.000089	03/11/03 12:05:08
P_1782	178.287	clp_std5	blk	464.200	-.021599	03/11/03 12:05:08
2203/1	220.351	clp_std4	blk	27.5069	-.001826	03/11/03 12:05:08
2203/2	220.352	clp_std4	blk	32.7086	-.000349	03/11/03 12:05:08
Pd3404	340.458	clp_std6	blk	44.1332	-.000736	03/11/03 12:05:08
S_1820	182.040	clp_std6	blk	228.761	-.009992	03/11/03 12:05:08
Sb2068	206.838	clp_std4	blk	44.2607	.058625	03/11/03 12:05:08
Sc3613	361.384	blk	dark	1.12024	.000000	03/11/03 12:05:08
1960/1	196.021	clp_std4	blk	27.9566	.009391	03/11/03 12:05:08
1960/2	196.022	clp_std4	blk	29.0727	-.006603	03/11/03 12:05:08
Si2881	288.158	clp_std5	blk	53.2781	-.126314	03/11/03 12:05:08
Pb220	220.353	NONE	NONE	1.00000	.000000	*NOT STANDARDIZED
Se196	196.026	NONE	NONE	1.00000	.000000	*NOT STANDARDIZED
Sn1899	189.989	clp_std5	blk	50.1227	-.001235	03/11/03 12:05:08
Sr4215	421.552	clp_std5	blk	3.91292	.000000	03/11/03 12:05:08
Th2837	283.730	clp_std6	blk	86.5883	-.000910	03/11/03 12:05:08
Ti3349	334.941	clp_std5	blk	3.51610	.000004	03/11/03 12:05:08
Tl1908	190.864	clp_std4	blk	35.4810	.014500	03/11/03 12:05:08
U_4090	409.014	clp_std6	blk	118.867	.039935	03/11/03 12:05:08
V_2924	292.402	clp_std3	blk	48.9864	.002307	03/11/03 12:05:08
W_2079	207.914	clp_std6	blk	23.3862	-.004635	03/11/03 12:05:08
Y_3710	371.030	clp_std6	blk	12.2933	.000111	03/11/03 12:05:08
Zn2062	206.200	clp_std3	blk	30.4586	.000307	03/11/03 12:05:08
Zr3496	349.621	clp_std6	blk	5.38061	-.000945	03/11/03 12:05:08

Analysis Report QC Standard 03/11/03 12:13:36 PM

Method: DAILY2 Sample Name: icv/ccv Operator:
Run Time: 03/11/03 12:09:06
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9983	9.962	5.071	4.766	9.825	.9995	5.099
SDev	.0003	.003	.003	.018	.023	.0006	.011
%RSD	.0345	.0274	.0664	.3846	.2361	.0603	.2223
#1	.9985	9.964	5.069	4.753	9.808	1.0000	5.091
#2	.9980	9.961	5.073	4.779	9.841	.9991	5.107
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	19.96	1.007	5.042	1.981	2.028	10.34	18.73
SDev	.05	.002	.006	.002	.002	.04	.02
%RSD	.2385	.2425	.1196	.1165	.0858	.3792	.1080
#1	19.99	1.005	5.046	1.982	2.027	10.37	18.72
#2	19.92	1.008	5.037	1.979	2.029	10.32	18.75
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	20.00	1.000	5.000	2.000	2.000	10.00	20.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.994	4.762	20.00	1.012	5.207	27.67	Q40.25
SDev	.001	.006	.03	.000	.019	.15	.04
%RSD	.0121	.1291	.1319	.0091	.3613	.5332	.1009
#1	4.994	4.758	20.02	1.012	5.194	27.77	Q40.28
#2	4.994	4.767	19.99	1.012	5.221	27.56	Q40.23
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail
Value	5.000	5.000	20.00	1.000	5.000	30.00	30.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.946	5.081	5.063	5.059	1.023	1.012	1.003
SDev	.005	.070	.022	.028	.000	.010	.008
%RSD	.0999	1.376	.4363	.5505	.0295	1.014	.8389
#1	4.943	5.131	5.079	5.079	1.022	1.019	.9966
#2	4.950	5.032	5.048	5.039	1.023	1.005	1.009
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass
Value	5.000	5.000			1.000	1.000	1.000
Range	10.00	10.00			10.00	10.00	10.00

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

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	95.66	5.264	5.294	4.958	5.060	5.284	4.906
SDev	.33	.005	.012	.000	.026	.010	.001
%RSD	.3450	.0984	.2240	.0039	.5124	.1823	.0276
#1	95.43	5.268	5.303	4.959	5.079	5.291	4.907
#2	95.90	5.260	5.286	4.958	5.042	5.278	4.905
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				5.000	5.000	5.000	5.000
Range				10.00	10.00	10.00	10.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.119	.9980	4.819	5.312	1.052	4.994	1.059
SDev	.003	.0014	.002	.023	.003	.003	.003
%RSD	.0556	.1414	.0406	.4378	.2613	.0646	.3283
#1	5.117	.9990	4.817	5.296	1.054	4.997	1.057
#2	5.121	.9970	4.820	5.329	1.050	4.992	1.062
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	5.023	1.006	4.872
SDev	.004	.004	.000
%RSD	.0733	.3813	.0041
#1	5.025	1.009	4.871
#2	5.020	1.003	4.872
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	853892	10000	--	--	--	--	--
SDev	2947.221	.0000000	--	--	--	--	--
%RSD	.3451515	.0000000	--	--	--	--	--
#1	851808	10000	--	--	--	--	--
#2	855976	10000	--	--	--	--	--

Analysis Report Blank Sample 03/11/03 12:20:08 PM page 1

Method: DAILY2 Sample Name: icb/ccb Operator:
Run Time: 03/11/03 12:15:38
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0053	.0041	.0095	.0003	.0001	.0042
SDev	.0004	.0011	.0017	.0022	.0002	.0000	.0021
%RSD	331.7	21.14	42.74	23.02	60.25	12.43	50.19
#1	-.0002	.0045	.0028	.0111	.0004	.0001	H.0056
#2	.0004	.0061	H.0053	.0080	.0002	.0001	.0027
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0008	.0001	-.0001	.0006	.0003	.0092	.0017
SDev	.0007	.0001	.0006	.0002	.0001	.0064	.0079
%RSD	82.99	109.8	527.6	28.36	23.30	69.50	466.9
#1	-.0003	.0000	-.0006	.0007	.0002	.0047	-.0039
#2	-.0013	.0001	.0003	.0005	.0003	.0137	.0072
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	.0004	.0073	.0002	H.0055	-.0467	.0002
SDev	.0006	.0000	.0032	.0001	.0010	.0033	.0036
%RSD	138.2	7.260	43.35	36.54	17.74	7.166	1454.
#1	.0000	.0004	.0051	.0002	H.0062	-.0491	-.0023
#2	.0008	.0003	.0096	.0001	.0048	-.0443	.0028
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC High	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	-.0002	.0002	.0030	-.0015	.0008	.0053	-.0000
SDev	.0005	.0110	.0016	.0019	.0006	.0002	.0019
%RSD	191.6	5027.	52.25	125.0	67.20	4.486	33830.
#1	.0001	.0080	.0042	-.0002	.0004	.0051	.0013
#2	-.0006	-.0075	.0019	-.0028	.0012	.0054	-.0013
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.10	-.0008	.0010	.0026	.0000	.0004	.0002
SDev	.90	.0007	.0004	.0011	.0018	.0000	.0018
%RSD	.9060	84.11	37.30	41.54	6355.	2.540	738.0
#1	98.46	-.0013	.0012	.0019	.0013	.0004	.0015
#2	99.73	-.0003	.0007	.0034	-.0012	.0004	-.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	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0029	-.0003	.0045	.0160	.0006	.0045
SDev	.0000	.0007	.0001	.0008	.0002	.0003	.0003
%RSD	43.02	22.76	27.86	18.13	1.385	42.99	5.986
#1	.0001	.0034	-.0002	.0051	.0158	.0008	.0047
#2	.0001	.0025	-.0003	.0039	.0162	.0004	.0043
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	.0003	.0003
SDev	.0001	.0001	.0001
%RSD	78.61	15.91	44.57
#1	.0003	.0003	.0005
#2	.0001	.0003	.0002
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

Analysis Report Blank Sample 03/11/03 12:20:08 PM

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	884535	10000	--	--	--	--	--
SDev	7966.265	.0000000	--	--	--	--	--
%RSD	.9006162	.0000000	--	--	--	--	--
#1	878902	10000	--	--	--	--	--
#2	890168	10000	--	--	--	--	--

Analysis Report 03/11/03 12:24:48 PM

Method: DAILY2 Sample Name: pbw Operator:
Run Time: 03/11/03 12:20:19
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	.0055	.0024	.0057	.0002	.0001	.0001
SDev	.0003	.0039	.0022	.0001	.0000	.0000	.0020
%RSD	53.98	71.44	91.45	1.788	10.73	41.07	3507.
#1	.0004	.0027	.0040	.0058	.0002	.0001	-.0014
#2	.0008	.0082	.0009	.0056	.0002	.0001	.0015
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0247	.0001	-.0003	.0017	.0006	.0004	.0050
SDev	.0311	.0001	.0001	.0001	.0006	.0048	.0037
%RSD	125.6	63.61	21.77	5.361	94.27	1212.	75.32
#1	.0028	.0002	-.0002	.0016	.0002	.0038	.0076
#2	.0467	.0001	-.0003	.0018	.0011	-.0030	.0023
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0003	.0066	.0003	.0016	L-.0535	.0008
SDev	.0003	.0000	.0024	.0003	.0002	.0090	.0041
%RSD	72.98	3.367	36.51	92.90	15.44	16.78	481.5
#1	.0002	.0002	.0049	.0001	.0017	-.0472	-.0020
#2	.0007	.0003	.0083	.0005	.0014	L-.0599	.0037
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	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	.0012	-.0019	.0022	.0003	.0009	-.0010	.0047
SDev	.0006	.0006	.0030	.0007	.0012	.0012	.0001
%RSD	47.89	33.58	138.7	240.1	132.2	131.3	1.442
#1	.0008	-.0024	.0000	.0008	.0001	-.0018	.0047
#2	.0017	-.0015	.0043	-.0002	.0017	-.0001	.0046
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.75	-.0027	.0010	.0004	.0009	-.0002	-.0007
SDev	.51	.0004	.0015	.0007	.0005	.0009	.0023
%RSD	.5249	13.32	149.7	159.7	54.09	391.8	310.3
#1	97.39	-.0030	.0021	-.0001	.0006	.0004	.0009
#2	98.12	-.0025	-.0001	.0009	.0013	-.0009	-.0024
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0032	-.0004	-.0003	.0192	.0002	.0043
SDev	.0000	.0004	.0001	.0031	.0011	.0001	.0006
%RSD	77.39	11.36	15.14	1168.	5.959	45.27	12.88
#1	.0000	.0029	-.0004	.0019	.0200	.0001	.0039
#2	.0001	.0035	-.0004	-.0024	.0183	.0003	.0047
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	.0022	.0005
SDev	.0000	.0026	.0000
%RSD	3.803	119.5	3.947
#1	.0002	.0003	.0005
#2	.0003	.0041	.0005
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	872592	10000	--	--	--	--	--
SDev	4585.587	.0000000	--	--	--	--	--
%RSD	.5255137	.0000000	--	--	--	--	--
#1	869349	10000	--	--	--	--	--
#2	875834	10000	--	--	--	--	--

010037

Analysis Report 03/11/03 12:29:29 PM page 1

Method: DAILY2 Sample Name: lcsw Operator:
Run Time: 03/11/03 12:25:00
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	-.0006	.0024	.0038	.0002	.0001	.0016
SDev	.0003	.0005	.0012	.0004	.0000	.0000	.0025
%RSD	147.4	77.72	48.85	11.78	8.935	40.04	153.8
#1	.0004	-.0003	.0016	.0041	.0002	.0001	.0034
#2	-.0000	-.0010	.0033	.0035	.0001	.0001	-.0001

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0090	.0002	.0002	.0012	.0004	-.0006	.0056
SDev	.0009	.0000	.0003	.0009	.0002	.0145	.0134
%RSD	10.58	28.54	137.4	74.03	42.01	2346.	241.1
#1	.0083	.0002	.0004	.0006	.0003	-.0108	-.0039
#2	.0096	.0001	.0000	.0018	.0005	.0096	.0151

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0002	.0020	.0002	.0017	-.0661	.0004
SDev	.0005	.0001	.0018	.0000	.0007	.1503	.0014
%RSD	596.5	22.78	90.20	4.291	41.44	227.4	349.1
#1	.0004	.0002	.0007	.0002	.0022	-.1724	-.0006
#2	-.0003	.0002	.0032	.0001	.0012	.0402	.0014

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	-.0078	.4950	.4980	.0001	.0095	.0034
SDev	.0001	.0016	.0016	.0037	.0021	.0092	.0012
%RSD	10.63	20.53	.3177	.7369	1950.	97.15	36.89
#1	.0010	-.0089	.4961	.5006	-.0013	.0030	.0025
#2	.0008	-.0067	.4939	.4954	.0016	.0160	.0042

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	98.07	-.0031	-.0003	.0007	.4970	-.0012	.0000
SDev	.72	.0018	.0016	.0031	.0030	.0016	.0001
%RSD	.7375	57.51	612.8	413.2	.5975	137.3	177.0
#1	98.58	-.0044	-.0014	-.0014	.4991	-.0024	.0001
#2	97.56	-.0018	.0009	.0029	.4949	-.0000	-.0000

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0034	-.0004	.0018	.0015	.0002	.0034
SDev	.0000	.0008	.0000	.0060	.0020	.0001	.0014
%RSD	47.81	24.78	7.276	343.9	135.2	42.24	42.10
#1	.0000	.0028	-.0004	-.0025	.0029	.0003	.0024
#2	.0000	.0040	-.0004	.0060	.0001	.0002	.0044

40mL sample spiked with 200L Pb 1000ppm # 3735

(spiked @ 0.5ppm)

DL 3-11-03

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0002	.0005	.0003
SDev	.0000	.0001	.0001
%RSD	18.82	18.83	37.16
#1	.0001	.0006	.0002
#2	.0002	.0004	.0004

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	875342	10000	--	--	--	--	--
SDev	6543.566	.0000000	--	--	--	--	--
%RSD	.7475439	.0000000	--	--	--	--	--
#1	879969	10000	--	--	--	--	--
#2	870715	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 221526 df1000 Operator:
Run Time: 03/11/03 12:29:40
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	.0040	-.0001	.0066	.0001	.0001	.0042
SDev	.0005	.0007	.0005	.0009	.0001	.0000	.0028
%RSD	113.5	18.09	808.3	13.47	60.00	3.553	67.56
#1	.0008	.0045	.0003	.0072	.0002	.0001	.0062
#2	.0001	.0035	-.0004	.0060	.0001	.0001	.0022

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0129	.0001	.0003	.0006	.0003	.0115	.0100
SDev	.0004	.0002	.0004	.0004	.0000	.0107	.0122
%RSD	2.905	116.2	133.0	66.37	5.691	93.39	122.1
#1	.0132	.0002	.0006	.0009	.0003	.0191	.0186
#2	.0127	.0000	.0000	.0003	.0003	.0039	.0014

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0002	.0043	.0001	.0013	.1014	.0050
SDev	.0005	.0000	.0004	.0000	.0008	.2190	.0002
%RSD	171.1	6.358	9.387	2.363	61.59	215.9	4.542
#1	.0007	.0002	.0046	.0001	.0018	.2563	.0051
#2	-.0001	.0002	.0040	.0001	.0007	-.0534	.0048

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	-.0066	1.620	1.619	.0018	.0000	-.0002
SDev	.0006	.0011	.015	.002	.0026	.0009	.0016
%RSD	332.3	16.29	.9075	.1090	145.6	2462.	722.6
#1	-.0006	-.0073	1.631	1.620	.0037	-.0006	.0009
#2	.0002	-.0058	1.610	1.618	-.0001	.0007	-.0013

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	98.64	.0019	.0004	.0229	1.619	.0010	-.0006
SDev	.43	.0039	.0020	.0009	.006	.0000	.0007
%RSD	.4337	202.5	454.7	4.137	.3753	3.108	117.7
#1	98.34	-.0008	.0019	.0222	1.624	.0010	-.0001
#2	98.94	.0047	-.0010	.0236	1.615	.0009	-.0011

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0027	-.0004	.0005	.0122	.0001	.0022
SDev	.0000	.0025	.0000	.0020	.0281	.0001	.0013
%RSD	69.92	90.23	13.22	381.5	231.2	101.2	57.90
#1	.0001	.0045	-.0003	.0019	.0321	.0000	.0031
#2	.0000	.0010	-.0004	-.0009	-.0077	.0003	.0013

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0002	.0007	.0001
SDev	.0001	.0002	.0005
%RSD	26.58	24.48	365.5
#1	.0002	.0008	.0005
#2	.0002	.0006	-.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	880416	10000	--	--	--	--	--
SDev	3750.494	.0000000	--	--	--	--	--
%RSD	.4259912	.0000000	--	--	--	--	--
#1	877764	10000	--	--	--	--	--
#2	883068	10000	--	--	--	--	--

Analysis Report 03/11/03 12:38:49 PM

Method: DAILY2 Sample Name: 221526d df1000 Operator:
Run Time: 03/11/03 12:34:20
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.0050	.0029	.0052	.0001	.0001	.0024
SDev	.0001	.0026	.0021	.0009	.0000	.0000	.0007
%RSD	19.20	51.74	69.93	16.84	31.46	15.42	29.24
#1	.0006	.0032	.0044	.0046	.0001	.0001	.0029
#2	.0008	.0069	.0015	.0058	.0002	.0001	.0019

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0119	.0002	.0005	.0007	.0004	.0145	.0105
SDev	.0005	.0003	.0004	.0001	.0001	.0101	.0023
%RSD	3.980	129.1	88.20	19.45	26.24	69.82	22.22
#1	.0115	.0000	.0008	.0006	.0004	.0216	.0122
#2	.0122	.0005	.0002	.0008	.0005	.0073	.0089

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0012	.0002	.0077	.0001	.0011	.0881	.0041
SDev	.0002	.0000	.0025	.0000	.0002	.1067	.0012
%RSD	19.21	2.067	32.29	5.717	15.33	121.1	29.00
#1	.0011	.0002	.0059	.0001	.0010	.1636	.0049
#2	.0014	.0002	.0095	.0001	.0012	.0127	.0032

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0038	1.620	1.621	.0034	.0058	.0013
SDev	.0001	.0065	.009	.005	.0006	.0052	.0002
%RSD	88.08	172.5	.5384	.3161	18.38	89.01	13.08
#1	.0000	-.0008	1.614	1.624	.0039	.0095	.0014
#2	.0001	.0083	1.626	1.617	.0030	.0022	.0011

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.37	-.0001	-.0010	.0242	1.620	-.0007	-.0000
SDev	.22	.0035	.0014	.0013	.001	.0002	.0010
%RSD	.2302	3113.	137.9	5.504	.0314	30.62	13530.
#1	97.53	.0024	-.0020	.0233	1.621	-.0006	.0007
#2	97.21	-.0026	-.0000	.0252	1.620	-.0009	-.0007

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0028	-.0004	.0007	.0383	.0002	.0030
SDev	.0000	.0014	.0001	.0022	.0017	.0003	.0015
%RSD	18.04	50.93	13.64	298.0	4.537	132.1	49.36
#1	.0001	.0018	-.0004	.0023	.0371	.0004	.0020
#2	.0001	.0038	-.0003	-.0008	.0395	.0000	.0041

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0002	.0006	.0004
SDev	.0000	.0004	.0001
%RSD	17.33	61.53	20.86
#1	.0002	.0003	.0003
#2	.0002	.0009	.0005

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	869107	10000	--	--	--	--	--
SDev	2032.225	.0000000	--	--	--	--	--
%RSD	.2338291	.0000000	--	--	--	--	--
#1	870544	10000	--	--	--	--	--
#2	867670	10000	--	--	--	--	--

Analysis Report 03/11/03 12:43:29 PM page 1

Method: DAILY2 Sample Name: 221526s df1000 Operator:
Run Time: 03/11/03 12:39:00
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	.0080	.0013	.0046	.0001	.0001	.0014
SDev	.0006	.0010	.0005	.0001	.0001	.0000	.0013
%RSD	70.89	12.43	37.81	1.084	50.06	14.54	92.77
#1	.0012	.0087	.0009	.0045	.0001	.0001	.0024
#2	.0004	.0073	.0016	.0046	.0001	.0001	.0005

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0092	.0002	.0005	.0007	.0005	.0160	.0117
SDev	.0012	.0002	.0003	.0005	.0005	.0129	.0124
%RSD	12.85	78.50	53.99	71.69	104.5	80.76	106.3
#1	.0101	.0001	.0007	.0010	.0001	.0251	.0205
#2	.0084	.0004	.0003	.0003	.0009	.0069	.0029

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.0002	.0054	.0001	.0007	.1236	.0071
SDev	.0008	.0001	.0034	.0001	.0001	.1772	.0004
%RSD	116.2	28.22	62.70	91.95	21.47	143.3	6.386
#1	.0013	.0003	.0078	.0000	.0008	.2489	.0074
#2	.0001	.0002	.0030	.0001	.0006	-.0017	.0068

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0075	2.076	2.085	.0044	-.0015	.0023
SDev	.0003	.0012	.000	.021	.0038	.0094	.0006
%RSD	262.2	16.20	.0137	.9931	87.64	633.2	24.99
#1	.0003	-.0066	2.076	2.099	.0071	-.0081	.0027
#2	-.0001	-.0084	2.076	2.070	.0017	.0052	.0019

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.64	.0023	.0006	.0253	2.082	.0012	.0013
SDev	.65	.0030	.0001	.0029	.014	.0010	.0001
%RSD	.6608	133.4	11.37	11.63	.6584	80.43	11.53
#1	97.18	.0044	.0006	.0274	2.092	.0019	.0012
#2	98.09	.0001	.0007	.0233	2.072	.0005	.0014

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0012	-.0005	.0003	.0257	.0002	.0020
SDev	.0000	.0025	.0001	.0011	.0174	.0004	.0011
%RSD	60.94	214.9	25.04	347.2	67.44	206.1	54.81
#1	.0001	-.0006	-.0006	.0011	.0380	-.0001	.0028
#2	.0000	.0029	-.0004	-.0004	.0135	.0005	.0012

50mL Sample spiked with 25uL Pb 1000ppm # 3735

DL 3-11-03

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0007	.0003
SDev	.0000	.0002	.0001
%RSD	28.44	26.00	23.98
#1	.0001	.0008	.0003
#2	.0001	.0006	.0004

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	871492	10000	--	--	--	--	--
SDev	5756.556	.0000000	--	--	--	--	--
%RSD	.6605400	.0000000	--	--	--	--	--
#1	867422	10000	--	--	--	--	--
#2	875563	10000	--	--	--	--	--

Analysis Report 03/11/03 12:48:10 PM

Method: DAILY2 Sample Name: 221527 df1000 Operator:
Run Time: 03/11/03 12:43:40
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0061	.0016	.0034	.0001	.0001	.0028
SDev	.0002	.0028	.0013	.0001	.0000	.0000	.0055
%RSD	62.26	45.50	77.49	3.866	15.45	12.95	200.4
#1	.0002	.0081	.0007	.0035	.0001	.0001	-.0012
#2	.0005	.0042	.0025	.0033	.0001	.0001	.0067

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0094	.0002	-.0001	.0008	.0004	.0043	.0098
SDev	.0004	.0000	.0001	.0002	.0003	.0103	.0050
%RSD	4.752	17.22	87.84	21.71	75.63	241.3	51.05
#1	.0097	.0003	-.0002	.0007	.0002	.0116	.0133
#2	.0091	.0002	-.0000	.0009	.0006	-.0030	.0063

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0002	.0049	.0001	.0009	-.0584	.0065
SDev	.0003	.0000	.0004	.0000	.0003	.0991	.0022
%RSD	1326.	8.064	8.071	19.41	27.80	169.7	34.41
#1	-.0003	.0002	.0052	.0001	.0008	.0117	.0049
#2	.0002	.0002	.0046	.0001	.0011	-.1285	.0080

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	-.0026	1.112	1.110	.0010	.0114	.0008
SDev	.0006	.0034	.005	.005	.0005	.0024	.0011
%RSD	253.0	132.8	.4096	.4957	48.28	21.16	140.5
#1	.0006	-.0002	1.109	1.107	.0014	.0097	.0015
#2	-.0002	-.0050	1.116	1.114	.0007	.0131	.0000

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.09	.0022	.0013	.0193	1.111	.0016	.0007
SDev	.12	.0001	.0000	.0013	.005	.0000	.0018
%RSD	.1190	4.558	.9065	6.603	.4670	1.628	257.4
#1	97.01	.0023	.0013	.0184	1.107	.0016	.0019
#2	97.17	.0022	.0013	.0202	1.115	.0016	-.0006

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0025	-.0004	-.0056	.0028	-.0001	.0022
SDev	.0000	.0011	.0000	.0027	.0024	.0004	.0000
%RSD	20.24	42.66	7.749	48.63	84.20	496.3	.3671
#1	.0000	.0017	-.0004	-.0076	.0045	-.0004	.0022
#2	.0000	.0032	-.0004	-.0037	.0011	.0002	.0022

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0008	.0001
SDev	.0001	.0001	.0001
%RSD	37.95	6.537	48.55
#1	.0001	.0008	.0001
#2	.0002	.0007	.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	866548	10000	--	--	--	--	--
SDev	1038.740	.0000000	--	--	--	--	--
%RSD	.1198711	.0000000	--	--	--	--	--
#1	865813	10000	--	--	--	--	--
#2	867282	10000	--	--	--	--	--

Analysis Report QC Standard 03/11/03 12:56:31 PM page 1

Method: DAILY2 Sample Name: icv/ccv Operator:
Run Time: 03/11/03 12:52:01
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9968	9.892	5.070	4.723	9.753	.9993	5.074
SDev	.0009	.001	.002	.022	.002	.0001	.012
%RSD	.0884	.0067	.0461	.4603	.0198	.0103	.2459
#1	.9974	9.892	5.069	4.707	9.754	.9993	5.065
#2	.9961	9.893	5.072	4.738	9.751	.9992	5.083
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	19.90	1.001	5.035	1.978	2.019	10.31	18.68
SDev	.01	.000	.000	.001	.001	.01	.04
%RSD	.0645	.0230	.0078	.0252	.0462	.1214	.1923
#1	19.91	1.001	5.035	1.978	2.019	10.32	18.65
#2	19.89	1.001	5.036	1.978	2.018	10.30	18.70
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	20.00	1.000	5.000	2.000	2.000	10.00	20.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.979	4.719	19.92	1.013	5.225	27.50	Q40.13
SDev	.007	.003	.00	.000	.009	.08	.03
%RSD	.1357	.0696	.0075	.0234	.1713	.2878	.0698
#1	4.983	4.716	19.92	1.013	5.219	27.55	Q40.11
#2	4.974	4.721	19.92	1.012	5.232	27.44	Q40.15
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail
Value	5.000	5.000	20.00	1.000	5.000	30.00	30.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.912	5.234	5.061	5.040	1.019	1.007	1.006
SDev	.005	.055	.010	.007	.000	.012	.001
%RSD	.0931	1.048	.2035	.1416	.0169	1.191	.0805
#1	4.909	5.195	5.054	5.045	1.019	.9988	1.006
#2	4.915	5.273	5.068	5.035	1.019	1.016	1.007
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	93.43	5.272	5.244	4.949	5.047	5.253	4.905
SDev	.12	.015	.011	.004	.001	.003	.007
%RSD	.1231	.2778	.2157	.0789	.0263	.0506	.1358
#1	93.51	5.261	5.252	4.952	5.048	5.255	4.910
#2	93.35	5.282	5.236	4.946	5.046	5.252	4.901
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				5.000	5.000	5.000	5.000
Range				10.00	10.00	10.00	10.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.092	.9966	4.811	5.304	1.028	4.983	1.058
SDev	.000	.0048	.003	.015	.002	.004	.006
%RSD	.0005	.4814	.0592	.2917	.2401	.0901	.5409
#1	5.092	.9932	4.813	5.293	1.030	4.986	1.054
#2	5.092	1.0000	4.809	5.315	1.026	4.980	1.062
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	5.009	1.006	4.877
SDev	.002	.000	.001
%RSD	.0394	.0364	.0170
#1	5.010	1.007	4.877
#2	5.007	1.006	4.876
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	833962	10000	--	--	--	--	--
SDev	960.9581	.0000000	--	--	--	--	--
%RSD	.1152281	.0000000	--	--	--	--	--
#1	834641	10000	--	--	--	--	--
#2	833282	10000	--	--	--	--	--

Analysis Report Blank Sample 03/11/03 01:03:03 PM page 1

Method: DAILY2 Sample Name: icb/ccb Operator:
Run Time: 03/11/03 12:58:33
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0027	.0019	.0060	.0002	.0002	.0014
SDev	.0004	.0026	.0008	.0009	.0000	.0000	.0013
%RSD	266.8	95.35	39.18	15.01	12.64	3.610	94.42
#1	.0001	.0046	.0024	.0066	.0002	.0002	.0023
#2	-.0004	.0009	.0014	.0054	.0002	.0002	.0005
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0050
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	.0002	-.0002	.0009	.0005	.0048	.0047
SDev	.0000	.0001	.0003	.0002	.0006	.0141	.0049
%RSD	1.586	18.22	178.5	22.99	121.0	293.2	103.0
#1	-.0006	.0002	.0000	.0010	.0009	.0148	.0013
#2	-.0006	.0003	-.0004	.0007	.0001	-.0052	.0081
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0005	.0037	.0001	.0049	L-.1032	.0018
SDev	.0004	.0000	.0014	.0000	.0007	.0271	.0009
%RSD	80.26	4.501	37.07	27.89	14.62	26.21	51.83
#1	.0002	.0005	.0027	.0001	H.0054	L-.1223	.0024
#2	.0008	.0005	.0047	.0001	.0044	L-.0841	.0011
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	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	-.0031	.0050	-.0021	.0008	-.0054	-.0000
SDev	.0002	.0065	.0034	.0006	.0010	.0013	.0000
%RSD	47.36	207.9	67.92	28.93	121.7	24.52	112.4
#1	.0003	-.0077	.0073	-.0026	.0015	-.0063	-.0000
#2	.0005	.0015	.0026	-.0017	.0001	-.0044	-.0000
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.09	-.0036	-.0000	-.0001	.0002	-.0012	.0002
SDev	.22	.0026	.0000	.0008	.0007	.0009	.0015
%RSD	.2235	71.89	98.67	694.6	300.0	70.71	839.9
#1	97.25	-.0055	-.0000	.0005	.0007	-.0018	-.0009
#2	96.94	-.0018	-.0000	-.0007	-.0003	-.0006	.0013
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0033	-.0004	.0040	.0060	-.0002	.0017
SDev	.0000	.0001	.0000	.0022	.0068	.0005	.0011
%RSD	19.32	2.590	6.756	54.51	113.2	285.6	67.77
#1	.0001	.0032	-.0004	.0024	.0108	.0002	.0009
#2	.0001	.0034	-.0005	.0055	.0012	-.0005	.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	.0002	.0002	.0002
SDev	.0000	.0000	.0000
%RSD	23.77	11.18	18.28
#1	.0002	.0002	.0002
#2	.0001	.0002	.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	866668	10000	--	--	--	--	--
SDev	1976.363	.0000000	--	--	--	--	--
%RSD	.2280417	.0000000	--	--	--	--	--
#1	868065	10000	--	--	--	--	--
#2	865270	10000	--	--	--	--	--

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010053

SOUTHWEST RESEARCH INSTITUTE

6220 Culebra Rd
San Antonio, Texas 78228

TJA_2 TRACE ICP DAILY LOG

ANALYST DL

DATE 3-11-03

As 189.042 Profile Line

As Intensity: 681.486

PEAK POSITION .046703

VERNIER POSITION 760

STDs PREP DATE:	
CLP_STD1_SC	03C03
CLP_STD2_SC	03C03
CLP_STD3_SC	03B28
CLP_STD4_SC	03B03
CLP_STD5_SC	03C10
CLP_STD6_SC	03C03
BLK_SC	03B03

QC PREP DATE:	
CCV/ICV	03B26
CRI	
ICSA	
ICSAB	

COMMENTS	FILE	CLIENT	WO#	PROJECT NO.	METHOD
~~B23922A~~	~~Daily47~~	~~Div 20~~	~~23922~~	~~05935.08.006~~	
B23945A	Daily47	Div 20	23945	06002.01.081	Daily2
B23955	"	W.L.GORE	23955	01.01446.003	" 52183

DH 3-11-03

DL 3-11-03

COMMENTS:

MAINTENANCE:

REVIEWED BY: Lorena O'Brien DATE: 3/12/03

010054

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- ~~02M12~~ 02M12 TB

Date Prepared: 12/12/02 Prepared By: T. O'Brien

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 3778

Added ✓ 50 ml HCL INORG #: 3730

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

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 02M23

Date Prepared: 12/23/02 Prepared By: T. O'Brien

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 3778

Added ✓ 50 ml HCL INORG #: 3731

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

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 03A06

Date Prepared: 1-6-03 Prepared By: [illegible]

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 3781

Added ✓ 50 ml HCL INORG #: 3887

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

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 03B03

Date Prepared: 2-3-03 Prepared By: [illegible]

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 3914

Added ✓ 50 ml HCL INORG #: 3890

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

ICP ICV/CCV SOLUTION

010055

CCV- 03B26

Date Prepared: 2-26-03 Prepared By: DL

HNO3 INORG #: 3917 HCl INORG #: 3946

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	3683	10000	10-1-03
B	5	5ml	✓	SPEX	3611	1000	8-15-03
Li	5	5ml	✓	SPEX	3612	1000	8-15-03
Mo	5	5ml	✓	SPEX	3613	1000	8-15-03
P	5	5ml	✓	SPEX	3927	1000	1-15-04
Si	5	5ml	✓	SPEX	3858	1000	12-15-03
Ti	5	5ml	✓	SPEX	~~3877~~ 3857	1000	12-15-03
Sr	5	5ml	✓	SPEX	3961	1000	2-15-04
Sn	5	5ml	✓	SPEX	3644	1000	8-15-03
Bi	5	5ml	✓	SPEX	3643	1000	8-15-03
La	5	5ml	✓	SPEX	3645	1000	~~8-15-03~~ 8-15-03
Y	5	5ml	✓	SPEX	3647	1000	8-15-03
Pd	1	1ml	✓	SPEX	3928	1000	1-15-04
S	1	1ml	✓	SPEX	3562	1000	7-15-03
Th	1	1ml	✓	SPEX	3684	1000	9-15-03
U	1	1ml	✓	SPEX	3533	1000	6-30-03
W	1	1ml	✓	SPEX	3646	1000	8-15-03
Zr	5	5ml	✓	SPEX	3608	1000	7-30-03
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: 6-30-03

ICP Calibration Standards

010056

Date Prepared: 3-3-03 Prepared By: [illegible]

HNO3 INORG #: 3917 HCl INORG #: 3947

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

Prepared	Standard Name	Element	Std Conc (ppm)	Added ml	Check	Source	INORG #	Stock Conc (ppm)	Exp Date
3-3-03 DH	STD1- 03C03	Al	50	2.50	✓	INORVENT	3649	10000	9-1-03
		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	3738	10000	11-1-03
		Mg	25	1.25	✓	INORVENT	3564	10000	8-1-03
		Na	50	2.50	✓	INORVENT	3565	10000	8-1-03 DH
		Li	10	5.00	✓	INORVENT	3736	1000	11-1-03
		Sc	10	0.500	✓	INORVENT	3683	10000	10-1-03
3-3-03 DH	STD2- 03C03	Ba	10	5.00	✓	INORVENT	3393	1000	4-1-03
		Be	5	2.50	✓	INORVENT	3499	1000	7-1-03
		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	3400	1000	4-1-03
		Sc	10	0.500	✓	INORVENT	3683	10000	10-1-03
	STD3-	Cd	10	5.00		INORVENT		1000	
		Co	10	5.00		INORVENT		1000	
		Mn	10	5.00		INORVENT		1000	
		V	10	5.00		INORVENT		1000	
		Zn	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
	STD4-	Ag	2	1.00		INORVENT		1000	
		As	10	5.00		INORVENT		1000	
		Pb	10	5.00		INORVENT		1000	
		Sb	10	5.00		INORVENT		1000	
		Se	10	5.00		INORVENT		1000	
		TL	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
	STD5-	B	10	5.00		INORVENT		1000	
		Mo	10	5.00		INORVENT		1000	
		P	10	5.00		INORVENT		1000	
		Si	10	5.00		INORVENT		1000	
		Ti	10	5.00		INORVENT		1000	
		Sr	10	5.00		INORVENT		1000	
		Sn	10	5.00		INORVENT		1000	
		Bi	5	2.50		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
3-3-03 DH	STD6- 03C03	La	10	5.00	✓	INORVENT	3650	1000	9-1-03
		Na	1	0.05	✓	INORVENT	3565	10000	8-1-03
		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	3397	1000	4-1-03
		W	5	2.50	✓	INORVENT	3568	1000	8-1-03
		Y	10	5.00	✓	INORVENT	3654	1000	9-1-03
		Zr	10	5.00	✓	INORVENT	3398	1000	4-1-03
		SC	10	0.500	✓	INORVENT	3683	10000	10-1-03

Expiration Dates:

STD1: 8-1-03 **STD4:**

STD2: 4.1.03 **STD5:**

STD3: **STD6:** 4-1-03

ICP Calibration Standards

Date Prepared: 2-28-03 Prepared By: DL 010057

HNO3 INORG #: 3917 HCl INORG #: 3946

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
	STD1-	Al	50	2.50		INORVENT		10000	
		Ca	50	2.50		INORVENT		10000	
		Fe	50	2.50		INORVENT		10000	
		K	50	2.50		INORVENT		10000	
		Mg	25	1.25		INORVENT		10000	
		Na	50	2.50		INORVENT		10000	
		Li	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
	STD2-	Ba	10	5.00		INORVENT		1000	
		Be	5	2.50		INORVENT		1000	
		Cr	10	5.00		INORVENT		1000	
		Cu	10	5.00		INORVENT		1000	
		Ni	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
2-28-03	STD3- 03326	Cd	10	5.00	✓	INORVENT	3395	1000	4-1-03
		Co	10	5.00	✓	INORVENT	3401	1000	4-1-03
		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	3567	1000	8-1-03
		Sc	10	0.500	✓	INORVENT	3683	10000	10-1-03
	STD4-	Ag	2	1.00		INORVENT		1000	
		As	10	5.00		INORVENT		1000	
		Pb	10	5.00		INORVENT		1000	
		Sb	10	5.00		INORVENT		1000	
		Se	10	5.00		INORVENT		1000	
		TL	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
	STD5-	B	10	5.00		INORVENT		1000	
		Mo	10	5.00		INORVENT		1000	
		P	10	5.00		INORVENT		1000	
		Si	10	5.00		INORVENT		1000	
		Ti	10	5.00		INORVENT		1000	
		Sr	10	5.00		INORVENT		1000	
		Sn	10	5.00		INORVENT		1000	
		Bi	5	2.50		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
	STD6-	La	10	5.00		INORVENT		1000	
		Na	1	0.05		INORVENT		10000	
		Pd	10	5.00		INORVENT		1000	
		S	10	5.00		INORVENT		1000	
		Th	10	5.00		INORVENT		1000	
		U	10	5.00		INORVENT		1000	
		W	5	2.50		INORVENT		1000	
		Y	10	5.00		INORVENT		1000	
		Zr	10	5.00		INORVENT		1000	
		SC	10	0.500		INORVENT		10000	

Expiration Dates:

STD1: **STD4:**

STD2: **STD5:**

STD3: 4-1-03 **STD6:**

ICP Calibration Standards

Date Prepared: 2-3-03 Prepared By: D 010058

HNO3 INORG #: 3914 HCl INORG #: 3890

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
	STD1-	Al	50	2.50		INORVENT		10000	
		Ca	50	2.50		INORVENT		10000	
		Fe	50	2.50		INORVENT		10000	
		K	50	2.50		INORVENT		10000	
		Mg	25	1.25		INORVENT		10000	
		Na	50	2.50		INORVENT		10000	
		Li	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
	STD2-	Ba	10	5.00		INORVENT		1000	
		Be	5	2.50		INORVENT		1000	
		Cr	10	5.00		INORVENT		1000	
		Cu	10	5.00		INORVENT		1000	
		Ni	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
	STD3-	Cd	10	5.00		INORVENT		1000	
		Co	10	5.00		INORVENT		1000	
		Mn	10	5.00		INORVENT		1000	
		V	10	5.00		INORVENT		1000	
		Zn	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
2-3-03	STD4- 03603	Ag	2	1.00	✓	INORVENT	3653	1000	9-1-03
		As	10	5.00	✓	INORVENT	3899	1000	2-1-04
		Pb	10	5.00	✓	INORVENT	3735	1000	11-1-03
		Sb	10	5.00	✓	INORVENT	3563	1000	8-1-03
		Se	10	5.00	✓	INORVENT	3652	1000	9-1-03
		TL	10	5.00	✓	INORVENT	3922	1000	2-1-04
		Sc	10	0.500	✓	INORVENT	3683	10000	10-1-03
	STD5-	B	10	5.00		INORVENT		1000	
		Mo	10	5.00		INORVENT		1000	
		P	10	5.00		INORVENT		1000	
		Si	10	5.00		INORVENT		1000	
		Ti	10	5.00		INORVENT		1000	
		Sr	10	5.00		INORVENT		1000	
		Sn	10	5.00		INORVENT		1000	
		Bi	5	2.50		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
	STD6-	La	10	5.00		INORVENT		1000	
		Na	1	0.05		INORVENT		10000	
		Pd	10	5.00		INORVENT		1000	
		S	10	5.00		INORVENT		1000	
		Th	10	5.00		INORVENT		1000	
		U	10	5.00		INORVENT		1000	
		W	5	2.50		INORVENT		1000	
		Y	10	5.00		INORVENT		1000	
		Zr	10	5.00		INORVENT		1000	
		SC	10	0.500		INORVENT		10000	

Expiration Dates:

STD1: **STD4:** 8-1-03

STD2: **STD5:**

STD3: **STD6:**

ICP Calibration Standards

010059

Date Prepared: 3-10-03 Prepared By: D

HNO3 INORG #: 3918 HCI INORG #: 3948

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

Prepared	Standard Name	Element	Std Conc (ppm)	Added ml	Check	Source	INORG #	Stock Conc (ppm)	Exp Date
	STD1-	Al	50	2.50		INORVENT		10000	
		Ca	50	2.50		INORVENT		10000	
		Fe	50	2.50		INORVENT		10000	
		K	50	2.50		INORVENT		10000	
		Mg	25	1.25		INORVENT		10000	
		Na	50	2.50		INORVENT		10000	
		Li	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
	STD2-	Ba	10	5.00		INORVENT		1000	
		Be	5	2.50		INORVENT		1000	
		Cr	10	5.00		INORVENT		1000	
		Cu	10	5.00		INORVENT		1000	
		Ni	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
	STD3-	Cd	10	5.00		INORVENT		1000	
		Co	10	5.00		INORVENT		1000	
		Mn	10	5.00		INORVENT		1000	
		V	10	5.00		INORVENT		1000	
		Zn	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
	STD4-	Ag	2	1.00		INORVENT		1000	
		As	10	5.00		INORVENT		1000	
		Pb	10	5.00		INORVENT		1000	
		Sb	10	5.00		INORVENT		1000	
		Se	10	5.00		INORVENT		1000	
		TL	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
3-10-03	STD5- 03C10	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	3901	1000	~~12-1~~ 12-1-04 on
		Si	10	5.00	✓	INORVENT	3500	1000	7-1-03
		Ti	10	5.00	✓	INORVENT	3762	1000	12-1-03
		Sr	10	5.00	✓	INORVENT	3566	1000	8-1-03
		Sn	10	5.00	✓	INORVENT	3552	1000	7-1-03
		Bi	5	2.50	✓	INORVENT	3606	1000	8-1-03
		Sc	10	0.500	✓	INORVENT	3683	10000	10-1-03
	STD6-	La	10	5.00		INORVENT		1000	
		Na	1	0.05		INORVENT		10000	
		Pd	10	5.00		INORVENT		1000	
		S	10	5.00		INORVENT		1000	
		Th	10	5.00		INORVENT		1000	
		U	10	5.00		INORVENT		1000	
		W	5	2.50		INORVENT		1000	
		Y	10	5.00		INORVENT		1000	
		Zr	10	5.00		INORVENT		1000	
		SC	10	0.500		INORVENT		10000	

Expiration Dates:

STD1: **STD4:**

STD2: **STD5:** 7-1-03

STD3: **STD6:**

Division 20
20.06002.01.081
WO# 23945

Analyst: AMS
Date 03/10/03
Method EPA 300

010060

Date Analyzed	System ID	Analyte	Conc. mg/L	RESULT mg/L	Qual	DL	TV	%REC %RPD
03/10/03	221526	CHLORIDE	2099.340	2099		20		
03/10/03	221526D	CHLORIDE	2100.630	2101		20		0.06%
03/10/03	221526MS	CHLORIDE	2471.716	2472		20	400	93.1%
03/10/03	221527	CHLORIDE	1398.494	1398		10		

MS = (2471.716 - 2099.340) / 400 = 93.1%

Division 20
20.06002.01.081
WO# 23945

Analyst: AMS
Date: 03/10/03
METHOD EPA 300

010061

QC DATA

Date Analyzed	System ID	Analyte	Conc. mg/L	RESULT mg/L	Qual	MDL	TV	%Rec/RPD	SOURCE
03/10/03	ICV	CHLORIDE	207.646	208		0.1	200	104%	SPEX 22-131AS
03/10/03	ICB	CHLORIDE	0.000	0.1	U	0.1			

U = UNDETECTED

Schedule File: C:\PeakNet\schedule\10MAR03.sch

Line	Sample	Sample Type	Level	Method	Data File	Dilution
1	ICV	Sample		anions021218.met	030310_001.dxd	20
2	ICB	Sample		anions021218.met	030310_002.dxd	1
3	221526	Sample		anions021218.met	030310_003.dxd	200
4	221526D	Sample		anions021218.met	030310_004.dxd	200
5	221526MS	Sample		anions021218.met	030310_005.dxd	200
6	221527	Sample		anions021218.met	030310_006.dxd	100
7	CCV	Sample		anions021218.met	030310_007.dxd	20
8	CCB	Sample		anions021218.met	030310_008.dxd	1
9	CCB	Sample		astop.met	030310_008.dxd	1

010062

Default Method Path: C:\PEAKNET\METHOD
Default Data Path: c:\peaknet\data\030310
Comment:
DIVISION 20 06002.01.081 WO#23945

ICV/CCV Source Spex 22-131AS Inorg# 3607
Chloride TV= 200 mg/L

MS - 50 uL of Spex 22-131AS was spiked into
5 ml of 1:200 sample

010063

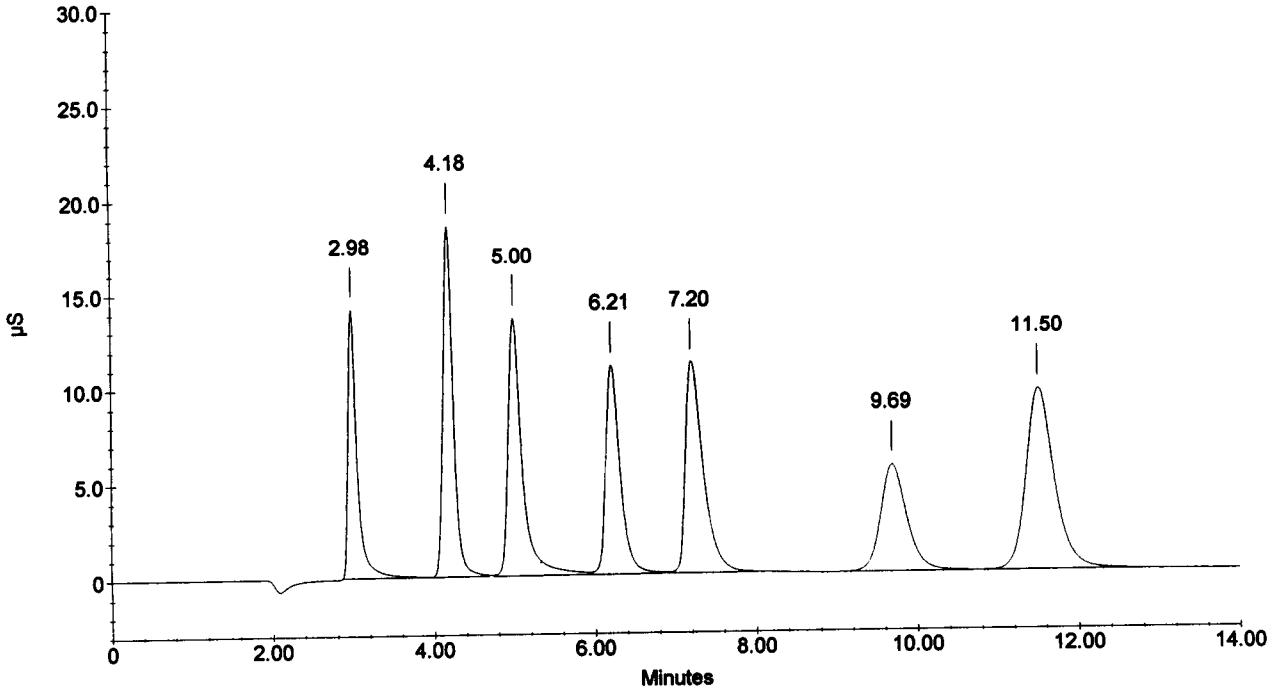
Sample Name : ICV
Dilution Factor : 20.00
Injection Number : 1
Data File Name : c:\peaknet\data\030310\030310_001.DXD
Method File Name : c:\peaknet\method\anions021218.met
Schedule File Name : c:\peaknet\schedule\10mar03.sch

Date Time Collected : 3/10/03 10:29:50 AM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#13535 AG14-#15177
System Operator : ams

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.98	FLUORIDE	98.738	141328	1103080	1	-2.19
2	4.18	CHLORIDE	207.646	184645	1620326	2	-2.79
3	5.00	NITRITE-N	101.421	135236	1651188	2	-3.60
4	6.21	BROMIDE	399.338	109544	1371072	2	-3.52
5	7.20	NITRATE-N	87.143	110385	1712068	2	-2.17
6	9.69	PHOSPHATE-P	195.047	55759	1270373	2	-3.45
7	11.50	SULFATE	418.007	94946	2334314	2	-4.64
	0.00		—total(s)— 1507.339		11062422		

ICV



Sample Name : ICB
Dilution Factor : 1.00
Injection Number : 2
Data File Name : c:\peaknet\data\030310\030310_002.DXD
Method File Name : c:\peaknet\method\anions021218.met
Schedule File Name : c:\peaknet\schedule\10mar03.sch

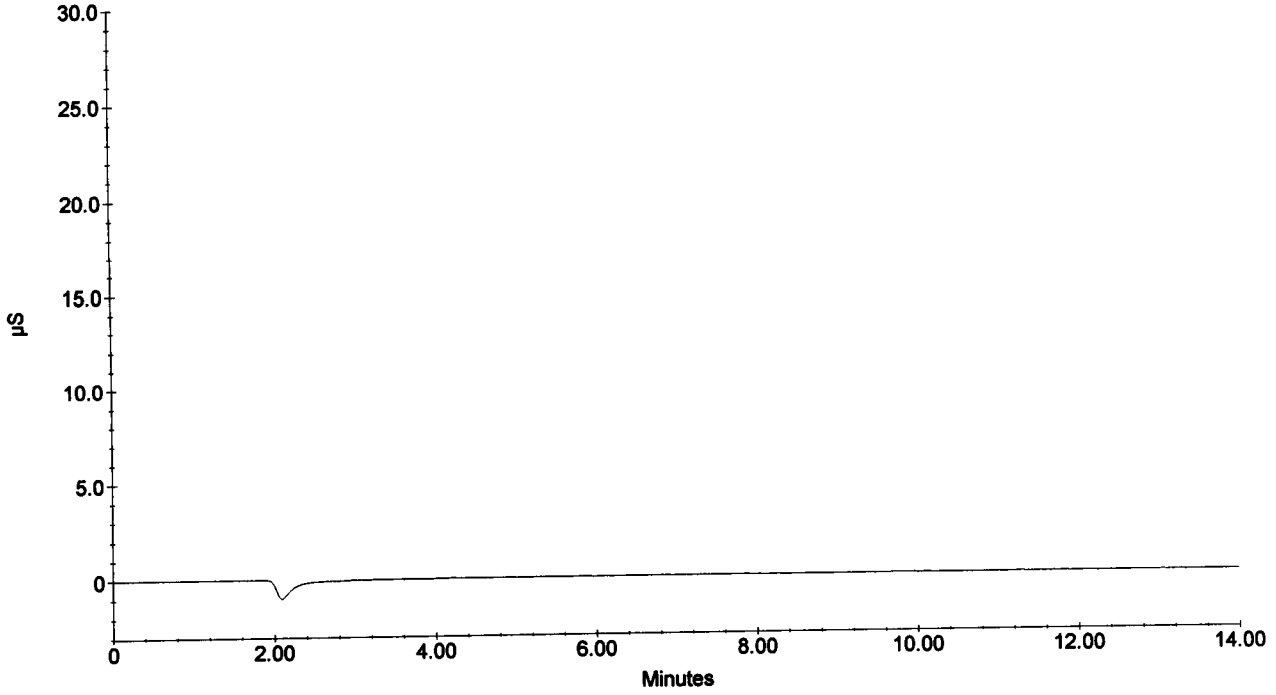
Date Time Collected : 3/10/03 10:46:27 AM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#13535 AG14-#15177
System Operator : ams

010064

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
0	0.00	(null)	0.000	0	0	0	0.00
		CHLORIDE					
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
	0.00		---total(s)--- 0.000		0		

ICB



Sample Name : 221526
Dilution Factor : 200.00
Injection Number : 3
Data File Name : c:\peaknet\data\030310\030310_003.DXD
Method File Name : c:\peaknet\method\anions021218.met
Schedule File Name : c:\peaknet\schedule\10mar03.sch

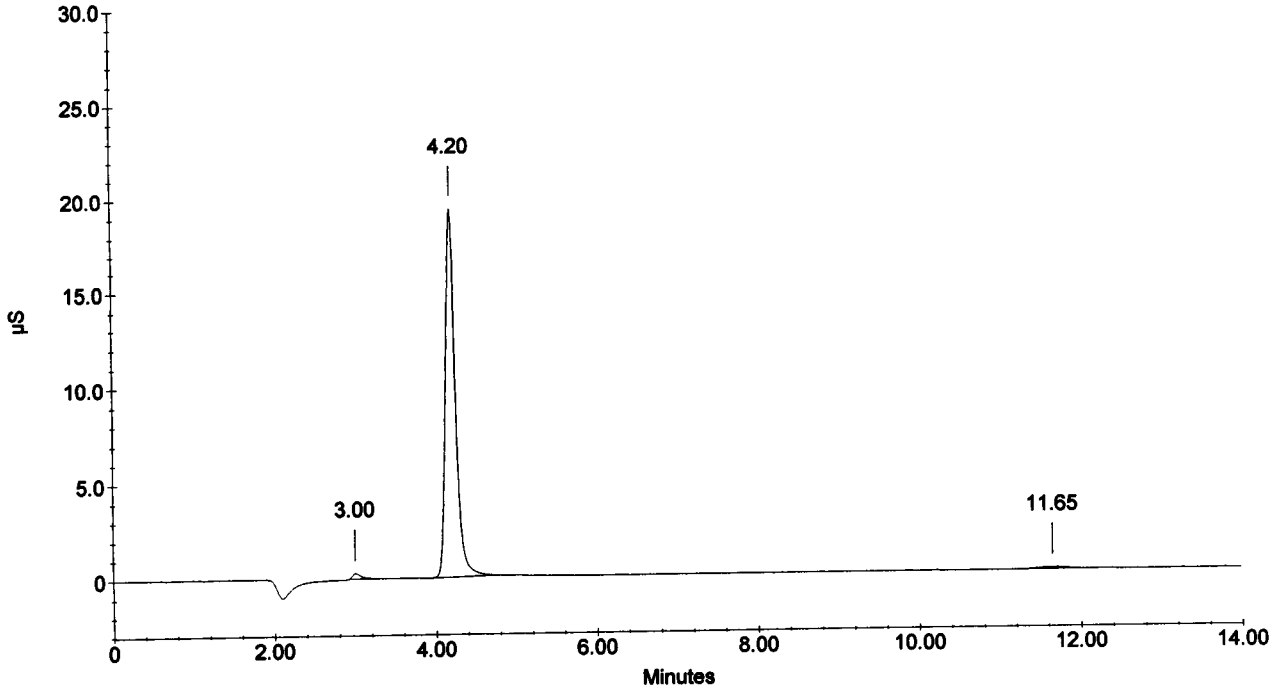
Date Time Collected : 3/10/03 11:03:19 AM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#13535 AG14-#15177
System Operator : ams

010065

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.00	FLUORIDE	19.086	2853	20980	1	-1.75
2	4.20	CHLORIDE	2099.340	193483	1639697	1	-2.48
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
3	11.65	SULFATE	42.910	961	21950	1	-3.43
	0.00		—total(s)— 2161.336		1682627		

221526



Sample Name : 221526D
Dilution Factor : 200.00
Injection Number : 4
Data File Name : c:\peaknet\data\030310\030310_004.DXD
Method File Name : c:\peaknet\method\anions021218.met
Schedule File Name : c:\peaknet\schedule\10mar03.sch

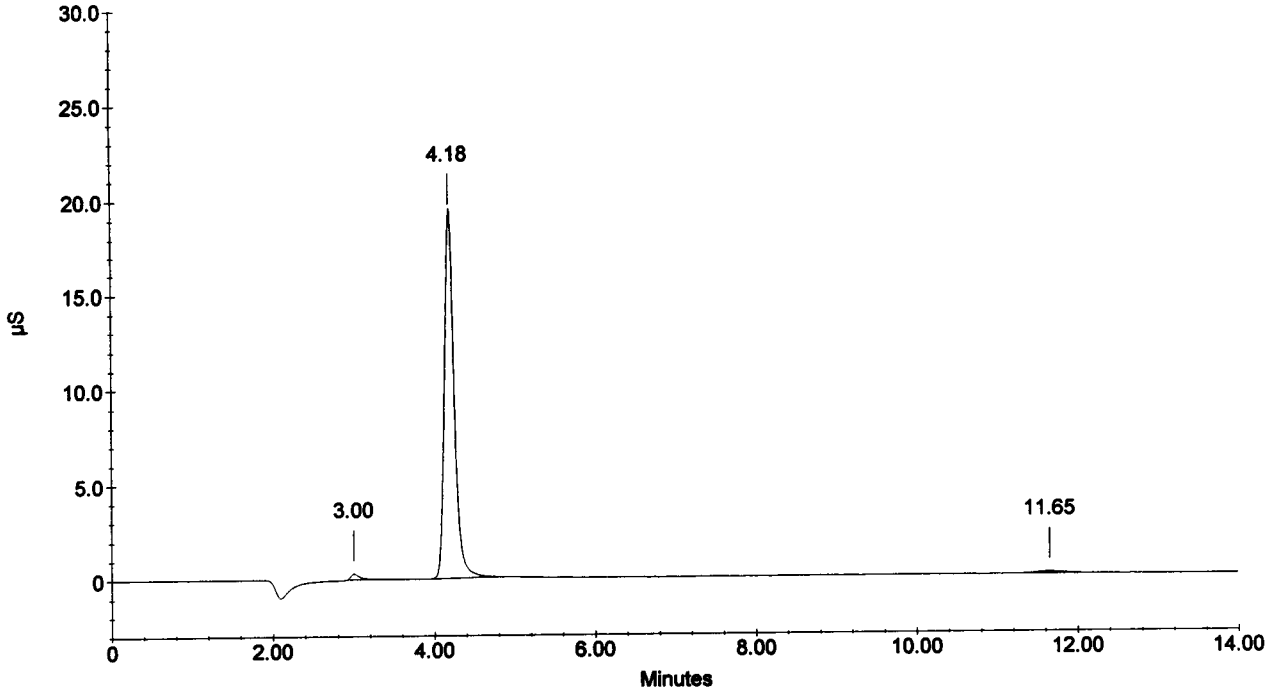
Date Time Collected : 3/10/03 11:20:15 AM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#13535 AG14-#15177
System Operator : ams

010066

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	3.00	FLUORIDE	21.828	2994	23995	1	-1.75
2	4.18	CHLORIDE	2100.630	189984	1640790	1	-2.79
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
3	11.65	SULFATE	47.236	1012	24165	1	-3.43
	0.00		---total(s)--- 2169.694		1688950		

221526D



Sample Name : 221526MS
Dilution Factor : 200.00
Injection Number : 5
Data File Name : c:\peaknet\data\030310\030310_005.DXD
Method File Name : c:\peaknet\method\anions021218.met
Schedule File Name : c:\peaknet\schedule\10mar03.sch

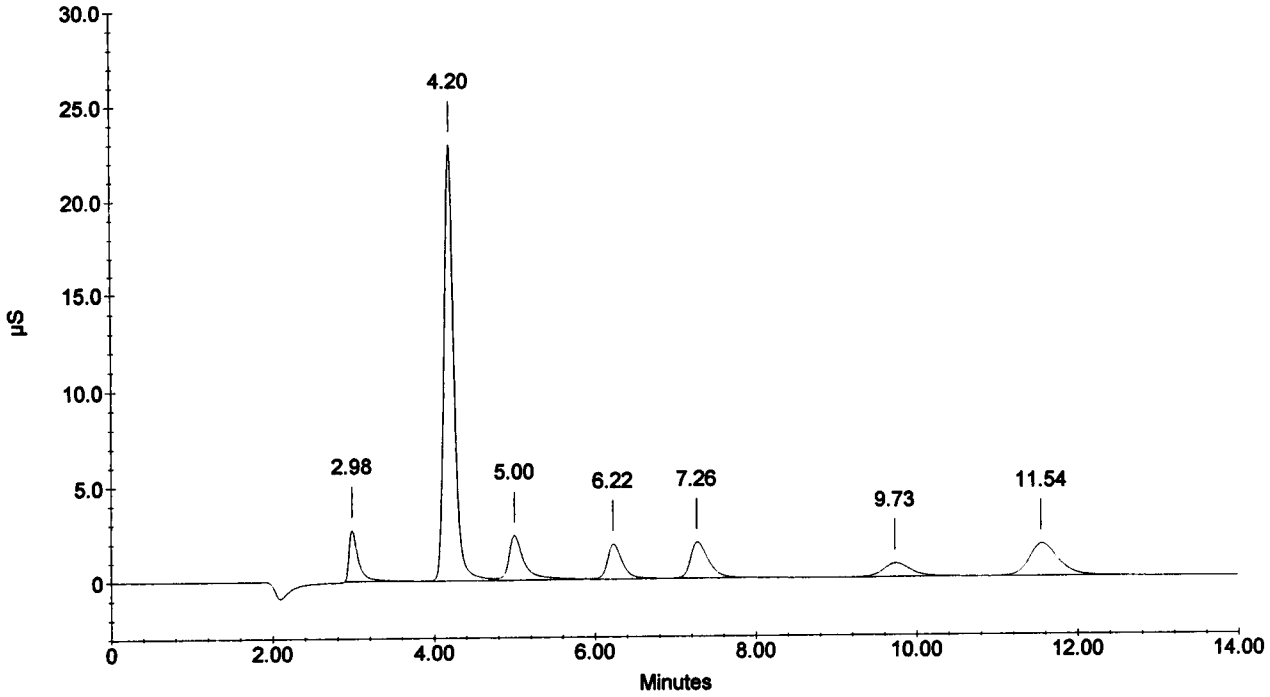
Date Time Collected : 3/10/03 11:37:04 AM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#13535 AG14-#15177
System Operator : ams

010067

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.98	FLUORIDE	195.908	26807	215972	1	-2.19
2	4.20	CHLORIDE	2471.716	228763	1960567	2	-2.48
3	5.00	NITRITE-N	200.627	23492	321210	2	-3.60
4	6.22	BROMIDE	775.740	18348	241820	2	-3.31
5	7.26	NITRATE-N	154.874	18892	295917	1	-1.27
6	9.73	PHOSPHATE-P	289.823	7261	172833	1	-3.06
7	11.54	SULFATE	849.991	17053	441531	1	-4.31
	0.00		—total(s)— 4938.679		3649849		

221526MS



Sample Name : 221527
Dilution Factor : 100.00
Injection Number : 6
Data File Name : c:\peaknet\data\030310\030310_006.DXD
Method File Name : c:\peaknet\method\anions021218.met
Schedule File Name : c:\peaknet\schedule\10mar03.sch

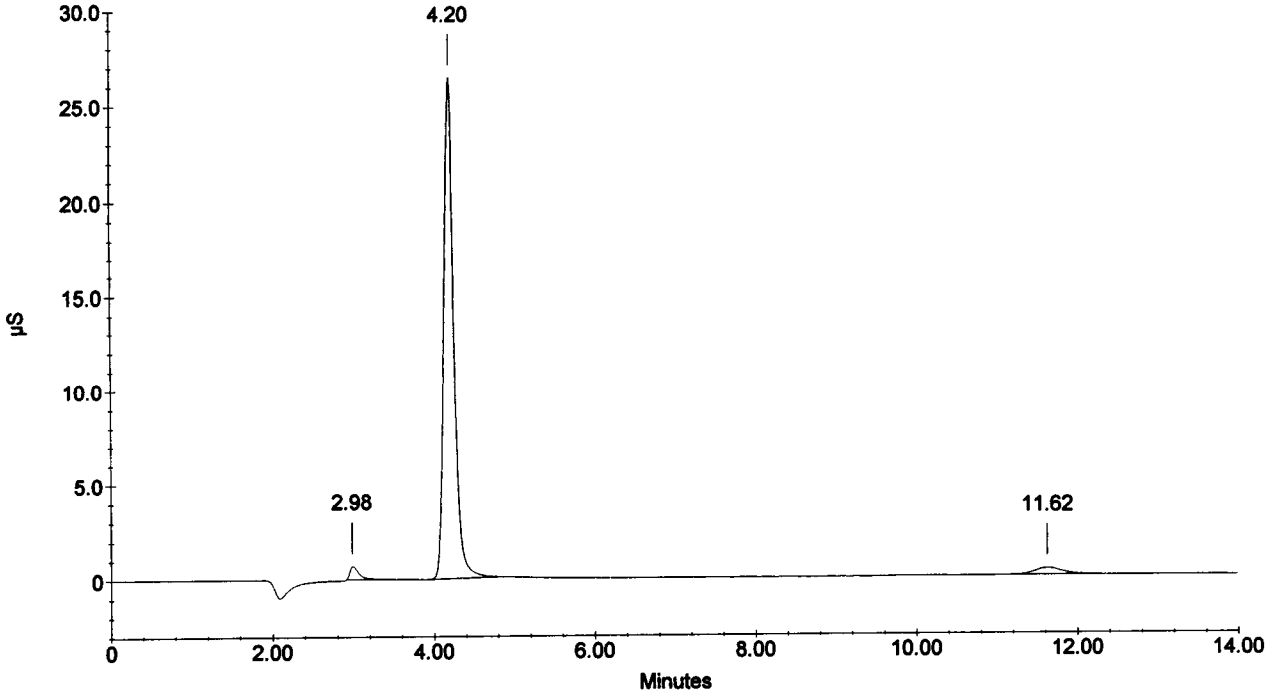
Date Time Collected : 3/10/03 11:53:46 AM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#13535 AG14-#15177
System Operator : ams

010068

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.98	FLUORIDE	24.926	6800	54826	1	-2.19
2	4.20	CHLORIDE	1398.494	263134	2250157	1	-2.48
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
3	11.62	SULFATE	81.268	3388	83329	1	-3.65
			---total(s)---				
	0.00		1504.689		2388313		

221527



Sample Name : CCV
Dilution Factor : 20.00
Injection Number : 7
Data File Name : c:\peaknet\data\030310\030310_007.DXD
Method File Name : c:\peaknet\method\anions021218.met
Schedule File Name : c:\peaknet\schedule\10mar03.sch

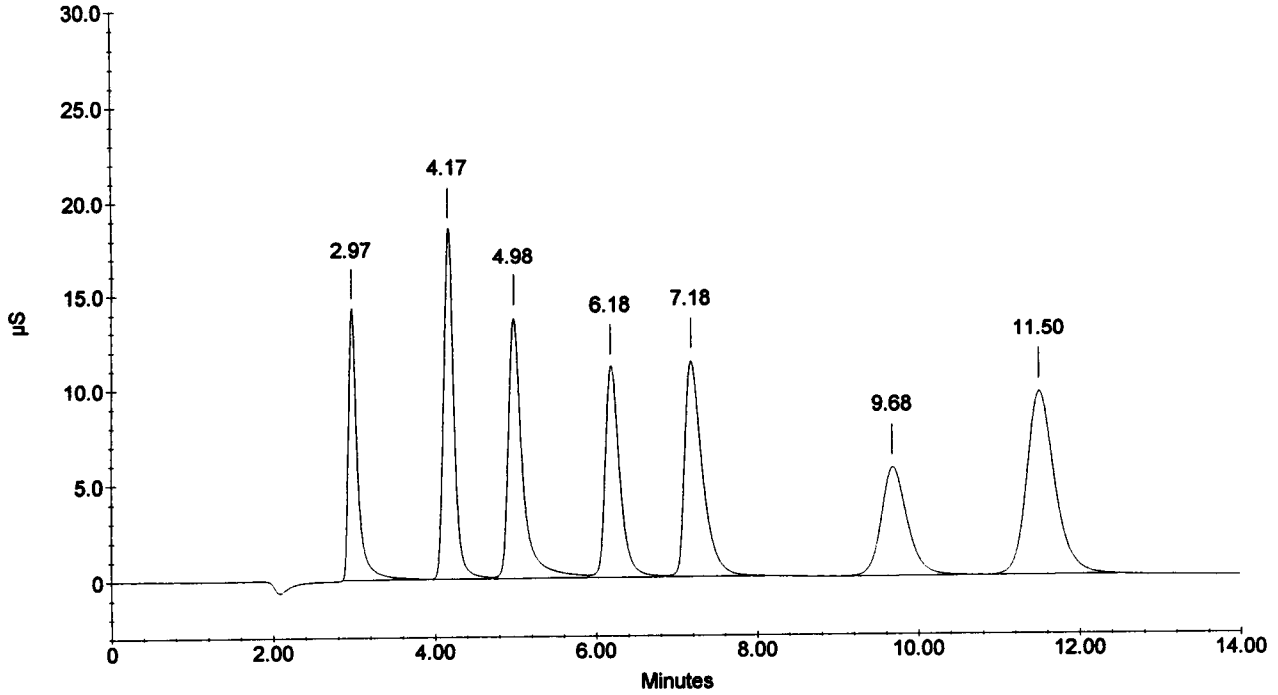
Date Time Collected : 3/10/03 12:10:39 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#13535 AG14-#15177
System Operator : ams

010069

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.97	FLUORIDE	99.076	140527	1106921	2	-2.62
2	4.17	CHLORIDE	208.368	183367	1626434	2	-3.10
3	4.98	NITRITE-N	102.243	136209	1664861	2	-3.86
4	6.18	BROMIDE	400.118	109385	1374124	2	-3.94
5	7.18	NITRATE-N	87.597	112425	1721308	2	-2.36
6	9.68	PHOSPHATE-P	195.259	56093	1271868	1	-3.59
7	11.50	SULFATE	414.875	95475	2315056	1	-4.64
	0.00		---total(s)--- 1507.536		11080572		

CCV



Sample Name : CCB
Dilution Factor : 1.00
Injection Number : 8
Data File Name : c:\peaknet\data\030310\030310_008.DXD
Method File Name : c:\peaknet\method\anions021218.met
Schedule File Name : c:\peaknet\schedule\10mar03.sch

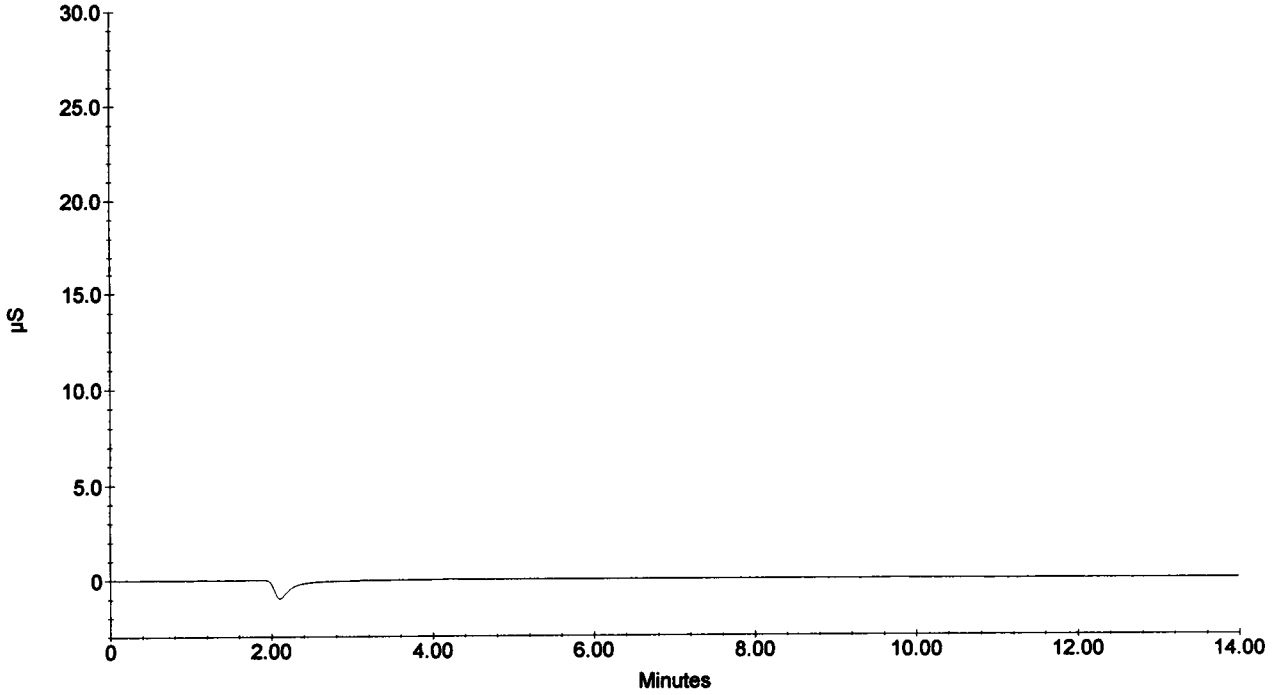
Date Time Collected : 3/10/03 12:27:34 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#13535 AG14-#15177
System Operator : ams

010070

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
0	0.00	(null)	0.000	0	0	0	0.00
		CHLORIDE					
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
			—total(s)—				
	0.00		0.000		0		

CCB



Book/Page: 10 003

Southwest Research Institute

Dionex DX500 Ion Chromatography Daily Log

010071

Analyst: ams

Date: 3/10/03

Conductivity: 16.4

Client	Project #	WO ~~TO~~ #ams 3/10/03	Analytical Method
Div. 20	06.002.01.081	23945	300
		TO: 030306-12	

Loop: 40 uL

Column: AS14: 13535

Comments:

Method: anions 021218

Calibration: 12/18/02

ICV/CCV/MS:

1st Source: Spex (Inorg # 3607)

Lot #: 22-131AS

CCV Conc: 1:20

MS Conc: 1:100

2nd Source: Nitrite

Lot #: 190-01-IC3

CCV Conc: 1:20

MS Conc: 1:100

✓ ELUENT SOLUTION PREP:

FV = 2.0L DI H20

1.0 mM Sodium Bicarbonate & 3.5 mM Sodium Carbonate

Weight: 0.168 g $NaHCO_3$

Source: Aldrich

Lot: 15308EQI ams 3/10/03

Weight: 0.7419 g Na_2HCO_3

Source: Aldrich

Lot: 08915 PU

Other Eluent:

50 mA-Autoregen (ASRS)

Other Regen:

VRSpies 3/17/03

SwRI 54 03

FRM-226 (Rev 3/Mar 03)

Page 2 of 2

Balance: 34

5000 G

1000 E

200 D

Book/Page: 10 002

Southwest Research Institute

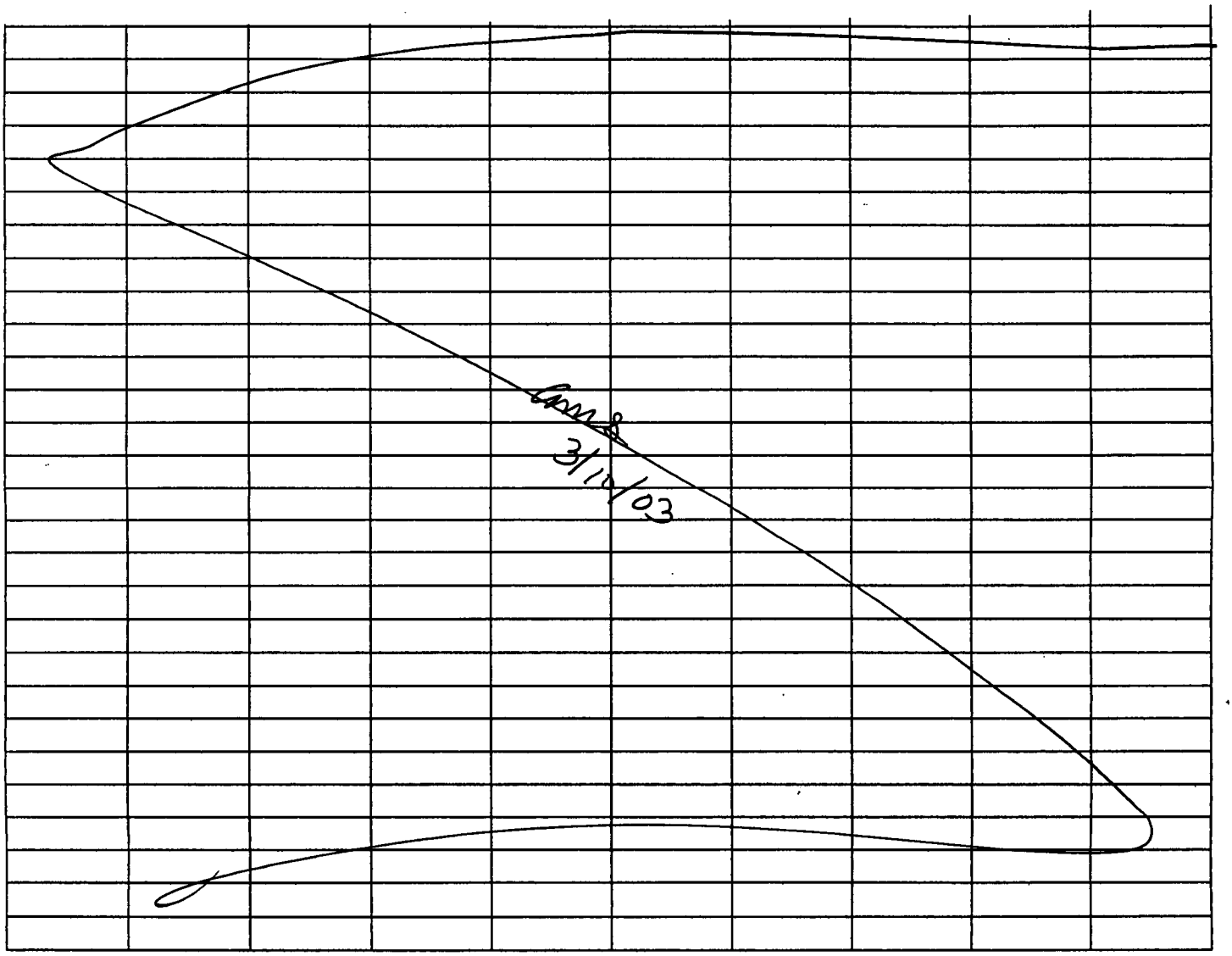
010072

amso 10/03

Schedule File: C:\PeakNet\schedule\10MAR03.sch

Line	Sample	Sample Type	Level	Method	Data File	Dilution
1	ICV	Sample		anions021218.met	030310_001.dxd	20
2	ICB	Sample		anions021218.met	030310_002.dxd	1
3	221526	Sample		anions021218.met	030310_003.dxd	200
4	221526D	Sample		anions021218.met	030310_004.dxd	200
5	221526MS	Sample		anions021218.met	030310_005.dxd	200
6	221527	Sample		anions021218.met	030310_006.dxd	100
7	CCV	Sample		anions021218.met	030310_007.dxd	20
8	CCB	Sample		anions021218.met	030310_008.dxd	1
9	CCB	Sample		astop.met	030310_008.dxd	1

Default Method Path: C:\PEAKNET\METHOD
Default Data Path: C:\PEAKNET\DATA\030310
Comment:
DIVISION 20 06002.01.081 WO#23945



186 TITLE Anions DIV 20 SwRI PROJECT NO. — BOOK NO. IC3

Work continued from Page

010073

186-01-IC2 20 ppm Anions Std. 8

Anion	STD Vol (ml)	STD Conc (ppm)	STD Inorg #	Spec Source	Exp Date
Fluoride	1.0	1000	3252	21-61 AS	1/5/03
Chloride	1.0	1000	3487	21-58 AS	6/15/03
Nitrite N	3.3	304	3488	5-255VY	6/15/03
Bromide	1.0	1000	3490	22-114AS	6/15/03
Nitrate N	1.0	1000	3253	21-76AS	1/15/03
Phosphate P	3.07	326	3880	24-63AS	12/15/2003
Sulfate	1.0	1000	3489	6-76VY	6/15/03

FV = 50 ml

186-02-IC2 1510 ppm Anions Std. 7 RSS 12/18/02
3 ml 186-01-IC2 + 1 ml DI H_2O.

186-03-IC2 10 ppm Anions Std 6
2 ml 186-01-IC2 + 2 ml DI H_2O

186-04-IC2 5 ppm Anions Std 5
2 ml 186-03-IC2 + 2 ml DI H_2O

186-05-IC2 1 ppm Anions Std 4
1 ml 186-04-IC2 + 4 ml DI H_2O

186-06-IC2 0.5 ppm Anions Std 3
2 ml 186-05-IC2 + 2 ml DI H_2O

186-07-IC2 0.1 ppm ~~DI to~~ Anions Std 2 RSS 12/18/02
4 ~~2~~ ml DI Water + ~~2~~ 1 ml 186-06-IC2. Balance #34:
Eppendorfs:
5000 ~~F~~ I RSS 12/18/02
1000 D
200 D

186-08-IC2 0
DI H_2O.

190 TITLE

SwRI

PROJECT NO.

BOOK NO. IC3

Work continued from Page

010074

190-01-IC3 Nitrite-N (100 ppm)

Diluted 0.0492 Sodium Nitrite in 100mL DI H_2O

(Fisher, Lot # 934669B, Inorg # 0379)

Balance #34

WAN 01/10/03

SCIENTIFIC BINDERY PRODUCTIONS CHICAGO 60605 MADE IN USA

Work continued to Page

SIGNATURE X Warren A. Naegeli

19 Nov 03

DATE 01/10/03

DISCLOSED TO AND UNDERSTOOD BY ams

DATE 11/20/03

WITNESS

DATE

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030306-12
SRR: 23945
SDG: 221526
CASE: Division 20
VTSR: MARCH 06, 2003
PROJECT#: 06002.01.081

Certificates of Analysis

SPECertificate™

010076

Certificate of Reference Material

Catalog Number: AS-$PO_4$9-2X/2Y **Lot No.:** 21-128AS
Description: 1000 mg/L of Phosphate
Matrix: H2O

This **ASSURANCE** ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: Phosphate (PO_4^{-3}): 996.5 mg/L
Uncertainty Associated with Measurement: +/- 3 mg/L
Certified Value is Traceable to: NIST SRM 3186

The CRM is prepared gravimetrically using high purity Potassium Dihydrogen Phosphate (KH_2PO_4) Lot#07991C. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 996 mg/L
Method: Gravimetric analysis by precipitation using Magnesia Mixture, filtering, igniting and weighing as $Mg_2P_2O_7$.

Instrumental Analysis by Ion Chromatography: 997 mg/L

Trace Anion Impurities in the Actual Solution via IC Analysis:

Component	mg/L	Component	mg/L
F^-	<0.05	NO_3^-	<0.1
Br^-	<0.05	NO_2^-	<0.1
SO_4^{2-}	<0.05	Cl^-	<1.0

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

Date of Certification: NOV "01 Certifying Officer: N. Kocherlakota

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010077

SPECertificate™

Certificate of Reference Material

Catalog Number: AS-F9-2X/2Y **Lot No.:** 21-61AS
Description: 1000 mg/L of Fluoride
Matrix: H_2O

This **ASSURANCE** ® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: Fluoride (F^-): 995.5 mg/L ± 3 mg/L
Traceable to: NIST SRM 3183

The CRM is prepared gravimetrically using high purity Sodium Fluoride (NaF) Lot#06001A. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 996 mg/L
Method: Potentiometric analysis using Fluoride combination Electrode.

Instrumental Analysis by Ion Chromatography: 995 mg/L

Trace Anion Impurities in the Actual Solution via IC Analysis:

Element	mg/L
Cl^-	<5.00
NO_2^-	<5.00
Br^-	<0.20
NO_3^-	<0.20
PO_4^{-3}	<0.50
SO_4^{-2}	<0.10

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% of the certified concentration value for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN '02 Certifying Officer: N. Kocherlakota

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SPECertificate™ 010078

Certificate of Reference Material

Catalog Number: AS-CL9-2X/2Y **Lot No.:**21-58AS
Description: 1000 mg/L of Chloride
Matrix: Water

This **ASSURANCE** ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: Chloride (Cl^-): 997.75 mg/L ± 3 mg/L
Traceable to: NIST SRM 3182

The CRM is prepared gravimetrically using high purity Sodium Chloride (NaCl) Lot#12001B. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 999.5 mg/L
Method: Gravimetric analysis by precipitation using Silver Nitrate, filtering, drying and weighing as AgCl.

Instrumental Analysis by Ion Chromatography: 996.0 mg/L

Trace Anion Impurities in the Actual Solution via IC Analysis:

Component	mg/L	Component	mg/L
F^-	<0.1	PO_4^{3-}	<0.2
NO_2^-	<0.1	NO_3^-	<0.2
SO_4^{2-}	<0.1		

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: JUN '02 Certifying Officer: N. Kocherlakota

6/13/03
6/15/03
6/17/03
3487
DK
ESHM

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010079

SPECertificate™

Certificate of Reference Material

Catalog Number: AS-$NO_2$9-2X/2Y **Lot No.:**5-255VY
Description: 1000 mg/L of Nitrite
Matrix: H_2O

3468
6/13/02
6/15/03
6/17/03
F51946

This **ASSURANCE** ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: Nitrite (NO_2^-): 1000.5 mg/L $\pm$ 3 mg/L
Traceable to: SPEX CRM 0601NO_2

The CRM is prepared gravimetrically using high purity Sodium Nitrite ($NaNO_2$) Lot#0791R. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L
Method: Titrimetric analysis using $KMnO_4$. KMnO4 standardized with As_2O_3 NIST SRM #83d.

Instrumental Analysis by Ion Chromatography: 1001 mg/L

Trace Anion Impurities in the Actual Solution via IC Analysis:

Element	mg/L
F^-	<0.2
SO_4^{-2}	<0.2
Cl^-	<0.5
PO_4^{-3}	<0.5
Br^-	<10.0
NO_3^-	<10.0

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% of the certified concentration value for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JUN '02 Certifying Officer: N. Kocherlakota

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010080

SPEXertificate™

Certificate of Reference Material

Catalog Number: AS-BR9-2X/2Y **Lot No.:**22-114AS
Description: 1000 mg/L of Bromide
Matrix: H_2O

This **ASSURANCE** ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: Bromide (Br^-): 992.5 mg/L ± 3 mg/L
Traceable to: NIST SRM 3184

The CRM is prepared gravimetrically using high purity Sodium Bromide (NaBr) Lot#04931B
The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 991 mg/L
Method: Gravimetric analysis by precipitation using Silver Nitrate, filtering, drying and weighing as AgBr.

Instrumental Analysis by Ion Chromatography: 994 mg/L

Trace Anion Impurities in the Actual Solution via IC Analysis:

Element	mg/L
F^-	<0.10
Cl^-	<0.20
NO_2^-	<0.20
NO_3^-	<0.30
SO_4^{-2}	<0.20
PO_4^{-3}	<0.20

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% of the certified concentration value for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JUN '02 Certifying Officer: N. Kocherlakota

6/13/02
6/13/03
6/14/02
3490
F5164

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SPECertificate™

010081

Certificate of Reference Material

Catalog Number: AS-NO_3N9-2X/2Y **Lot No.:** 21-76AS
Description: 1000 mg/L of Nitrate-N
Matrix: H_2O

This **ASSURANCE** ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: Nitrate-N (NO_3^--N): 1004.5 mg/L ± 3 mg/L
Traceable to: NIST SRM 3185

The CRM is prepared gravimetrically using high purity Sodium Nitrate ($NaNO_3$) Lot#M14156. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1004 mg/L
Method: Gravimetric analysis by precipitation using Nitron Acetate, filtering, drying and weighing as Nitron Nitrate ($C_{20}H_{17}N_4.NO_3$).

Instrumental Analysis by Ion Chromatography: 1005 mg/L

Trace Anion Impurities in the Actual Solution via IC Analysis:

Element	mg/L
F^-	<0.05
Cl^-	<0.2
NO_2^-	<0.2
Br^-	<0.5
SO_4^-	<0.5
PO_4^{3-}	<2.0

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

Date of Certification: JAN '02 Certifying Officer: N. Kocherlakota

3253
Exp 1/31/03
Rec'd 1/22/02

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SPEXertificate™

Certificate of Reference Material

010082

Catalog Number: AS-SO49-2X/2Y **Lot No.** 6-76VY
Description: 1000 mg/L Sulfate
Matrix: H2O

This **ASSURANCE** ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevent to the certified properties listed below.

Certified Value: 1000.5 mg/L
Traceable to: NIST SRM 3181

The CRM is prepared gravimetrically using high purity Potassium Sulfate Lot# T24163 . 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 Barium Chloride, filter, ignite and weigh as BaSO4.

Instrumentation Analysis By ICP spectrometer: 1,004 mg/L
Uncertified Properties:

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

Element	mg/L	Element	mg/L	Element	mg/L
Cl	<1.0	Br	<1.0		
F	<0.5	NO3	<0.5		
NO2	<1.0	PO4	<1.0		

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 '02 Certifying Officer: N. Kocherlakota

3489 6/13/02 6/15/2003 6/17/02 51640

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010083

FISHER SCIENTIFIC
TRACEMETAL GRADE NITRIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A509 **Lot No: 1102100**
Date: October, 2002

Tests	Units	Value
Assay	%	70%
Color	APHA	<10
Aluminum	ppb	<0.2
Antimony	ppb	<0.1
Arsenic	ppb	<0.1
Barium	ppb	<0.1
Beryllium	ppb	<0.1
Bismuth	ppb	<0.1
Boron	ppb	1
Cadmium	ppb	<0.1
Calcium	ppb	<0.5
Chromium	ppb	<0.1
Cobalt	ppb	<0.1
Copper	ppb	<0.1
Iron	ppb	<0.5
Lead	ppb	<0.1
Lithium	ppb	<0.1
Magnesium	ppb	<0.2
Manganese	ppb	<0.1
Mercury	ppb	<0.2
Molybdenum	ppb	<0.1
Nickel	ppb	<0.1
Potassium	ppb	<0.2
Selenium	ppb	<0.1
Silver	ppb	<0.1
Sodium	ppb	<0.2
Strontium	ppb	<0.1
Thorium	ppb	<0.1
Tin	ppb	<0.1
Titanium	ppb	<0.1
Uranium	ppb	<0.1
Vanadium	ppb	<0.1
Zinc	ppb	<0.2
Zirconium	ppb	<0.1

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

B McKelvey
Dr. B. McKelvey
QA/QC Manager

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

Fisher Chemical
A Fisher Scientific Company

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/15/03
DATE EXPIRED: 01/15/2013
DATE OPENED: 01/15/03
INORG: 39147 3919 PO: F52073

FISHER SCIENTIFIC
TRACEMETAL GRADE HYDROCHLORIC ACID

010084

CERTIFICATE OF ANALYSIS

Catalog No. A508

Lot No: 4102080
Date: September, 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

DANNY -lot#4102080
F.(210)522-6938
ANNA MCMAHE GOEASMK
P.O.: 800-643-0280
DATE: March 7/03

Element concentrations are at the point of bottling. Concentrations of some elements in particular, Ca, Fe, Na, Zn & Al will increase due to storage in polyethylene bottles.

B McKelvey
Dr. B. McKelvey
QA/QC Manager

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/07/03
DATE EXPIRED: 2/07/2013
DATE OPENED: 2/11/03
INORG: 3945-3950 PO: F52057

Fisher Chemical
A Fisher Scientific Company

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

FISHER SCIENTIFIC
TRACEMETAL GRADE HYDROCHLORIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A508 **Lot No: 4102050**
Date: June, 2002

Tests	Units	Value
Assay	%	35%
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: 12/10/02
DATE EXPIRED: 12/10/2012
DATE OPENED: 12/12/02 DK
INORG: 38862-38891 PO: 152067

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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A Fisher Scientific Company

Certificate of Analysis

010086

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

Catalog Number: CGSC10-1and CGSC10-5

Lot Number: **T-QSC01104**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 9/4/02
DATE EXPIRED: 10/1/2003 DR
DATE OPENED: 9/4/02
INORG: 3683 PO: F52048

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

CERTIFIED VALUE: 10,056 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: 10,040 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: 10,071 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3148a
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 .

O	Al	<0.07	M	Dy	<0.006	M	Li	<0.01	M	Pr	<0.0003	M	Te	<0.03
M	Sb	<0.0005	M	Er	<0.005	M	Lu	<0.0004	M	Re	<0.001	M	Tb	<0.0003
M	As	<0.01	M	Eu	<0.003	M	Mg	<0.03	M	Rh	<0.001	M	Tl	<0.001
M	Ba	<0.01	M	Gd	<0.001	M	Mn	<0.004	M	Rb	<0.001	M	Th	0.028
M	Be	<0.0005	M	Ga	<0.001	O	Hg	i	M	Ru	<0.002	M	Tm	<0.0004
M	Bi	0.043	M	Ge	<0.006	M	Mo	<0.002	M	Sm	<0.001	M	Sn	<0.005
O	B	<0.034	M	Au	<0.003	M	Nd	<0.002	s	Sc		n	Ti	
M	Cd	<0.003	M	Hf	0.03	O	Ni	<0.084	O	Se	<0.67	M	W	<0.01
O	Ca	0.17	M	Ho	<0.0005	M	Nb	<0.0005	O	Si	<0.034	M	U	<0.002
M	Ce	<0.005	M	In	<0.001	n	Os		M	Ag	0.005	M	V	<0.002
M	Cs	<0.0003	M	Ir	<0.005	M	Pd	<0.005	O	Na	<0.16	M	Yb	<0.001
M	Cr	<0.005	O	Fe	<0.16	O	P	i	M	Sr	<0.0005	M	Y	<0.04
M	Co	<0.003	M	La	<0.0005	M	Pt	<0.002	n	S		M	Zn	0.075
M	Cu	<0.006	M	Pb	0.005	O	K	<5.01	M	Ta	<0.007	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): 1.062 g/mL

QA:KL Rev.050302DN

(over)

Inorganic Ventures, Inc.
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Paul R. Haines
Quality Assurance Manager

EXPIRES
1?2003

SPECertificate™ 010087

Certificate of Reference Material

Catalog Number: PLB9-2X/2Y/2T **Lot No.** 8-138B

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: 998 mg/L

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

Certified Value is Traceable to: NIST SRM 3107

The CRM is prepared gravimetrically using high purity Ammonium Tetraborate 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: 998 mg/L

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

Instrumentation Analysis By ICP spectrometer: 998 mg/L

Uncertified Properties:

Density: 1.008 @ 26.7 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.07	Cu	<0.001	Pb	<0.002
As	<0.001	Fe	0.002	Re	<0.001
Ag	<0.001	Ga	<0.001	Rb	<0.001
Ba	<0.001	In	<0.001	Sr	<0.001
Be	<0.01	K	0.002	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	0.008	Mg	<0.001	V	<0.001
Cr	<0.004	Na	0.01	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.

Date of Certification: AUG 02 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 8/8/02
DATE EXPIRED: 8/15/2003
DATE OPENED: 8/9/02
INORG: 3611 PO: E52035

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SPECertificate™ 010088

Certificate of Reference Material

Catalog Number: PLLI2-2X/2Y **Lot No.** 8-159LI

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: 1001 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# 11001A. 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: 1000 mg/L

Uncertified Properties:

Density: 1.014 @ 24.3 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.01	Cu	<0.006	Pb	<0.009
As	<0.001	Fe	0.01	Re	0.01
Ag	<0.001	Ga	<0.001	Rb	<0.001
B	<0.02	In	<0.001	Sr	<0.001
Ba	0.006	K	0.03	Sb	<0.001
Be	<0.001	Mn	<0.001	Sn	<0.001
Bi	<0.001	Mo	<0.001	Ti	<0.001
Ca	0.05	Mg	0.009	Tl	<0.001
Cr	<0.004	Na	0.02	V	<0.001
Cd	<0.001	Ni	<0.001	Zr	<0.001
Co	<0.001			Zn	0.80

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 02 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
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DATE EXPIRED: 8/15/2003
DATE OPENED: 8/9/03
INORG: 3612 PO: F52035

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Certificate of Reference Material

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DATE RECEIVED: 8/8/02
DATE EXPIRED: 8/15/2003
DATE OPENED: 8/9/02
INORG: 3613 PO: F52035

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

Description: 1000 mg/L Molybdenum

Matrix: H2O

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

Date of Certification: AUG '02 Certifying Officer: N. Kocherlakota

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Certificate of Reference Material

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

Description: 1000 mg/L Phosphorus

Matrix: H2O

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/16/03
DATE EXPIRED: 01/15/2004
DATE OPENED: 01/23/03
INORG: 3927 PO: FS3073

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.

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

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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 12/9/02
DATE EXPIRED: 12/9/03
DATE OPENED: 12/9/03
INORG: 3858 PO: 152066

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010091

Certificate of Reference Material

Catalog Number: PLSI9-2X/2Y/2T **Lot No.** 9-66SI

Description: 1000 mg/L Silicon

Matrix: H2O / Tr 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 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 3150

The CRM is prepared gravimetrically using high purity Ammonium HexafluorosiliLot# 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: 1003 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: 1.001 @ 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	0.002	Cu	0.01	Pb	<0.001
As	<0.001	Fe	0.006	Rb	<0.001
Ag	0.009	Ga	<0.001	Re	<0.001
B	<0.05	In	<0.001	Sn	<0.001
Ba	<0.001	K	0.014	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	<0.001	Ti	<0.002
Ca	0.004	Mn	<0.001	Tl	<0.001
Cr	<0.002	Mo	<0.001	V	<0.001
Cd	<0.001	Na	0.006	Zr	0.008
Co	<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.

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

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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 12/19/02
DATE EXPIRED: 12/15/03
DATE OPENED: 12/26/02
INORG: 3654 PO: F50066

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010092

Certificate of Reference Material

Catalog Number: PLTI9-2X/2Y/2T **Lot No.** 9-52TI

Description: 1000 mg/L Titanium

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: 995.5 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/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: 996 mg/L

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

Instrumentation Analysis By ICP spectrometer: 995 mg/ L

Uncertified Properties:

Density: 1.000 @ 23.9 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.01	Cu	0.35	Pb	0.002
As	<0.001	Fe	0.01	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.005	In	<0.001	Sn	<0.001
Ba	<0.001	K	<0.05	Sr	<0.001
Be	<0.002	Li	<0.001	Sb	0.005
Bi	0.008	Mg	0.008	Tl	<0.001
Ca	0.095	Mn	0.001	V	<0.001
Cr	<0.001	Mo	<0.001	Zr	0.20
Cd	<0.001	Na	0.009	Zn	0.030
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: DEC - - '02 Certifying Officer: N. Kocherlakota

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010093

Certificate of Reference Material

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

Description: 1000 mg/L Strontium in 2% HNO3

Matrix: 2% HNO3

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

Certified Value: 1002.5 mg/L

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

Certified Value is Traceable to: NIST SRM 3153a

The CRM is prepared gravimetrically using high purity Strontium Carbonate Lot# 02001B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1002 mg/L

Method: EDTA titration using Methyl Thymol Blue as indicator. EDTA standardized against Pb(NO3)2 NIST SRM #928.

Instrumentation Analysis By ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 1.010 @ 22.7 Degrees Celsius

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

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

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

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

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/20/03
DATE EXPIRED: 2/15/2004 DP
DATE OPENED: 2/24/03
INORG: 3161 PO: F52040

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DATE RECEIVED: 8/20/02
DATE EXPIRED: 8/15/03 DR
DATE OPENED: 8/20/02
INORG: 3644 PO: E52039

SPEXertificate™

010094

Certificate of Reference Material

Catalog Number: PLSN5-2X/2Y/2T **Lot No.** 9-81SN

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: 1002.5 mg/L

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

Certified Value is Traceable to: NIST SRM 3161

The CRM is prepared gravimetrically using high purity Tin Powder Lot# 10831R. 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: 1006 mg/L

Method: Precipitation using ammonium hydroxide,filter,ignite and weigh as Sn02.

Instrumentation Analysis By ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.037 @ 25.0 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.008	Cu	<0.002	Pb	0.01
As	0.02	Fe	0.06	Rb	<0.001
Ag	0.02	Ga	<0.001	Re	<0.001
B	<0.02	In	0.10	Sr	<0.001
Ba	<0.001	K	<0.3	Sb	0.008
Be	<0.001	Li	<0.001	Ti	<0.003
Bi	<0.001	Mg	<0.001	Tl	<0.001
Ca	0.015	Mn	<0.001	V	0.3
Cr	<0.002	Mo	<0.001	Zr	<0.001
Cd	<0.001	Na	0.05	Zn	4
Co	0.009	Ni	0.06		

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: 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.** 9-17LA

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.** 8-170Y

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: 1000 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# 06011A. 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: 998 mg/L

Uncertified Properties:

Density: 1.012 @ 22.8 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	0.006	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	0.005	Ni	<0.005	Ti	<0.001
Gd	<0.001	Na	0.03	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	<0.001
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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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.

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Catalog Number: PLS9-2X/2Y/2T **Lot No.** 9-64S

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: 1000.5 +/- 3 mg/L

Uncertainty Associated with Measurement:

Certified Value is Traceable to: NIST SRM 3154

The CRM is prepared gravimetrically using high purity AMMONIUM SULFATE Lot# 0891NK. 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: PRECIPITATION USING BARIUM CHLORIDE,FILTER,IGNITE AND WEIGH AS BaS04.

Instrumentation Analysis By ICP spectrometer: 1000 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
Ag	<0.001	Cu	<0.01	Pb	<0.1
Al	0.002	Fe	0.012	Rb	<0.001
As	<0.001	Ga	<0.001	Re	<0.001
Ba	<0.001	In	<0.001	Sn	<0.001
Be	<0.001	K	<0.08	Sr	<0.001
B	<0.006	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	0.02	Ti	<0.001
Cr	0.002	Mn	<0.001	Tl	<0.001
Co	<0.001	Mo	<0.001	V	<0.001
Cd	<0.001	Na	0.02	Zr	<0.001
Ca	0.015	Ni	<0.001	Zn	0.38

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

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Catalog Number: PLTH2-2X/2Y **Lot No.** 9-95TH

Description: 1000 mg/Lthorium

Matrix: 2% HNO3

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

Certified Value: 1000 mg/L +/- 3 mg/L

Uncertainty Associated with Measurement:

Certified Value is Traceable to: NIST SRM 3159

The CRM is prepared gravimetrically using high purity Th(NO3)4-4H2O Lot# 01851R. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1001 mg/L

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

Instrumentation Analysis By ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.043 @ 25.2 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Ce	0.008	La	0.002	Tb	<0.001
Ca	0.01	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	0.002	Tl	<0.001
Fe	<0.01	Ni	<0.001	V	<0.001
Gd	<0.001	Na	0.03	W	<0.001
Ga	<0.001	Pr	<0.001	Y	0.001
Hf	<0.001	Rb	<0.001	Yb	<0.001
Ho	<0.001	Sc	0.002	Zr	0.002
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: PLU2-2X/2Y **Lot No.** 8-123U

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: 1000.5 mg/L +/- 3 mg/L

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: 1001 mg/L

Method: Evaporate to dryness,ignite and weigh as U3 O8.

Instrumentation Analysis By ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.018 @ 23.5 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.05	Cu	0.02	Pb	<0.007
As	0.05	Fe	0.10	Rb	<0.001
Ag	<0.005	Ga	<0.001	Re	<0.001
B	<0.004	In	<0.001	Sn	<0.001
Ba	0.003	K	0.06	Sr	0.004
Be	<0.001	Li	<0.001	Sb	0.003
Bi	0.002	Mg	0.003	Ti	<0.001
Ca	.12	Mn	0.003	Tl	<0.001
Cr	<0.003	Mo	0.005	V	0.005
Cd	<0.001	Na	0.1	Zr	<0.001
Co	<0.001	Ni	<0.002	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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6/28/02 6/30/03 OK 7/1/02 F51957

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Catalog Number: PLW9-2X/2Y **Lot No.** 8-135W

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: 999.5 mg/L +/- 3 mg/L

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: 997 mg/L

Method: Fume with Sulfuric Acid to dryness, ignite and weigh as WO3.

Instrumentation Analysis By ICP spectrometer: 1002 mg/L

Uncertified Properties:

Density: 1.006 @ 25.2 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.005	Cu	<0.001	Pb	<0.008
As	0.006	Fe	0.003	Rb	<0.001
Ag	<0.004	Ga	<0.001	Re	0.009
B	<0.004	In	<0.001	Sn	0.001
Ba	<0.001	K	0.07	Sr	<0.001
Be	<0.001	Li	0.04	Sb	0.002
Bi	<0.001	Mg	0.006	Ti	<0.002
Ca	0.008	Mn	<0.001	Tl	<0.001
Cr	<0.005	Mo	0.005	V	<0.001
Cd	<0.001	Na	0.03	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	<0.2

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

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Catalog Number: PLZR2-2X/2Y/2T **Lot No.** 9-07ZR

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 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: 996 mg/L

Method: Fume with Sulfuric Acid to dryness,ignite and weigh as ZrO2.

Instrumentation Analysis By ICP spectrometer: 998 mg/L

Uncertified Properties:

Density: 1.009 @ 25.0 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.02	Cu	<0.001	Pb	<0.001
As	<0.002	Fe	0.039	Rb	<0.001
Ag	0.2	Ga	<0.001	Re	<0.001
B	<0.05	In	<0.001	Sn	<0.001
Ba	<0.001	K	<0.08	Sr	<0.001
Be	<0.001	Li	<0.005	Sb	<0.001
Bi	<0.001	Mg	<0.002	Ti	<0.002
Ca	0.04	Mn	<0.001	Tl	<0.001
Cr	<0.005	Mo	<0.001	V	<0.001
Cd	0.004	Na	<0.03	Zn	0.005
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: 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.

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DATE OPENED: 11/19/02
INORG: 3223 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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INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/19/02
DATE EXPIRED: 11/30/2003 DK
DATE OPENED: 11/19/02
INORG: 3224 PO: F52064

SPECertificate™ 010106

Certificate of Reference Material

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

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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 FO: F5d064

010107

SPECertificate™

Certificate of Reference Material

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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Certificate of Analysis

010108

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

Catalog Number: CGAL10-1and CGAL10-5

Lot Number: **S-AL03136 (Revised 06/10/02)**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 08/23/02
DATE EXPIRED: 09/01/2003
DATE OPENED: 08/26/02
INORG: 3649 PO: F52042

Starting Material:	Aluminum Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	607116

CERTIFIED CONCENTRATION: 10,041 ± 25 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: 10,041 ± 25 µg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 10,017 ± 102 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3101a.

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 .

s	Al		M	Dy	<0.028	M	Li	<0.047	M	Pr	<0.0014	M	Te	<0.14
M	Sb	<0.0024	M	Er	<0.024	M	Lu	<0.0019	M	Re	<0.0047	M	Tb	<0.0014
M	As	<0.047	M	Eu	<0.014	O	Mg	0.0050	M	Rh	<0.0047	M	Tl	<0.0047
M	Ba	<0.047	M	Gd	<0.0047	M	Mn	<0.019	M	Rb	<0.0047	M	Th	<0.0047
O	Be	<0.00017	M	Ga	<0.0047	O	Hg	<0.0070	M	Ru	<0.0094	M	Tm	<0.0019
M	Bi	<0.0019	M	Ge	<0.028	M	Mo	<0.0094	M	Sm	<0.0047	M	Sn	<0.024
O	B	0.012	M	Au	<0.014	M	Nd	<0.0094	M	Sc	<0.047	M	Ti	<0.24
M	Cd	<0.014	M	Hf	<0.0094	O	Ni	<0.0060	M	Se	<0.036	M	W	<0.047
O	Ca	0.0084	M	Ho	<0.0024	M	Nb	<0.0024	O	Si	0.052	M	U	<0.0094
M	Ce	<0.024	O	In	<0.030	n	Os		M	Ag	<0.0094	M	V	<0.0094
M	Cs	<0.0014	M	Ir	<0.024	M	Pd	<0.024	O	Na	<0.10	M	Yb	<0.0047
O	Cr	0.0026	O	Fe	0.018	O	P	<0.030	M	Sr	<0.0024	M	Y	<0.19
M	Co	<0.014	M	La	<0.0024	M	Pt	<0.0094	O	S	0.086	M	Zn	<0.094
M	Cu	<0.028	M	Pb	<0.014	O	K	<0.0060	M	Ta	<0.033	M	Zr	<0.024

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): 1.061 g/mL

QA:KL Rev.061002DN

(over)

Paul R. Haines
Quality Assurance Manager

Inorganic Ventures, Inc.
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EXPIRES 1 SEP 2003

inorganic ventures / iv labs

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010109

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
	B	< 0.00054	M	Au	< 0.01280	M	Nd	< 0.00853	O	Sc	< 0.00002	M	Ti	< 0.21329
	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 010110

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; 8; $Ca(H_2O)_8^{+2}$

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)

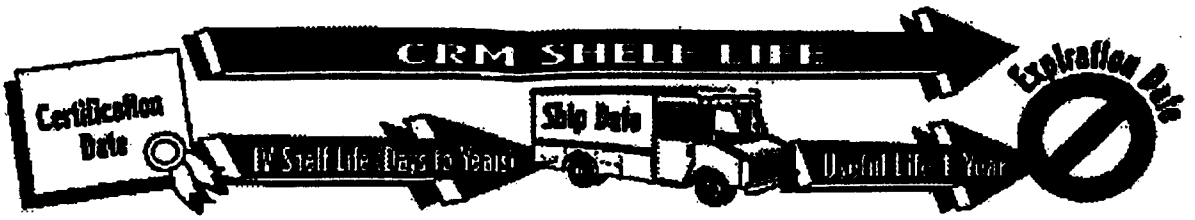
10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

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

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
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e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

010111

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

2.0 DESCRIPTION OF CRM

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

Catalog Number:	CGFE10-1 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: 39603 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 010112

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

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)

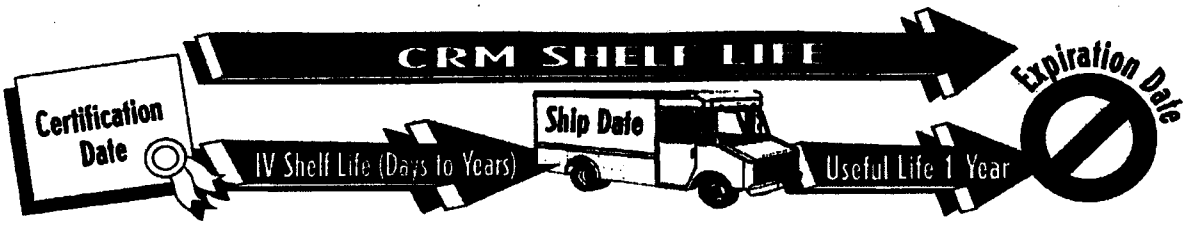
10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

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) 010113

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

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Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES 1/2003

Certificate of Analysis

010114

CUSTOM-GRADE SOLUTION

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

Cataiog Number: CGMG10-1and CGMG10-5

Lot Number: **T-MG02151**

Starting Material:	Magnesium Metal	7/12/02
Starting Material Purity:	99.999%	8/01/2003
Starting Material Lot No:	91191	7/15/02
		3564 F51959

CERTIFIED CONCENTRATION: 10,016 ± 22 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: 10,016 ± 22 µg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 10,016 ± 52 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3131a.

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	0.050	M	Dy	<0.025	O	Li	0.0063	M	Pr	<0.0013	M	Te	<0.13
M	Sb	0.0031	M	Er	<0.021	M	Lu	<0.0017	M	Re	<0.0041	M	Tb	<0.0013
M	As	<0.041	M	Eu	<0.013	s	Mg		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
O	Be	<0.00017	M	Ga	<0.0041	O	Hg	<0.0090	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	0.013	M	Au	<0.013	M	Nd	<0.0082	M	Sc	<0.041	O	Ti	0.17
M	Cd	<0.013	M	Hf	<0.0082	O	Ni	0.015	M	Se	<0.033	M	W	<0.041
O	Ca	0.050	M	Ho	<0.0021	M	Nb	<0.0021	O	Si	0.040	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	0.025	M	Yb	<0.0041
O	Cr	0.027	O	Fe	0.069	O	P	<0.016	M	Sr	<0.0021	M	Y	<0.17
M	Co	<0.013	M	La	<0.0021	M	Pt	<0.0082	n	S		O	Zn	0.0065
O	Cu	0.0088	O	Pb	0.034	O	K	<0.050	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 22°C): 1.050 g/mL

(over)

QA:KSL Rev.022202DN

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Paul R. Haines
Quality Assurance Manager

EXPIRES 1 2 2003

Certificate of Analysis

010115

CUSTOM-GRADE SOLUTION 10,000 µg/mL Sodium in 1.4% HNO_3 (abs)

Catalog Number: CGNA10-1and CGNA10-5

Lot Number: **T-NA02144**

Starting Material:	Na_2CO_3	7/12/02
Starting Material Purity:	99.999%	8/01/2003
Starting Material Lot No:	41355	7/15/02
		3565 E51959

CERTIFIED CONCENTRATION: 10,029 ± 8 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: 10,029 ± 8 µg/mL
Method: Gravimetric as the Sulfate vs NIST weights #822/254143-94.

Instrument Analysis: 10,035 ± 40 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3152a.

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	<0.026	O	Li	<0.000030	M	Pr	<0.0013	M	Te	<0.13
M	Sb	<0.0022	M	Er	<0.022	M	Lu	<0.0018	M	Re	<0.0044	M	Tb	<0.0013
M	As	<0.044	M	Eu	<0.013	O	Mg	0.00019	M	Rh	<0.0044	M	Tl	<0.0044
M	Ba	<0.044	M	Gd	<0.0044	O	Mn	<0.000030	M	Rb	<0.0044	M	Th	<0.0044
O	Be	<0.00020	M	Ga	<0.0044	O	Hg	<0.015	M	Ru	<0.0087	M	Tm	<0.0018
M	Bi	<0.0018	O	Ge	<0.0015	M	Mo	<0.0087	M	Sm	<0.0044	M	Sn	<0.022
O	B	0.00040	O	Au	<0.0030	M	Nd	<0.0087	O	Sc	<0.000020	O	Ti	<0.00070
M	Cd	<0.013	M	Hf	<0.0087	O	Ni	<0.0023	O	Se	<0.050	M	W	<0.044
O	Ca	0.0026	M	Ho	<0.0022	M	Nb	<0.0022	O	Si	<0.0034	M	U	<0.0087
M	Ce	<0.022	M	In	<0.044	n	Os		M	Ag	<0.0087	O	V	<0.00090
M	Cs	0.021	M	Ir	<0.022	M	Pd	<0.022	s	Na		M	Yb	<0.0044
M	Cr	<0.022	O	Fe	<0.0011	O	P	0.0014	M	Sr	<0.0022	M	Y	<0.18
M	Co	<0.013	M	La	<0.0022	M	Pt	<0.0087	O	S	<0.072	O	Zn	<0.00020
O	Cu	<0.0014	M	Pb	<0.013	O	K	0.22	M	Ta	<0.031	M	Zr	<0.022

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): 1.030 g/mL

(over)

QA:KL Rev.032702DN

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Paul R. Haines
Quality Assurance Manager

EXPIRES
1 02003

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Lithium in 0.1% HNO_3 (abs) 010116

Catalog Number: CGLI1-1, CGLI1-2 and CGLI1-5

Lot Number: **T-LI02059**

Starting Material:	Li_2CO_3
Starting Material Purity:	99.999%
Starting Material Lot No:	1053

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/22/02
DATE EXPIRED: 11/01/2003
DATE OPENED: 10/23/02
INORG: 3736 PO: F52057

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.

Classical Wet Assay: 997 ± 1 μg/mL
Method: Gravimetric as the Sulfate vs NIST weights #822/254143-94.

Instrument Analysis: 998 ± 2 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.032702DN

Paul R. Haines
Quality Assurance Manager

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
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Technical Support: 800-569-6799

EXPIRES 11/2003

Certificate of Analysis

010117

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

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

Lot Number: **S-BA02016**

INORGANIC LABS/DANCHEM LABS
DATE RECEIVED: 4/3/02
DATE EXPIRED: 4/1/2003 OR
DATE OPENED: 4/4/02
INBOX: 3393 PO: FS1773

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

CERTIFIED VALUE: 1008 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: 1009 µg/mL

Method: Gravimetric as the Sulfate vs NIST Weights

Sufficient number of sample measurements were made to give a minimum relative precision of ± 0.3% at the 95% confidence level.

Instrument Analysis: 1007 µg/mL

Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3104a

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.

O	Al	<0.04	M	Dy	<0.0006	M	Li	<0.001	n	Pr		M	Te	i			
M	Sb	<0.00005	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	<0.003	M	Rh	<0.0001	M	Tl	<0.0001			
s	Ba		M	Gd	0.002	M	Mn	<0.0004	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	0.001	M	Mo	<0.0002	M	Sm	<0.0001	M	Sn	<0.0005			
M	B	<0.007	M	Au	<0.0003	M	Nd	0.002	M	Sc	<0.001	M	Ti	<0.005			
M	Cd	<0.0003	M	Hf	<0.0002	O	Ni	i	O	Se	<0.4	M	W	<0.001			
O	Ca	<0.01	M	Ho	<0.00005	M	Nb	<0.00005	O	Si	<0.02	M	U	<0.0002			
n	Ce		O	In	i	n	Os		M	Ag	<0.0002	M	V	<0.0002			
n	Cs		M	Ir	<0.0005	M	Pd	<0.0005	O	Na	<0.09	M	Yb	<0.0001			
M	Cr	<0.0005	O	Fe	<0.05	O	P	<0.05	M	Sr	0.004	M	Y	<0.004			
M	Co	<0.0003	n	La		M	Pt	<0.0002	n	S		O	Zn	<0.03			
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): 1.000 g/mL

QA:KL Rev.070901DN

(over)

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Paul R. Haines
Quality Assurance Manager

EXPIRES 1 APR 2003

Certificate of Analysis

010118

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

Catalog Number: CGBE1-1, CGBE1-2 and CGBE1-5

Lot Number: **S-QBE01080**

Date Received:	6/19/02
Date Expiration:	7/01/2003
Date Produced:	6/19/02
Lot:	3499 F51941

Starting Material:	Beryllium Acetate
Starting Material Purity:	99.999%
Starting Material Lot No:	9504-2

CERTIFIED VALUE: 1000 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)

Calculated Value: 1003 μg/mL
Method: Calculated, based on starting material

Instrument Analysis: 997 μg/mL
Method : Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3105a
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.

O	Al	<0.04	M	Dy	<0.0006	O	Li	<0.02	M	Pr	<0.00003	M	Te	<0.003
M	Sb	<0.00005	M	Er	<0.0005	M	Lu	<0.00004	M	Re	<0.0001	M	Tb	<0.00003
M	As	<0.001	M	Eu	<0.0003	O	Mg	<0.01	M	Rh	<0.0001	M	Tl	<0.0001
M	Ba	<0.001	M	Gd	<0.0001	M	Mn	<0.0004	M	Rb	<0.0001	M	Th	<0.0001
s	Be		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	<0.0002	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	M	Ni	<0.03	O	Se	i	M	W	<0.001
O	Ca	<0.01	M	Ho	<0.00005	M	Nb	<0.00005	O	Si	<0.02	M	U	<0.0002
M	Ce	<0.0005	O	In	<0.03	n	Os		M	Ag	<0.0002	M	V	<0.0002
M	Cs	<0.00003	M	Ir	<0.0005	M	Pd	<0.0005	O	Na	<0.09	M	Yb	<0.0001
M	Cr	<0.0005	O	Fe	i	O	P	i	M	Sr	<0.00005	M	Y	0.004
M	Co	<0.0003	M	La	<0.00005	M	Pt	<0.0002	n	S		M	Zn	0.005
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): 1.023 g/mL

QA:KL Rev.011002DN

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Paul R. Haines
Quality Assurance Manager

EXPIRES 1/2003

Certificate of Analysis

010119

CUSTOM-GRADE SOLUTION 1000 μg/mL Chromium^{+3} in 1.4% HNO_3 (abs)

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

Lot Number: **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

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Paul R. Haines
Quality Assurance Manager

EXPIRES
1/2003

Certificate of Analysis

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

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

010120

Lot Number: **T-CU02060**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 02/13/03
DATE EXPIRED: 03/01/2004
DATE OPENED: 03/13/03
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
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EXPIRES 1 MAR 2004

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Nickel in 1.4% HNO_3 (abs) 010121

Catalog Number: CGNI1-1, CGNI1-2 and CGNI1-5

Lot Number: **S-NI02022**

INORGANIC LABS/PARTICLE LABS
DATE RECEIVED: 4/3/02
DATE EXPIRED: 4/1/2003 DR
DATE OPENED: 4/4/02
INVOICE: 3400 PO: F51793

Starting Material:	Nickel Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	B20G26

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: 1004 ± 4 µg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3136.

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	<0.0009	M	Dy	<0.0006	M	Li	<0.001	M	Pr	<0.00003	M	Te	<0.003
M	Sb	<0.00005	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	<0.003	M	Rh	<0.0001	M	Tl	<0.0001
M	Ba	<0.001	M	Gd	<0.0001	O	Mn	<0.01	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	<0.0002	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	s	Ni		O	Se	<0.4	M	W	<0.001
O	Ca	<0.01	M	Ho	<0.00005	M	Nb	<0.00005	O	Si	<0.3	M	U	<0.0002
M	Ce	<0.0005	O	In	i	n	Os		M	Ag	<0.0002	O	V	<0.01
M	Cs	<0.00003	M	Ir	<0.0005	M	Pd	<0.0005	O	Na	<0.09	M	Yb	<0.0001
M	Cr	<0.0005	O	Fe	<0.05	O	P	<0.05	M	Sr	<0.00005	M	Y	<0.004
O	Co	i	M	La	0.00005	M	Pt	<0.0002	n	S		M	Zn	<0.002
M	Cu	<0.006	M	Pb	0.00009	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): 1.010 g/mL **(over)**

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Paul R. Haines
Quality Assurance Manager

EXPIRES 1 APR 2003

Certificate of Analysis

CUSTOM-GRADE SOLUTION

1000 μg/mL Lanthanum in 1.4% HNO_3 (abs)

010122

Catalog Number: CGLA1-1 and CGLA1-5

Lot Number: **S-QLA01054**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 08/23/02
DATE EXPIRED: 09/01/2003
DATE OPENED: 08/26/02
INORG: 3650 PO: F52042

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

CERTIFIED VALUE: 1001 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: 1002 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: 999 μg/mL

Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3127a

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.

O	Al	<0.04	M	Dy	<0.0006	M	Li	<0.001	O	Pr	<0.02	M	Te	<0.003
M	Sb	<0.00005	M	Er	0.001	M	Lu	0.00004	M	Re	<0.0001	M	Tb	<0.00003
M	As	<0.001	M	Eu	<0.0003	M	Mg	<0.003	M	Rh	<0.0001	M	Tl	<0.0001
O	Ba	<0.02	M	Gd	0.039	M	Mn	<0.0004	M	Rb	<0.0001	M	Th	<0.0001
M	Be	<0.00005	M	Ga	<0.0001	O	Hg	<0.03	M	Ru	<0.0002	M	Tm	<0.00004
M	Bi	<0.00004	M	Ge	<0.0006	M	Mo	<0.0002	M	Sm	0.0004	M	Sn	<0.0005
O	B	<0.02	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	<0.001
O	Ca	<0.01	M	Ho	0.0001	M	Nb	<0.00005	O	Si	<0.02	M	U	<0.0002
O	Ce	i	O	In	<0.03	n	Os		M	Ag	<0.0002	M	V	<0.0002
n	Cs		M	Ir	<0.0005	M	Pd	<0.0005	O	Na	<0.09	M	Yb	<0.0001
M	Cr	<0.0005	O	Fe	<0.05	O	P	<0.05	M	Sr	<0.00005	M	Y	<0.004
M	Co	<0.0003	s	La		M	Pt	<0.0002	n	S		M	Zn	<0.002
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): 1.009 g/mL

QA:KSL Rev.110101DN

(over)

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Paul R. Haines
Quality Assurance Manager

EXPIRES 1 SEP 2003

Certificate of Analysis

CUSTOM-GRADE SOLUTION 10,000 μg/mL Sodium in 1.4% HNO_3 (abs)

010123

Catalog Number: CGNA10-1and CGNA10-5

Lot Number: **T-NA02144**

Starting Material:	Na_2CO_3
Starting Material Purity:	99.999%
Starting Material Lot No:	41355

INDIVIDUAL LABORATORIES
DATE REPORTED: 7/12/02
DATE EXPIRES: 8/01/2003
DATE OPENED: 7/15/02
INITIAL: 3565 LOT: E51959

CERTIFIED CONCENTRATION: 10,029 ± 8 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: 10,029 ± 8 μg/mL
Method: Gravimetric as the Sulfate vs NIST weights #822/254143-94.

Instrument Analysis: 10,035 ± 40 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3152a.

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	<0.026	O	Li	<0.000030	M	Pr	<0.0013	M	Te	<0.13
M	Sb	<0.0022	M	Er	<0.022	M	Lu	<0.0018	M	Re	<0.0044	M	Tb	<0.0013
M	As	<0.044	M	Eu	<0.013	O	Mg	0.00019	M	Rh	<0.0044	M	Tl	<0.0044
M	Ba	<0.044	M	Gd	<0.0044	O	Mn	<0.000030	M	Rb	<0.0044	M	Th	<0.0044
O	Be	<0.00020	M	Ga	<0.0044	O	Hg	<0.015	M	Ru	<0.0087	M	Tm	<0.0018
M	Bi	<0.0018	O	Ge	<0.0015	M	Mo	<0.0087	M	Sm	<0.0044	M	Sn	<0.022
O	B	0.00040	O	Au	<0.0030	M	Nd	<0.0087	O	Sc	<0.000020	O	Ti	<0.00070
M	Cd	<0.013	M	Hf	<0.0087	O	Ni	<0.0023	O	Se	<0.050	M	W	<0.044
O	Ca	0.0026	M	Ho	<0.0022	M	Nb	<0.0022	O	Si	<0.0034	M	U	<0.0087
M	Ce	<0.022	M	In	<0.044	n	Os		M	Ag	<0.0087	O	V	<0.00090
M	Cs	0.021	M	Ir	<0.022	M	Pd	<0.022	s	Na		M	Yb	<0.0044
M	Cr	<0.022	O	Fe	<0.0011	O	P	0.0014	M	Sr	<0.0022	M	Y	<0.18
M	Co	<0.013	M	La	<0.0022	M	Pt	<0.0087	O	S	<0.072	O	Zn	<0.00020
O	Cu	<0.0014	M	Pb	<0.013	O	K	0.22	M	Ta	<0.031	M	Zr	<0.022

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): 1.030 g/mL

(over)

QA:KL Rev.032702DN

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Paul R. Haines
Quality Assurance Manager

EXPIRES
1 Aug 2003

Certificate of Analysis

010124

CUSTOM-GRADE SOLUTION

1000 µg/mL Palladium in 3.3% HCl (abs)

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: F52C64

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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Quality Assurance Manager

EXPIRES
1 MAR 2004

Certificate of Analysis

010125

CUSTOM-GRADE SOLUTION 1000 μg/mL Sulfur in H_2O

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)**

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Paul R. Haines
Quality Assurance Manager

EXPIRES 1/2003

Certificate of Analysis

CUSTOM-GRADE SOLUTION

1000 μg/mL Thorium in 3% HNO_3 (abs)

010126

Catalog Number: CGTH1-1 and CGTH1-5

Lot Number: **T-TH01059**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 9/4/02
DATE EXPIRED: 10/1/2003 DR
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.050802DN

(over)

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Quality Assurance Manager

EXPIRES 1 2003

Certificate of Analysis

010127

CUSTOM-GRADE SOLUTION

1000 μg/mL Uranium in 1% HNO_3 (abs)

Catalog Number: CGU1-1 and CGU1-5

Lot Number: **S-U01055**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 4/3/02
DATE EXPIRED: 4/1/2003 DR
DATE OPENED: 4/4/02
INORG: 3397 PO: F51773

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

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.

Instrument Analysis: 998 ± 2 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3164.

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	<0.20	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
M	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	O	Hg	i	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	O	Ni	i	M	Se	<0.0080	M	W	<0.010
O	Ca	0.11	M	Ho	<0.00050	M	Nb	<0.00050	O	Si	i	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	O	Fe	i	O	P	i	M	Sr	0.0011	M	Y	0.56
M	Co	0.014	M	La	0.0014	M	Pt	<0.0020	O	S	i	M	Zn	0.020
M	Cu	0.022	M	Pb	0.0025	O	K	i	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): 1.007 g/mL

(over) QA:KSL Rev.111601DN

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Paul R. Haines
Quality Assurance Manager

EXPIRES 1 APR 2003

Certificate of Analysis

010128

CUSTOM-GRADE SOLUTION 1000 μg/mL Tungsten in 0.1% HNO_3 (abs)/1% HF (abs)

Catalog Number: CGW1-1, CGW1-2, and CGW1-5

This standard should **not** be prepared or stored in glass.

Lot Number: **T-W01078**

			7/12/02
Starting Material:	Tungsten Metal		8/01/2003
Starting Material Purity:	99.999%		7/15/02
Starting Material Lot No:	E03K06	3568	F51959

CERTIFIED CONCENTRATION: 1003 ± 4 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: 1003 ± 4 μg/mL (Average of 2 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3163.

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	0.030	M	Dy	<0.00060	O	Li	<0.000030	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.020	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	O	Mg	0.0010	M	Rh	<0.0010	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	<0.00010	i	Hg		M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	M	Sc	<0.0040	M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	0.00037	O	Ni	<0.10	M	Se	<0.010	s	W	
O	Ca	0.00086	M	Ho	<0.000050	M	Nb	≤0.00080	n	Si		M	U	<0.00020
M	Ce	<0.00050	M	In	<0.0010	n	Os		M	Ag	<0.00020	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	0.047	M	Yb	<0.00010
M	Cr	<0.00050	i	Fe		i	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	0.031
M	Cu	<0.00060	M	Pb	<0.00030	O	K	0.028	M	Ta	<0.010	M	Zr	0.0026

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

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Paul R. Haines
Quality Assurance Manager

EXPIRES 1 Aug 2003

Certificate of Analysis

010129

CUSTOM-GRADE SOLUTION

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

Catalog Number: CGY1-1 and CGY1-5

Lot Number: **T-Y01085**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 08/23/02
DATE EXPIRED: 09/01/2003
DATE OPENED: 08/26/02
INORG: 3654 PO: F52042

Starting Material:	Y_2O_3
Starting Material Purity:	99.999%
Starting Material Lot No:	Y-O-5-9503201

CERTIFIED CONCENTRATION: 999 ± 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: 999 ± 2 μg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 996 ± 3 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:JF Rev.041502DN

Inorganic Ventures, Inc.
195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701
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Paul R. Haines
Quality Assurance Manager

EXPIRES 1/2003

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Zirconium in H_2O tr. HF tr. HNO_3 010130

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

INORGANIC LABS/RADIOCHEM LABS
DATE RECEIVED: 4/3/02
DATE EXPIRED: 4/4/2003
DATE OPENED: 4/4/02
INORG: 3398 PO: F51773

Lot Number: **S-ZR01051**

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

CERTIFIED CONCENTRATION: 995 ± 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:

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

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

Instrument Analysis: 995 ± 6 µg/mL
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
O	B	i	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	O	Nb	i	O	Si	i	M	U	0.00040
M	Ce	<0.0098	M	In	<0.020	n	Os		O	Ag	i	M	V	0.0016
M	Cs	<0.00059	M	Ir	<0.0098	O	Pd	i	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	O	S	i	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.081701DN

(over)

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Paul R. Haines
Quality Assurance Manager

EXPIRES 1 APR 2003

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Cadmium in 2% HNO_3 (abs) 010131

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

Lot Number: **T-CD01123**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 4/3/02
DATE EXPIRED: 4/1/2003
DATE OPENED: 4/4/02
INORG: 3345 RC: F51773

Starting Material:	Cadmium Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	F25B03

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 928 Lead Nitrate.

Instrument Analysis: 994 ± 4 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3108.

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	<0.04	M	Dy	<0.0006	M	Li	<0.001	M	Pr	<0.00003	M	Te	<0.008
M	Sb	<0.00005	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	<0.003	M	Rh	<0.0001	M	Tl	<0.0001
M	Ba	<0.001	M	Gd	<0.0001	M	Mn	<0.0006	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	<0.0002	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
s	Cd		M	Hf	<0.0002	O	Ni	<0.05	O	Se	<0.4	M	W	<0.001
O	Ca	<0.02	M	Ho	<0.00005	M	Nb	<0.00005	O	Si	<0.02	M	U	<0.0002
M	Ce	<0.0005	M	In	0.0059	n	Os		M	Ag	<0.002	M	V	<0.0002
M	Cs	<0.00003	M	Ir	<0.0005	M	Pd	<0.05	O	Na	<0.09	M	Yb	<0.0001
M	Cr	<0.0005	O	Fe	<0.05	O	P	<0.05	M	Sr	<0.00005	M	Y	<0.004
M	Co	<0.0003	M	La	<0.00005	M	Pt	<0.0002	n	S		M	Zn	0.0022
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): 1.014 g/mL

QA:KL Rev.011802DN

(over)

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Paul R. Haines
Quality Assurance Manager

EXPIRES
1 APR 2003

Certificate of Analysis

010132

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

Catalog Number: CGCO1-1, CGCO1-2 and CGCO1-5

Lot Number: **S-CO01113**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 4/3/02
DATE EXPIRED: 4/4/2003 DR
DATE OPENED: 4/4/02
INORG: 3401 PO: F51973

Starting Material:	Cobalt Metal
Starting Material Purity:	99.997%
Starting Material Lot No:	22738

CERTIFIED VALUE: 993 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: 997 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: 988 μg/mL

Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3113

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.

O	Al	<0.0002	M	Dy	<0.0006	O	Li	<0.000002	M	Pr	<0.00003	M	Te	<0.003
M	Sb	<0.00005	M	Er	<0.0005	M	Lu	<0.00004	M	Re	<0.0001	M	Tb	<0.00003
M	As	<0.8	M	Eu	<0.0003	M	Mg	<0.003	M	Rh	<0.0001	O	Tl	<0.02
M	Ba	<0.001	M	Gd	<0.0001	M	Mn	<0.0004	M	Rb	<0.0001	M	Th	<0.0001
M	Be	<0.00005	O	Ga	<0.001	O	Hg	<0.04	M	Ru	<0.0002	M	Tm	<0.00004
M	Bi	<0.00004	M	Ge	<0.0006	M	Mo	<0.0002	M	Sm	<0.0001	M	Sn	<0.0005
M	B	<0.007	M	Au	<0.0003	M	Nd	<0.0002	M	Sc	<0.001	O	Ti	<0.001
M	Cd	<0.0003	M	Hf	<0.0002	O	Ni	0.0007	O	Se	<0.04	M	W	<0.001
O	Ca	0.03	M	Ho	<0.00005	M	Nb	<0.00005	O	Si	0.0009	M	U	<0.0002
M	Ce	<0.0005	O	In	<0.001	n	Os		M	Ag	<0.0002	M	V	<0.0002
O	Cs	<0.002	M	Ir	<0.0005	M	Pd	<0.0005	O	Na	<0.002	M	Yb	<0.0001
O	Cr	0.0003	O	Fe	<0.002	O	P	<0.03	M	Sr	<0.00005	M	Y	<0.004
s	Co		M	La	<0.00005	M	Pt	<0.0002	O	S	0.009	O	Zn	0.0003
M	Cu	<0.0006	M	Pb	<0.0003	O	K	0.004	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): 1.015 g/mL

QA:KL Rev.051001ROR

(over)

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Paul R. Haines
Quality Assurance Manager

Expires: EXPIRES 1 APR 2003

Certificate of Analysis

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

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

010133

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

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Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES FEB 2004

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Vanadium in 1.4% HNO_3 (abs) 010134

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

Lot Number: **S-QV01080**

Starting Material:	Vanadium Pentoxide	INORGANIC LABS/RADCHEM LABS
Starting Material Purity:	99.999%	DATE RECEIVED: 10/22/02
Starting Material Lot No:	46	DATE EXPIRED: 11/01/2003
		DATE OPENED: 10/23/02
		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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Technical Support: 800-569-6799

Paul R. Haines

Quality Assurance Manager

EXPIRES 1/2003

Certificate of Analysis

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

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

010135

Lot Number: **T-ZN02015**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 7/12/02
DATE EXPIRED: 8/01/2003
DATE OPENED: 7/15/02
INGRD: 3567 PO: #51959

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.061702DN

(over)

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Paul R. Haines
Quality Assurance Manager

EXPIRES
1 2003

Certificate of Analysis

010136

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

Catalog Number: CGAG1-1, CGAG1-2 and CGAG1-5

Lot Number: **T-AG02013**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 08/23/02
DATE EXPIRED: 09/01/2003
DATE OPENED: 08/26/02
INORG: 3653 PO: F52042

Starting Material:	Silver Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	F15102

CERTIFIED CONCENTRATION: 996 ± 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: 998 ± 3 μg/mL
Method: Volhard Titration vs NIST SRM 999a Potassium Chloride

Instrument Analysis: 996 ± 3 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.

M	Al	<0.0009	M	Dy	<0.0006	M	Li	<0.001	M	Pr	<0.00003	M	Te	<0.003
M	Sb	0.0006	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	<0.003	n	Rh		M	Tl	<0.0001
M	Ba	<0.001	M	Gd	<0.0001	M	Mn	<0.0004	M	Rb	<0.0001	M	Th	<0.0001
M	Be	<0.00005	M	Ga	<0.0001	O	Hg	<0.02	n	Ru		M	Tm	<0.00004
M	Bi	0.0007	M	Ge	0.001	M	Mo	<0.0002	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
O	Cd	<0.01	M	Hf	<0.0002	O	Ni	<0.05	O	Se	<0.4	M	W	<0.001
O	Ca	<0.01	M	Ho	<0.00005	M	Nb	<0.00005	O	Si	<0.02	M	U	<0.0002
M	Ce	<0.0005	O	In	<0.03	n	Os		s	Ag		M	V	<0.0002
M	Cs	<0.00003	M	Ir	<0.0005	n	Pd		O	Na	<0.09	M	Yb	<0.0001
M	Cr	<0.002	O	Fe	<0.05	O	P	<0.05	M	Sr	<0.00005	M	Y	<0.004
M	Co	<0.0003	M	La	<0.00005	M	Pt	<0.0002	n	S		M	Zn	0.006
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): 1.025 g/mL (over)

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Paul R. Haines
Quality Assurance Manager

EXPIRES 1/2003

Certificate of Analysis

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

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

010137

Lot Number: **T-AS02019**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/09/03
DATE EXPIRED: 02/04/2004 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)

Paul R. Haines

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Quality Assurance Manager

EXPIRES 1 FEB 2004

Certificate of Analysis

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

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

010138

Lot Number: **T-PB02110**

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

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

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.051702.JTS

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EXPIRES
1/2003

Certificate of Analysis

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

010139

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

Lot Number: **T-SB02072**

Starting Material:	Antimony Metal	7/12/02
Starting Material Purity:	99.995%	8/01/03
Starting Material Lot No:	E14H25	7/15/02
		3563 F51959

CERTIFIED CONCENTRATION: 993 ± 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: 1001 μg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 993 ± 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): 1.021 g/mL

(over)

QA:KL Rev.031302DN

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Paul R. Haines
Quality Assurance Manager

Expires: EXPIRES 1 2 2003

Certificate of Analysis

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

010140

Catalog Number: CGSE1-1, CGSE1-2 and CGSE1-5

Lot Number: **T-SE01098**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 08/23/02
DATE EXPIRED: 09/01/2003
DATE OPENED: 08/26/02
INORG: 3652 PO: F52042

Starting Material:	Selenium Metal
Starting Material Purity:	99.998%
Starting Material Lot No:	A09C08

CERTIFIED CONCENTRATION: 996 ± 4 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: 1005 μg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 996 ± 4 μg/mL (Average of 2 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3149.

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	<0.04	M	Dy	<0.0006	M	Li	<0.001	M	Pr	<0.00003	M	Te	<0.003
M	Sb	<0.00005	M	Er	<0.0005	M	Lu	<0.00004	M	Re	<0.0001	M	Tb	<0.00003
M	As	0.004	M	Eu	<0.0003	M	Mg	<0.003	M	Rh	<0.0001	M	Tl	<0.0001
M	Ba	<0.001	M	Gd	<0.0001	M	Mn	0.0008	M	Rb	0.0002	M	Th	<0.0001
M	Be	<0.00005	M	Ga	<0.0001	O	Hg	<0.02	M	Ru	<0.0002	M	Tm	<0.00004
M	Bi	<0.00004	M	Ge	<0.0006	M	Mo	0.0024	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	s	Se		M	W	0.0042
O	Ca	<0.01	M	Ho	<0.00005	M	Nb	<0.03	O	Si	<0.02	M	U	<0.0002
M	Ce	<0.0005	M	In	<0.0001	n	Os		M	Ag	<0.0002	M	V	0.0012
M	Cs	<0.00003	M	Ir	<0.0005	M	Pd	<0.0005	O	Na	<0.09	M	Yb	<0.0001
M	Cr	<0.0005	O	Fe	<0.05	O	P	<0.05	M	Sr	<0.00005	M	Y	<0.004
M	Co	<0.0003	M	La	<0.00005	M	Pt	<0.0002	n	S		M	Zn	0.0032
M	Cu	0.0035	M	Pb	<0.0003	M	K	<0.02	M	Ta	<0.0007	M	Zr	<0.004

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

QA:KSL Rev.032502DN

(over)

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Paul R. Haines
Quality Assurance Manager

EXPIRES 1 92003

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

010141

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

010142

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)

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Quality Assurance Manager

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

01014

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

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

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

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EXPIRES
1 MAR 2004

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 μg/mL Phosphorus in H_2O

Catalog Number: CGP1-1, CGP1-2 and CGP1-5

010111

Lot Number: **T-P01118**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/09/03
DATE EXPIRED: 03/01/2004 DR
DATE OPENED: 01/10/03
INORG: 3901 PO: F52071

Starting Material:	Phosphoric Acid
Starting Material Purity:	99.999%
Starting Material Lot No:	J18804

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

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Quality Assurance Manager

EXPIRES 1 FEB 2004

Certificate of Analysis

010145

CUSTOM-GRADE SOLUTION 1000 μg/mL Silicon in H_2O tr HNO_3 tr HF

Catalog Number: CGSI1-1, CGSI1-2, and CGSI1-5

This standard should not be prepared or stored in glass.

Lot Number: **T-SI02076**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 6/19/02
DATE EXPIRED: 7/01/2003
DATE OPENED: 6/19/02
INORG: 3500 PO: E51941

Starting Material:	SiO_2
Starting Material Purity:	99.999%
Starting Material Lot No:	C05310C

CERTIFIED CONCENTRATION: 996 ± 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: 996 ± 3 μg/mL (Average of 2 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3150.

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	0.030	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	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	<0.00010	M	Sn	<0.00050
n	B		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	i	Se		M	W	<0.0010
O	Ca	<0.010	M	Ho	<0.000050	M	Nb	<0.000050	s	Si		M	U	<0.00020
M	Ce	<0.00050	O	In	<0.070	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	i	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	<0.0020
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): 1.002 g/mL

QA:KL Rev.031202/TS

(over)

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Paul R. Haines
Quality Assurance Manager

EXPIRES 1/2003

Certificate of Analysis

010146

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 JR
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.080502DN

(over)

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EXPIRES 1 Dec 2003

Certificate of Analysis

010147

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

Catalog Number: CGSR1-1, CGSR1-2 and CGSR1-5

Lot Number: **S-SR01118**

		7/12/02
		8/01/2003
Starting Material:	$SrCO_3$	7/15/02
Starting Material Purity:	99.998%	3566 F51959
Starting Material Lot No:	22593	

CERTIFIED VALUE: 997 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: 997 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: 996 µg/mL

Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3153a

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	<0.0009	M	Dy	<0.0006	M	Li	<0.001	M	Pr	<0.00003	M	Te	<0.003
M	Sb	0.0006	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	<0.003	M	Rh	i	M	Tl	0.0001
M	Ba	0.05	M	Gd	<0.0001	M	Mn	<0.0004	n	Rb		M	Th	<0.0001
M	Be	<0.00005	M	Ga	<0.0001	O	Hg	<0.02	M	Ru	<0.0002	M	Tm	<0.00004
M	Bi	0.00038	M	Ge	<0.0006	O	Mo	<0.03	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	i	O	Se	<0.4	M	W	<0.001
O	Ca	<0.01	M	Ho	<0.00005	n	Nb		O	Si	<0.02	M	U	<0.0002
M	Ce	<0.0005	O	In	<0.03	n	Os		M	Ag	0.0004	M	V	<0.0002
M	Cs	<0.00003	M	Ir	<0.0005	M	Pd	i	O	Na	<0.09	M	Yb	<0.0001
M	Cr	0.0015	O	Fe	<0.05	O	P	i	s	Sr		n	Y	
M	Co	<0.0003	M	La	0.00005	M	Pt	<0.0002	n	S		M	Zn	0.013
O	Cu	<0.04	M	Pb	<0.0003	n	K		n	Ta		n	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:JF Rev.062101KSL

(over)

Inorganic Ventures, Inc.

195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701

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

Technical Support: 800-569-6799

Paul R. Haines

Quality Assurance Manager

EXPIRES 1/2003

Certificate of Analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Tin in H_2O tr. HF tr. HNO_3

010148

Catalog Number: CGSN1-1, CGSN1-2, and CGSN1-5

This standard should **not** be prepared or stored in glass.

Lot Number: **T-SN01105**

Starting Material:	Tin Metal	7/3/02
Starting Material Purity:	99.999%	7/1/2003
Starting Material Lot No:	H12H17	7/3/02
		3552 F51952

CERTIFIED CONCENTRATION: 1008 ± 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.

Calculated Value: 1000 µg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 1008 ± 5 µg/mL (Average of 2 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3161.

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	<0.00060	O	Li	<0.000020	M	Pr	<0.000030	O	Te	<0.030
O	Sb	<0.0080	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	O	Rh	<0.050	M	Tl	<0.00010
O	Ba	<0.000080	M	Gd	<0.00010	O	Mn	<0.00020	M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	O	Hg	<0.060	M	Ru	<0.00020	M	Tm	<0.000040
O	Bi	<0.050	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	s	Sn	
O	B	<0.0020	O	Au	<0.0020	M	Nd	<0.00020	O	Sc	<0.00020	M	Ti	<0.0050
O	Cd	<0.0020	M	Hf	<0.00020	O	Ni	<0.0090	O	Se	<0.50	M	W	<0.0010
O	Ca	<0.00080	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.020	M	U	<0.00020
O	Ce	<0.0030	O	In	<0.020	n	Os		O	Ag	<0.050	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	0.0011	M	Yb	<0.00010
O	Cr	<0.0020	O	Fe	<0.050	O	P	<0.030	M	Sr	<0.000050	M	Y	<0.0040
O	Co	<0.0040	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	<0.0020
M	Cu	<0.00060	M	Pb	<0.00030	O	K	<0.0060	M	Ta	<0.00070	O	Zr	<0.0020

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:KSL Rev.022102DN

(over)

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

Paul R. Haines
Quality Assurance Manager

EXPIRES 1/2003

Certificate of Analysis

CUSTOM-GRADE SOLUTION

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

010149

Catalog Number: CGBI1-1 and CGBI1-5

Lot Number: **T-BI01087**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 8/1/02
DATE EXPIRED: 8/1/2013
DATE OPENED: 8/1/02
INORG: 3606 PO: F52013

Starting Material:	Bismuth Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	L13D09

CERTIFIED CONCENTRATION: 996 ± 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: 1001 μg/mL
Method: Calculated, based on starting material.

Instrument Analysis: 996 ± 3 μg/mL (Average of 2 runs)
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3106.

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	<0.020	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	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	O	Hg	<0.15	M	Ru	<0.00020	M	Tm	<0.000040
s	Bi		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	<0.010	O	Se	<0.20	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		M	Ag	<0.00020	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	0.0020	O	Na	<0.050	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.020	O	P	<0.050	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	<0.0020
M	Cu	<0.00060	M	Pb	0.020	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): 1.027 g/mL

QA:KL Rev.031402DN

(over)

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

Paul R. Haines
Quality Assurance Manager

EXPIRES 1/2003

SPEXertificate™ 010150

Certificate of Reference Material

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 08/01/02
DATE EXPIRED: 07/30/2003
DATE OPENED: 08/03/02
INORG: 3607 PO: F521011

Catalog Number: ICMIX2-100 **Lot No.:** 22-131AS
Description: **IC Instrument Check Standard 2**
Matrix: H_2O

This **ASSURANCE** ®certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single ion concentrates of individual elements using Class A laboratory ware to give precise concentration.
Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ION Chromatography:

Analyte	Labeled (mg/L)	Measured (mg/L)	NIST SRM
F^-	100	101	3183
Cl^-	200	199	3182
Br^-	400	395	3184
NO_3^-	400	403	3185
HPO_4^{-2}	600	591	3186
SO_4^{-2}	400	401	3181

Spex Reference Multi: Lot #IC6-77VY

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: JUL -- '02 Certifying Officer: N. Kocherlakota

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ALDRICH®

1001 West St. Paul Ave.
Milwaukee, WI 53233 USA
Tel. 800.558.9160 • 414.273.3850
Fax 800.962.9591 • 414.273.4979
e-mail aldrich@sial.com

Certificate of Analysis

PO NBR: 1306586

010151

SOUTHWEST RESEARCH INST
DARRY RAMIREZ
6220 CULEBRA RD
SAN ANTONIO TX 78238

1/9/2001
1/9/2002 DR
1/9/2001
2636 1306586

PRODUCT NUMBER: 236527-500G

LOT NUMBER: 15308EI

PRODUCT NAME: SODIUM HYDROGENCARBONATE, 99.7+%, A.C.S. REAGENT

FORMULA: NAHCO3

FORMULA WEIGHT: 84.01

APPEARANCE	WHITE POWDER
TITRATION	100.3 % (WITH HCL)
ICP ASSAY	CONFIRMS SODIUM COMPONENT
INSOLUBLE MATTER	0.001% *
CALCIUM	0.0050%
CHLORIDE	0.0014% *
IRON	< 0.0001% *
HEAVY METALS	<5PPM (AS PB) *
POTASSIUM	<0.0020 % *
MAGNESIUM	0.00025%
AMMONIUM	<5PPM *
PHOSPHATE	<0.001% *
CALCIUM, MAGNESIUM & R2O3 PRECIPITATE	0.016% *

CONTINUED ON NEXT PAGE

ALDRICH CHEMICAL COMPANY
DAVID SWESSEL
JANUARY 5, 2001

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Certificate of Analysis

SOUTHWEST RESEARCH INST
DARRY RAMIREZ
6220 CULEBRA RD
SAN ANTONIO TX 78238

PO NBR: 1306866

1/9/2001 22
1/9/2001 DK
1/9/2001
2635 1306866

PRODUCT NUMBER: 223484-500G

LOT NUMBER: 08915PU

PRODUCT NAME: SODIUM CARBONATE, 99.95-100.05%, A.C.S. PRIMARY STANDARD

FORMULA: NA2CO3

FORMULA WEIGHT: 105.99

APPEARANCE	WHITE GRANULAR POWDER
TITRATION	100.01% (WITH HCL)
LOSS ON DRYING	0.08% (285 DEGREES CELSIUS) *
ICP ASSAY	CONFIRMS SODIUM COMPONENT
INSOLUBLE MATTER	<0.002% (10%, H2O) *
AMMONIUM HYDROXIDE PRECIPITATE	0.008% *
CHLORIDE	0.0007% *
IRON	2 PPM *
HEAVY METALS	3PPM (AS PB) *
POTASSIUM	0.0004% *
MAGNESIUM AND CALCIUM PRECIPITATE	0.006% *
NITROGEN COMPOUNDS	0.0007% *
PHOSPHATE	0.0006% *

CONTINUED ON NEXT PAGE

ALDRICH CHEMICAL COMPANY
DAVID SWESSEL
JANUARY 5, 2001

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FISHER SCIENTIFIC CHEMICAL DIVISION
One Reagent Lane, Fair Lawn, NJ 07410

010153

ANALYTICAL CONTROL LABORATORY ANALYSIS

Name & Grade:
SODIUM NITRITE, A.C.S.
Catalog Number: S347
Lot Number: 934669
P.O./ Other Customer ID:

Date of Testing/Mfg: 08/17/93

This is to certify that units of the above mentioned lot number were tested and found to comply with the specifications of the grade listed. The following are the actual analytical results obtained:

Test	Unit	Result
APPEARANCE	PASS/FAIL	PASS-YELLOW WHITE CRYSTALS
ASSAY	%	99.8000
CALCIUM IN %	%	0.0020
CHLORIDE	%	0.0010
HEAVY METALS	%	0.0002
IDENTIFICATION		PASS
INSOLUBLE MATTER	%	0.0020
IRON	%	0.00020
POTASSIUM	%	0.00100
SULFATE (SO4)	%	0.0020

Approved by: Frederick H. Turk, FL Analytical QA Supv. or Edgar E. Hess, BPF Analytical QA Supv.

Date: 08/25/93 (Signed and dated original is on file)

NOTE: The data listed is valid for all package sizes of this lot of product, expressed as a extension of the catalog number listed above. If there are any questions with this certificate, please call Steven P. Davis, Analytical QA Manager, at (201) 703-3149.

Ref. No. S347..934669.B1.

Location: FL

010154

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030306-12
SRR: 23945
SDG: 221526
CASE: Division 20
VTSR: MARCH 06, 2003
PROJECT#: 06002.01.081

Pipette Calibrations

Book/page: 02 023

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

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

010155

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

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	20	0.0199	0.0202	0.0201	0.020	100.33
ADJ200-A	100	0.1022	0.0998	0.0999	0.101	100.63
28	200	0.1996	0.2015	0.2015	0.201	100.43
	20					
ADJ200-B	100	Out of Tolerance - 20uL too low				
28	200					
	20	0.0198	0.0199	0.0199	0.020	99.33
ADJ200-C	100	0.0980	0.0988	0.0898	0.096	95.53
34	200	0.1981	0.1982	0.1988	0.198	99.18
	20	0.0201	0.0205	0.0202	0.020	101.33
ADJ200-D	100	0.0995	0.0997	0.0997	0.100	99.63
29	200	0.1999	0.1997	0.2003	0.200	99.98
	20	0.0199	0.0198	0.0200	0.020	99.50
ADJ200-E	100	0.0996	0.0997	0.0999	0.100	99.73
30	200	0.1981	0.1985	0.1986	0.198	99.20
	20	0.0198	0.0197	0.0198	0.020	98.83
ADJ200-G	100	0.0999	0.0998	0.1001	0.100	99.93
29	200	0.2006	0.2003	0.2001	0.200	100.17
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					

FRM-247a (Rev 1/Sept 02)

Book/page: 02 024

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16 Thermometer #: G011 diH20 Temperature (C) ~~OK~~ 0156

20 µL – 200 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
ADJ200-A	20	0.0199	0.0202	0.0201
	100	0.1022	0.0998	0.0999
	200	0.1996	0.2015	0.2015
ADJ200-B	20			
	100	Out of Service		
	200			
ADJ200-C	20	0.0198	0.0199	0.0199
	100	0.0980	0.0988	0.0989
	200	0.1981	0.1982	0.1988
ADJ200-D	20	0.0201	0.0205	0.0202
	100	0.0995	0.0997	0.0997
	200	0.1999	0.1997	0.2003
ADJ200-E	20	0.0199	0.0198	0.0200
	100	0.0996	0.0997	0.0999
	200	0.1981	~~0.0~~ 0.1985	0.1986
ADJ200-G	20	0.0198	0.0197	0.0198
	100	0.0999	0.0998	0.1001
	200	0.2006	0.2003	0.2001
ADJ200	20			
	100			
	200			
ADJ200	20			
	100			
	200			
ADJ20	20			
	100			
	200			

12-16-02

Analyst: [signature]

Reviewed by: Laura Navarro

Date: 12-16-02

Date: 1/7/03

Book/page: 02 073

010157

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

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

L.Navarro (2/27/02)

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	0.0998	0.0998	0.0993	0.100	99.63
ADJ1000-C	500	0.4930	0.4980	0.4921	0.494	98.87
34	1000	0.9890	0.9930	0.9971	0.993	99.30
	100	0.0985	0.0999	0.0986	0.099	99.00
ADJ1000-D	500	0.4994	0.4961	0.4966	0.497	99.47
29	1000	0.9937	0.9924	0.9968	0.994	99.43
	100	0.0980	0.0995	0.0998	0.099	99.10
ADJ1000-E	500	0.4922	0.4925	0.4929	0.493	98.51
27/28	1000	0.9845	0.9848	0.9867	0.985	98.53
	100	0.0989	0.0981	0.0977	0.098	98.23
ADJ1000-F	500	0.4960	0.4952	0.4943	0.495	99.03
30	1000	0.9939	0.9945	0.9937	0.994	99.40
	100	0.0999	0.0997	0.0984	0.099	99.33
ADJ1000-G	500	0.4957	0.4982	0.4937	0.496	99.17
27/28	1000	0.9977	0.9970	0.9947	0.996	99.65
	100					
ADJ1000-H	500	couldn't be located				
	1000					
	100					
ADJ1000	500					
	1000					
	100					
ADJ1000	500					
	1000					
	100					
ADJ1000	500					
	1000					

FRM-247b (Rev 1/Sept 02)

Book/page: 02 074

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34 Thermometer #: G-011 diH20 Temperature (C) 22 010158

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100	0.0998	0.0978	0.0993
ADJ1000-C	500	0.4930	0.4980	0.4921
34	1000	0.9890	0.9930	0.9971
	100	0.0985	0.0999	0.0986
ADJ1000-D	500	0.4994	0.4961	0.4966
29	1000	0.9937	0.9924	0.9968
	100	0.0980	0.0995	0.0998
ADJ1000-E	500	0.4922	0.4925	0.4929
27/28	1000	0.9845	0.9848	0.9851
	100	0.0959	0.0981	0.0977
ADJ1000-F	500	0.4960	0.4952	0.4943
30	1000	0.9939	0.9945	0.9937
	100	0.0999	0.0997	0.0984
ADJ1000-G	500	0.4957	0.4982	0.4937
27/28	1000	0.9977	0.9970	0.9947
	100			
ADJ1000-H	500	Couldn't be located		
	1000			11/12/20/02
	100			
ADJ1000	500			
	1000			
	100			
ADJ1000	500			
	1000			
	100			
ADJ1000	500			
	1000			

Analyst: Laura Navasso Date: 12/10/02

Reviewed by: [illegible] Date: 1-7-03

Book/page: 02 075

010159

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

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

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

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100	0.1001	0.1011	0.1004	0.101	100.53
ADJ1000-C	500	0.4967	0.4970	0.4966	0.497	99.35
34	1000	0.9888	0.9888	0.9887	0.989	98.88
	100					
ADJ1000-D	500					
30	1000					
	100	0.1003	0.1002	0.1002	0.100	100.23
ADJ1000-E	500	0.4934	0.4938	0.4974	0.495	98.97
27	1000	0.9963	0.9969	0.9968	0.997	99.67
	100	0.1008	0.1007	0.1005	0.101	100.67
ADJ1000-F	500	0.5008	0.4944	0.4934	0.496	99.24
28	1000	0.9944	0.9920	0.9922	0.993	99.29
	100	0.0991	0.0996	0.0993	0.099	99.33
ADJ1000-G	500	0.4982	0.4983	0.4980	0.498	99.63
28	1000	0.9888	0.9885	0.9881	0.988	98.85
	100	0.0993	0.1000	0.1000	0.100	99.77
ADJ1000-H	500	0.4946	0.4948	0.4945	0.495	98.93
29	1000	0.9911	0.9915	0.9912	0.991	99.13
	100					
ADJ1000	500					
	1000					
	100					
ADJ1000	500					
	1000					
	100					
ADJ1000	500					
	1000					

FRM-247b (Rev 1/Sept 02)

Book/page: 02 076

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

010160

Balance #: 16 Thermometer #: G011 diH20 Temperature (C) 21

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100	0.1001	0.1004	0.1004
ADJ1000-C	500	0.4967	0.4970	0.4966
	1000	0.9888	0.9888	0.9887
	100			
ADJ1000-D	500	Could not located		
	1000			
	100	0.1003	0.1002	0.1002
ADJ1000-E	500	0.4934	0.4938	0.4974
	1000	0.9963	0.9969	0.9968
	100	0.1008	0.1007	0.1005
ADJ1000-F	500	0.5008	0.4944	0.4934
	1000	0.9944	0.9920	0.9922
	100	0.0991	0.0996	0.0993
ADJ1000-G	500	0.4982	0.4983	0.4980
	1000	0.9888	0.9885	0.9881
	100	0.0993	0.1000	0.1000
ADJ1000-H	500	0.4946	0.4948	0.4945
	1000	0.9911	0.9915	0.9912
	100			
ADJ1000	500			
	1000			
	100			
ADJ1000	500			
	1000			
	100			
ADJ1000	500			
	1000			

12-16-02

Analyst: Date: 12-16-02

Reviewed by: Dawn Navarro Date: 1/7/03

Book/page: 02 077

010161

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

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

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

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100	0.0998	0.1001	0.1000	0.100	99.97
ADJ1000-C	500	0.4862	0.4882	0.4881	0.488	97.50 X
	1000	0.9956	0.9898	0.9919	0.992	99.24
	100	0.1012	0.0996	0.0995	0.100	100.10
ADJ1000-D	500	0.4921	0.4966	0.4949	0.495	98.91
	1000	0.9896	0.9871	0.9863	0.988	98.77
	100	0.1001	0.1005	0.1002	0.100	100.27
ADJ1000-E	500	0.4939	0.4942	0.4955	0.495	98.91
	1000	0.9862	0.9885	0.9888	0.988	98.78
	100	0.0989	0.0985	0.0987	0.099	98.70
ADJ1000-F	500	0.4960	0.4981	0.4959	0.497	99.33
	1000	0.9936	0.9905	0.9882	0.991	99.08
	100	0.0999	0.0996	0.0998	0.100	99.77
ADJ1000-G	500	0.4945	0.4943	0.4928	0.494	98.77
	1000	0.9999	0.9961	0.9929	0.996	99.63
	100	0.1011	0.0999	0.1001	0.100	100.37
ADJ1000-H	500	0.4918	0.4926	0.4901	0.492	98.30
	1000	0.9858	0.9849	0.9853	0.985	98.53
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000	500				0.000	0.00
	1000				0.000	0.00

FRM-247b (Rev 1/Sept 02)

Book/page: 02 078

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16/34 Thermometer #: G-011 diH20 Temperature (C) 21 010162

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100	0.0998	0.1001	0.1000
ADJ1000-C	500	0.4862	0.4882	0.4881
34	1000	0.9956	0.9898	0.9919
hartlum	100	0.1012	0.0996	0.0995
ADJ1000-D	500	0.4921	0.4966	0.4949
29	1000	0.9896	0.9871	0.9863
	100	0.1001	0.1005	0.1002
ADJ1000-E	500	0.4939	0.4942	0.4955
X	1000	0.9862	0.9885	0.9888
	100	0.0989	0.0985	0.0987
ADJ1000-F	500	0.4960	0.4981	0.4959
30	1000	0.9936	0.9905	0.9882
	100	0.0999	0.0996	0.0998
ADJ1000-G	500	0.4945	0.4943	0.4928
28	1000	0.9999	0.9961	0.9929
	100	0.1011	0.0999	0.1001
ADJ1000-H	500	0.4918	0.4926	0.4901
27 GFAA	1000	~~0.1011~~ 0.9858	0.9849	0.9853
	100			
ADJ1000	500			
	1000			
	100			
ADJ1000	500			
	1000			
	100			
ADJ1000	500			
	1000			

12/27/02

Analyst: Laura Navarro Date: 12/27/02

Reviewed by: [illegible] Date: 1-7-03

Book/page: 02 127

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

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

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

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	500	0.5002	0.5018	0.5011	0.501	100.21
ADJ5000-C	2500	2.5008	2.5055	2.4983	2.502	100.06
27	5000	5.0133	4.9996	4.9983	5.004	100.07
	500					
ADJ5000-E	2500	Drips- won't hold diH2O				
27	5000					
	500	0.5044	0.5036	0.5033	0.504	100.75
ADJ5000-F	2500	2.5025	2.5026	2.5022	2.502	100.10
29	5000	4.9808	4.9920	4.9840	4.986	99.71
	500	0.5003	0.4996	0.4998	0.500	99.98
ADJ5000-G	2500	2.5012	2.4991	2.4992	2.500	99.99
29	5000	5.0194	5.0222	5.0212	5.021	100.42
	500	0.4997	0.4990	0.4996	0.499	99.89
ADJ5000-H	2500	2.5027	2.4989	2.4996	2.500	100.02
34	5000	5.0005	4.9689	4.9877	4.986	99.71
	500	0.5025	0.5005	0.5006	0.501	100.24
ADJ5000-I	2500	2.4938	2.4915	2.4920	2.492	99.70
29	5000	5.0001	4.9978	4.9998	4.999	99.98
	500	0.5093	0.5088	0.5092	0.509	101.82
ADJ5000-J	2500	2.5023	2.5089	2.5066	2.506	100.24
27	5000	5.0263	5.0203	5.0289	5.025	100.50
	500	0.4961	0.4930	0.4956	0.495	98.98
ADJ5000-K	2500	2.4962	2.4984	2.4952	2.497	99.86
30	5000	5.0101	5.0111	5.0102	5.010	100.21
	500	0.5016	0.5022	0.5021	0.502	100.39
ADJ5000-L	2500	2.4949	2.4952	2.4955	2.495	99.81
25	5000	5.0009	5.0076	5.0062	5.005	100.10
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					

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SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16 Thermometer #: G011 diH20 Temperature (C) 21

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500	0.5002	0.5018	0.5011
ADJ5000-C	2500	2.5008	2.5055	2.4983
	5000	5.0133	4.9996	4.9983
	500			
ADJ5000-E	2500	Out of Service		
	5000			
	500	0.5044	0.5036	0.5033
ADJ5000-F	2500	2.5025	2.5026	2.5022
	5000	4.9808	4.9920	4.9940
	500	0.5003	0.4996	0.4998
ADJ5000-G	2500	2.5012	2.4991	2.4992
	5000	5.0194	5.0222	5.0212
	500	0.4997	0.4990	0.4996
ADJ5000-H	2500	2.5027	2.4989	2.4996
	5000	5.0005	4.9689	4.9877
	500	0.5025	0.5005	0.5006
ADJ5000-I	2500	2.4938	2.4915	2.4920
	5000	5.0001	4.9978	4.9998
	500	0.5093	0.5088	0.5092
ADJ5000-J	2500	2.5023	2.5089	2.5066
	5000	5.0263	5.0203	5.0289
	500	0.4961	0.4930	0.4956
ADJ5000-K	2500	2.4962	2.4984	2.4952
	5000	5.0104	5.0111	5.0102
	500	0.5016	0.5022	0.5021
ADJ5000-L	2500	~~2.5~~ 2.4949	2.4952	2.4955
	5000	5.0009	5.0076	5.0062
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

12-16-02

Analyst: [signature] Date: 12-16-02

Reviewed by: Laura Navarro Date: 1/3/03

FRM-244 (c) (Rev 2/Sept 02)

Book/page: 02 149

010165

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

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

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

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	500	0.5057	0.5086	0.5082	0.508	101.50
ADJ5000-C	2500	2.4871	2.4968	2.4887	2.491	99.63
	5000	4.9748	4.9735	4.9876	4.979	99.57
	500					
ADJ5000-E	2500	OUT	OF	SERVICE		
	5000					
	500					
ADJ5000-F	2500	OUT	OF	SERVICE		
	5000					
	500	0.5089	0.5091	0.5094	0.509	101.83
ADJ5000-G	2500	2.5031	2.5048	2.5047	2.504	100.17
	5000	5.0084	5.0414	5.0152	5.022	100.43
	500	0.4928	0.4947	0.5037	0.497	99.41
ADJ5000-H	2500	2.4849	2.4861	2.4859	2.486	99.43
	5000	5.0189	5.0114	4.9984	5.010	100.19
	500	0.5017	0.5052	0.5033	0.503	100.68
ADJ5000-I	2500	2.4972	2.4985	2.4997	2.498	99.94
	5000	5.0383	5.0130	5.0176	5.023	100.46
	500	0.5007	0.5021	0.5011	0.501	100.26
ADJ5000-J	2500	2.4962	2.5008	2.4984	2.498	99.94
	5000	5.0458	5.0200	5.0069	5.024	100.48
	500	0.4988	0.4943	0.4936	0.496	99.11
ADJ5000-K	2500	2.5003	2.4994	2.5084	2.503	100.11
	5000	5.0165	5.0198	5.0090	5.015	100.30
	500	0.4914	0.5043	0.5018	0.499	99.83
ADJ5000-L	2500	2.5031	2.4985	2.4887	2.497	99.87
	5000	4.9921	4.9940	4.8987	4.962	99.23
	500					
ADJ5000	2500					
	5000					
	500			3-8-03		
ADJ5000	2500					
	5000					

FRM-247c (Rev 1/Sept 02)

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SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16 Thermometer #: G011 diH20 Temperature (C) 21

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500	.5057	.5086	.5082
ADJ5000-C	2500	2.4871	2.4968	2.4887
	5000	4.9748	4.9735	4.9876
	500			
ADJ5000-E	2500	OUT	OF	SERVICE
	5000			
	500			
ADJ5000-F	2500	OUT	OF	SERVICE
	5000			
	500	.5089	.5091	.5094
ADJ5000-G	2500	2.5031	2.5048	2.5047
	5000	5.0084	5.0414	5.0152
	500	.4928	.4947	.5037
ADJ5000-H	2500	2.4849	2.4861	2.4859
	5000	5.0189	5.0114	4.9984
	500	.5017	.5052	.5033
ADJ5000-I	2500	2.4972	2.4985	2.4997
	5000	5.0383	5.0130	5.0176
	500	.5007	.5021	.5011
ADJ5000-J	2500	2.4962	2.5008	2.4984
	5000	5.0458	5.0200	5.0069
	500	.4988	.4943	.4936
ADJ5000-K	2500	2.5003	2.4994	2.5084
	5000	5.0165	5.0198	5.0090
	500	.4914	.5043	.5018
ADJ5000-L	2500	2.5031	2.4985	2.4887
	5000	4.9921	4.9940	4.8987
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

Jen 3-8-03

Analyst: John Wilks Date: 3-8-03

Reviewed by: [illegible] Date: 3/11/03

Book/page: 02 097

010167

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

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

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

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100	0.0999	0.0997	0.0992	0.100	99.60
ADJ1000-C	500	0.4928	0.4946	0.4925	0.493	98.66
	1000	1.0039	1.0011	0.9965	1.001	100.05
	100	0.1002	0.1010	0.1005	0.101	100.57
ADJ1000-D	500	0.5018	0.4987	0.4991	0.500	99.97
	1000	0.9937	1.0016	0.9989	0.998	99.81
	100	0.0995	0.0994	0.0994	0.099	99.43
ADJ1000-E	500	0.4989	0.4985	0.4970	0.498	99.63
	1000	0.9984	0.9958	0.9973	0.997	99.72
	100	0.0984	0.0989	0.0980	0.098	98.43
ADJ1000-F	500	0.4945	0.5011	0.4951	0.497	99.38
	1000	0.9976	0.9965	1.0041	0.999	99.94
	100	0.0994	0.1001	0.0996	0.100	99.70
ADJ1000-G	500	0.4948	0.4968	0.4954	0.496	99.13
	1000	0.9934	0.9918	0.9867	0.991	99.06
	100	0.0997	0.0988	0.0986	0.099	99.03
ADJ1000-H	500	0.5011	0.5022	0.5018	0.502	100.34
	1000	1.0000	1.0020	0.9944	0.999	99.88
	100					
ADJ1000	500					
	1000					
	100					
ADJ1000	500					
	1000					
	100					
ADJ1000	500					
	1000					

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SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

010168

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

100 µL – 1000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	100	.0999	.0997	.0992
ADJ1000-C	500	.4928	.4946	.4925
	1000	1.0039	1.0011	.9965
	100	.1002	.1010	.1005
ADJ1000-D	500	.5018	.4987	.4991
	1000	.9937	1.0016	.9989
	100	.0995	.0994	.0994
ADJ1000-E	500	.4989	.4985	.4970
	1000	.9984	.9958	.9973
	100	.0984	.0989	.0980
ADJ1000-F	500	.4945	.5011	.4951
	1000	.9976	.9965	1.0041
	100	.0994	.1001	.0996
ADJ1000-G	500	.4948	.4968	.4954
	1000	.9934	.9918	.9867
	100	.0997	.0988	.0986
ADJ1000-H	500	.5011	.5022	.5018
	1000	1.0000	1.0020	.9944
	100			
ADJ1000	500			
	1000			
	100			
ADJ1000	500			
	1000			
	100			
ADJ1000	500			
	1000			

3-8-03

Analyst: John Wills Date: 3-8-03

Reviewed by: AMS Date: 3/11/03

Book/page: 02 045

010169

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

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

3-8-03

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
	20	0.0201	0.0199	0.0202	0.020	100.33
ADJ200-A	100	0.0994	0.0991	0.0989	0.099	99.13
	200	0.1987	0.1994	0.1993	0.199	99.57
	20					
ADJ200-B	100	Out of Service				
	200					
	20	0.0198	0.0199	0.0198	0.020	99.17
ADJ200-C	100	0.0988	0.0994	0.0991	0.099	99.10
	200	0.1987	0.1990	0.1988	0.199	99.42
	20	0.0202	0.0198	0.0199	0.020	99.83
ADJ200-D	100	0.0991	0.0981	0.0994	0.099	98.87
	200	0.1974	0.1974	0.1975	0.197	98.72
	20	0.0204	0.0198	0.0203	0.020	100.83
ADJ200-E	100	0.0992	0.1012	0.0996	0.100	100.00
	200	0.1984	0.1980	0.1987	0.198	99.18
	20	0.0204	0.0203	0.0202	0.020	101.50
ADJ200-G	100	0.0986	0.0995	0.0983	0.099	98.80
	200	0.1985	0.1986	0.1984	0.199	99.25
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					

FRM-247a (Rev 1/Sept 02)

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

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

	Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
20 µL – 200 µL		20	.0201	.0199	.0202
	ADJ200-A	100	.0994	.0991	.0989
		200	.1987	.1994	.1993
		20			
	ADJ200-B	100	OUT	OF	SERVICE
		200			
		20	.0198	.0199	.0198
	ADJ200-C	100	.0988	.0994	.0991
		200	.1987	.1990	.1988
		20	.0202	.0198	.0199
	ADJ200-D	100	.0991	.0981	.0994
		200	.1974	.1974	.1975
		20	.0204	.0198	.0203
	ADJ200-E	100	.0992	.1012	.0996
		200	.1984	.1980	.1987 gw 3-8-03
		20	.0204	.0203	.0202
	ADJ200-G	100	.0986	.0995	.0983
		200	.1985	.1986	.1984
		20			
	ADJ200	100			
		200			
		20			
	ADJ200	100			
		200			
		20			
	ADJ20	100			
		200			

Analyst: John Wills Date: 3-08-03

Reviewed by: JAMS Date: 3/11/03

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030306-12
SRR: 23945
SDG: 221526
CASE: Division 20
VTSR: MARCH 06, 2003
PROJECT#: 06002.01.081

Balance Calibrations

Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

010171

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
34	28	1116031935	±0.0005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
12-13-02	2.0000	2.0000	[illegible]	SN. J50526-15
12/16/02	2.0000	2.0000	[illegible]	"
12/17/02	2.0000	2.0000	[illegible]	"
12/18/02	2.0000	1.9999	[illegible]	"
12/19/02	2.0000	2.0000	[illegible]	"
12-20-02	2.0000	1.9999	[illegible]	"
12-23-02	2.0000	2.0000	[illegible]	"
12-26-02	2.0000	2.0000	[illegible]	"
12-27-02	2.0000	2.0000	[illegible]	"
12-28-02	2.0000	2.0000	[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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✓ ams
1/15/03

Southwest Research Institute
Division 01

BALANCE VERIFICATION LOG

010172

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
34	28	1116031935	±0.0005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
3/2/03	2.0000	2.0000	LW	SN: 99-J5052615
3-3-03	2.0000	1.9999	JW	"
3/4/03	2.0000	2.0000	LW	"
3/5/03	2.0000	2.0000	LW	"
3-6-03	2.0000	2.0000	JW	"
3-7-03	2.0000	2.0000	JW	"
3/10/03	2.0000	1.9999	LW	"
3-11-03	~~1.9999~~ 2.0000	1.9999	JW	"
		ams		
		3/11/03		

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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✓ ams
3/11/03

010173

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	
12-30-02	2.0000	2.0000	JW	S.N.: 350526-15
12/31/02	2.0000	1.9999	M	"
1-2-03	2.0000	1.9999	JW	"
1/03/03	2.0000	2.0000	M	"
1/06/03	2.0000	2.0000	M	"
1/07/03	2.0000	2.0000	M	"
1-8-03	2.0000	2.0000	JW	"
1-9-03	2.0000	2.0000	JW	"
1-10-03	2.0000	2.0000	JW	"
1/13/03	2.0000	2.0000	M	"

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.

✓ ams 1/15/03

Page # ____13____

FRM-112 (Rev 1/Dec 99)

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 030306-12
SRR: 23945
SDG: 221526
CASE: Division 20
VTSR: MARCH 06, 2003
PROJECT#: 06002.01.081

DI Water Verification

D.I. WATER SYSTEM NOTEBOOK 01 021
METALS LAB
SOUTHWEST RESEARCH INSTITUTE 010174

DATE	INITIALS	READING (M OHMS)	SET PT./ QC LT. Green=OK	CALL FOR Service LT. Green=OK	USAGE (GALS)	COMMENTS
12/16/02	DR	18.0	✓	✓	48534.1	5:35 p.m.
12/17/02	DR	18.0	✓	✓	48546.2	9:25 p.m
12/18/02	DR	18.0	✓	✓	48562.0	5:56 p.m.
12/19/02	DR	18.0	✓	✓	48570.9	6:09 p.m.
12/20/02	DR	18.0	✓	✓	48585.4	6 p.m.
12/23/02	DR	18.0	✓	✓	48595.2	6:21 p.m.
12/26/02	DR	18.0	✓	✓	48601.0	12:25 p.m.
12/27/02	DR	18.0	✓	✓	48617.5	5:35 p.m
12/30/02	DR	18.0	✓	✓	48629.2	6:04 p.m
1-31/03	DR	18.0	✓	✓	48632.0	10:15 p.m
01/02/2003	DR	18.0	✓	✓	48647.9	6:05 p.m [illegible]
01/03/2003	DR	18.0	✓	✓	48661.5	5:50 p.m
01/06/03	DR	18.0	✓	✓	48689.5	6:45 p.m.
01/07/03	DR	18.0	✓	✓	48699.7	6:21 p.m
01/08/03	DR	18.0	✓	✓	48705.8	7:30 p.m
01/09/03	DR	18.0	✓	✓	48735.2	6:38 p.m
01/10/03	DR	18.0	✓	✓	48767.4	6:15 p.m
01/13/03	DR	18.0	✓	✓	48791.6	7:40 p.m
01/14/03	DR	18.0	✓	✓	48814.6	10:55 p.m.
		Reviewed ams 1/15/03				
01/15/03	DR	18.0	✓	✓	48829.0	8:01 p.m
01/16/03	DR	18.0	✓	✓	48838.5	5:20 p.m.
1/17-1/19/03	System could not be checked due to asbestos abatement →					
		Reviewed ams 1/20/03				

D.I. WATER SYSTEM NOTEBOOK 01 022
METALS LAB
SOUTHWEST RESEARCH INSTITUTE

010175

Changed 1/30/03

DATE	INITIALS	READING (M OHMS)	SET PT./ QC LT. Green=OK	CALL FOR Service LT. Green=OK	USAGE (GALS)	COMMENTS
01/21/03	DR	~~48933.2~~ 18.0	01/21/03 ✓	✓	48933.2	6:35 p.m.
01/22/03	DR	~~48944.8~~ 18.0	01/22 ✓	✓	48944.8	7:40 pm (Jury Duty)
01/23/03	DR	18.0	✓	✓	48958.1	7:31 p.m (Jury Duty)
01/27/03	DR	18.0	✓	✓	48987.8	6:15 pm (Jury Duty)
01/28/03	DR	18.0	✓	✓	49009.1	9:07 pm (Jury Duty)
01/29/03	DR	18.0	✓	✓	DR ~~49008~~ 49018.1	7:35 pm (Jury Duty)
01/30/03	DR	18.0	✓	yellow	49019.6	11 a.m. red p.o. [illegible]
01/31/03	DR	18.0	✓	yellow	49034.1	6 pm red P.O.
02/03/03	DR	18.0	✓	yellow	49050.3	7 p.m. red P.O.
02/4/03	DR	18.0	✓	yellow	49056.2	11 A.m. U.S. Filter called. [illegible]
02/5/03	DR	18.0	✓	✓	49083.2	tank Exchange, Backwash [illegible]
02/6/03	DR	18.0	✓	✓	49092.5	7:40 p.m
02/7/03	DR	18.0	✓	✓	49105.6	6:10 p.m.
02/10/03	DR	18.0	✓	✓	49122.4	8:50 p.m.
02/11/03	DR	18.0	✓	✓	49134.1	8:40 p.m
02/12/03	DR	18.0	✓	✓	49145.0	9:42 p.m
2/13/03	DR	18.0	✓	✓	49162.7	7:30 p.m
2/14/03	DR	18.0	✓	✓	49170.2	7:17 p.m
2/17/03	DR	18.0	✓	✓	49176.6	7:50 p.m
2/18/03	DR	18.0	✓	✓	49192.7	11:09 p.m
2/19/03	DR	18.0	✓	✓	49196.1	7:16 p.m
2/20/03	DR	18.0	✓	✓	49203.8	8:10 p.m.
2/21/03	DR	18.0	✓	✓	49208.1	7:41 p.m
2/24/03	DR	18.0	✓	✓	49218.5	5:30 p.m.
2/25/03	DR	18.0	✓	✓	49223.1	4 p.m.
2/27/03	VDJ	18.0	✓	✓	49234.8	9:30 am
2/28/03	VDJ	18.0	✓	✓	49255.3	2:30 pm
		Reviewed 03/03/03 ams				
3/3/03	DR	18.0	✓	✓	49275.4	7 p.m
3/4/03	DR	18.0	✓	✓	49286.9	7:22 pm
3/5/03	DR	18.0	✓	✓	49298.6	6:10 p.m.
3/6/03	DR	18.0	✓	✓	49316.0	6:28 p.m
3/7/03	DR	18.0	✓	✓	49334.7	7:41 p.m
3/10/03	DR	18.0	✓	✓	49349.2	7:27 p.m.
		Reviewed 03/11/03 ams				

D.I. WATER SYSTEM NOTEBOOK 01 021
METALS LAB
SOUTHWEST RESEARCH INSTITUTE 010176

DATE	INITIALS	READING (M OHMS)	SET PT./ QC LT. Green=OK	CALL FOR Service LT. Green=OK	USAGE (GALS)	COMMENTS
12/16/02	DR	18.0	✓	✓	48534.1	5:35 p.m.
12/17/02	DR	18.0	✓	✓	48546.2	9:25 p.m
12/18/02	DR	18.0	✓	✓	48562.0	5:56 p.m.
12/19/02	DR	18.0	✓	✓	48570.9	6:09 p.m.
12/20/02	DR	18.0	✓	✓	48585.4	6 p.m
12/23/02	DR	18.0	✓	✓	48595.2	6:21 p.m
12/26/02	DR	18.0	✓	✓	48601.0	12:05 p.m.
12/27/02	DR	18.0	✓	✓	48617.5	5:35 p.m
12/30/02	DR	18.0	✓	✓	48629.2	6:04 p.m
1/31/03	DR	18.0	✓	✓	48632.0	10:15 p.m
01/02/2003	DR	18.0	✓	✓	48647.9	6:05 p.m [illegible]
01/03/2003	DR	18.0	✓	✓	48661.5	5:50 p.m
01/06/03	DR	18.0	✓	✓	48689.5	6:45 p.m.
01/07/03	DR	18.0	✓	✓	48699.7	6:21 p.m
01/08/03	DR	18.0	✓	✓	48705.8	7:30 p.m
01/09/03	DR	18.0	✓	✓	48735.2	6:38 p.m
01/10/03	DR	18.0	✓	✓	48767.4	6:15 p.m
01/13/03	DR	18.0	✓	✓	48791.6	7:10 p.m
01/14/03	DR	18.0	✓	✓	48814.6	10:55 p.m.
		Reviewed ams 1/15/03				
01/15/03	DR	18.0	✓	✓	48829.0	8:01 p.m
01/16/03	DR	18.0	✓	✓	48838.5	5:20 p.m.
1/17-1/18/03	System could not be checked due to asbestos abatement →					
		Reviewed ams 1/20/03				
	fittings	connecting	MOVEDBED	TANK	WAS DISCON	on 01/18 DR ASBESTOS
Abatement	crew: U.S.	Filter stain	ed fitting	on 01/20, but	made IAN	personnel aware
of a	possible	future problem	with the	water circulating	pump.	due to the problem
fitting	pump could	have run	on Saturday	without it actually	circulate	in water, causing
it to	overheat.	If pump	continues	to rise in	temp, it	could possibly
melt	fittings	connecting it.	told to keep	close eye on it.	DR	01/20/03
01/20/03	DR	18.0	✓	✓	48908.9	12:05 p.m. back on

D.I. WATER SYSTEM NOTEBOOK 01 022
METALS LAB
SOUTHWEST RESEARCH INSTITUTE

010177

Change 11/30/03

DATE	INITIALS	READING (M OHMS)	SET PT./ QC LT. Green=OK	CALL FOR Service LT. Green=OK	USAGE (GALS)	COMMENTS
01/21/03	DR	~~48933.2~~ 18.0	01/21/03 ✓	✓	48933.2	6:35 p.m.
01/22/03	DR	~~48944.8~~ 18.0	01/22 ✓	✓	48944.8	7:40 p.m. (Jury Duty)
01/23/03	DR	18.0	✓	✓	48958.1	7:31 p.m (Jury Duty)
01/27/03	DR	18.0	✓	✓	48987.8	6:15 pm (Jury Duty)
01/28/03	DR	18.0	✓	✓	49009.1	9:07 pm (Jury Duty)
01/29/03	DR	18.0	✓	✓	~~49008~~ 49018.1	7:35 pm (Jury Duty)
01/30/03	DR	18.0	✓	yellow	49019.6	11 a.m. red p.o. red tank U.S. Filter
01/31/03	DR	18.0	✓	yellow	49034.1	6 pm red P.O.
02/03/03	DR	18.0	✓	yellow	49050.3	7 p.m. red P.O.
02/4/03	DR	18.0	✓	yellow	49056.2	11 Am U.S. Filter called. 'on' red
02/5/03	DR	18.0	✓	✓	49083.2	tank exchange. Back online 7
02/6/03	DR	18.0	✓	✓	49092.5	7:40 p.m
02/7/03	DR	18.0	✓	✓	49105.6	8:10 p.m.
02/10/03	DR	18.0	✓	✓	49122.4	8:50 p.m.
02/11/03	DR	18.0	✓	✓	49134.1	8:40 p.m
02/12/03	DR	18.0	✓	✓	49145.0	9:42 p.m
2/13/03	DR	18.0	✓	✓	49162.7	7:30 p.m
2/14/03	DR	18.0	✓	✓	49170.2	7:17 p.m
2/17/03	DR	18.0	✓	✓	49176.6	7:50 p.m
2/18/03	DR	18.0	✓	✓	49192.7	11:09 p.m
2/19/03	DR	18.0	✓	✓	49196.1	7:16 p.m
2/20/03	DR	18.0	✓	✓	49203.8	8:10 p.m.
2/21/03	DR	18.0	✓	✓	49208.1	7:45 p.m
2/24/03	DR	18.6	✓	✓	49218.5	5:30 p.m.
2/25/03	DR	18.0	✓	✓	49223.1	4 p.m.
2/27/03	VDJ	18.0	✓	✓	49234.8	9:30 am
2/28/03	VDJ	18.0	✓	✓	49255.3	2:30 pm
		Reviewed 03/03/03 ams				
3/3/03	DR	18.0	✓	✓	49275.4	7 pm
3/4/03	DR	18.0	✓	✓	49286.9	7:22 pm
3/5/03	DR	18.0	✓	✓	49298.6	6:10 p.m.
3/6/03	DR	18.0	✓	✓	49316.0	6:28 p.m
3/7/03	DR	18.0	✓	✓	49334.7	7:41 p.m
3/10/03	DR	18.0	✓	✓	49349.2	7:27 p.m.
		Reviewed 03/11/03 ams				

D.I. WATER SYSTEM NOTEBOOK
METALS LAB
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01 023

010178

DATE	INITIALS	READING (M OHMS)	SET PT./ QC LT. Green=OK	CALL FOR Service LT. Green=OK	USAGE (GALS)	COMMENTS
3/11/03	DR	18.0	✓	✓	49355.8	6:32 p.m.