010001

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050502-4
SRR: 27541
SDG: 262525
CASE: CNWRA
VTSR: May 02, 2005
PROJECT#: 06002.01.222

FINAL REPORT

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010002

Sample ID
60-0

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 5/2/05

Matrix: Liquid

Project No.: 06002.01.222

Lab System ID: 262525

SRR: 27541

Task Order: 050502-4

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<2.50	2.5
Antimony	<0.500	0.5
Arsenic	<0.250	0.25
Barium	<0.250	0.25
Beryllium	<0.250	0.25
Bismuth	<0.500	0.5
Boron	<1.00	1
Cadmium	<0.250	0.25
Calcium	12.0	2.5
Chromium	<0.250	0.25
Cobalt	<0.250	0.25
Copper	<0.250	0.25
Iron	<2.50	2.5
Lanthanum	<0.250	0.25
Lead	<0.250	0.25
Lithium	<0.250	0.25
Magnesium	<2.50	2.5
Manganese	<0.250	0.25
Molybdenum	<0.250	0.25
Nickel	<0.250	0.25
Palladium	<0.250	0.25
Phosphorus	<1.00	1
Potassium	<12.5	12.5
Selenium	<0.250	0.25
Silicon	<1.00	1
Silver	<0.250	0.25
Sodium	44.0	10
Strontium	<0.250	0.25
Sulfur	6.27	1
Thallium	<0.500	0.5
Thorium	<1.25	1.25
Tin	<0.250	0.25
Titanium	<0.250	0.25
Tungsten	<0.500	0.5
Uranium	<5.00	5
Vanadium	<0.250	0.25
Yttrium	<0.250	0.25
Zinc	<0.250	0.25
Zirconium	<0.250	0.25

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SOUTHWEST RESEARCH INSTITUTE

DUPLICATE SUMMARY

010003

Sample ID
60-0

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 5/2/05

Matrix: Liquid

Project No.: 06002.01.222

Lab System ID: 262525D

SRR: 27541

Task Order: 050502-4

Analysis	Original Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Aluminum	<2.50	<2.50	0.00%
Antimony	<0.500	<0.500	0.00%
Arsenic	<0.250	<0.250	0.00%
Barium	<0.250	<0.250	0.00%
Beryllium	<0.250	<0.250	0.00%
Bismuth	<0.500	<0.500	0.00%
Boron	<1.00	<1.00	0.00%
Cadmium	<0.250	<0.250	0.00%
Calcium	12.0	12.1	0.83%
Chromium	<0.250	<0.250	0.00%
Cobalt	<0.250	<0.250	0.00%
Copper	<0.250	<0.250	0.00%
Iron	<2.50	<2.50	0.00%
Lanthanum	<0.250	<0.250	0.00%
Lead	<0.250	<0.250	0.00%
Lithium	<0.250	<0.250	0.00%
Magnesium	<2.50	<2.50	0.00%
Manganese	<0.250	<0.250	0.00%
Molybdenum	<0.250	<0.250	0.00%
Nickel	<0.250	<0.250	0.00%
Palladium	<0.250	<0.250	0.00%
Phosphorus	<1.00	<1.00	0.00%
Potassium	<12.5	<12.5	0.00%
Selenium	<0.250	<0.250	0.00%
Silicon	<1.00	<1.00	0.00%
Silver	<0.250	<0.250	0.00%
Sodium	44.0	41.4	6.09%
Strontium	<0.250	<0.250	0.00%
Sulfur	6.27	6.05	3.57%
Thallium	<0.500	<0.500	0.00%
Thorium	<1.25	<1.25	0.00%
Tin	<0.250	<0.250	0.00%
Titanium	<0.250	<0.250	0.00%
Tungsten	<0.500	<0.500	0.00%
Uranium	<5.00	<5.00	0.00%
Vanadium	<0.250	<0.250	0.00%
Yttrium	<0.250	<0.250	0.00%
Zinc	<0.250	<0.250	0.00%
Zirconium	<0.250	<0.250	0.00%

NA - Not Applicable

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SOUTHWEST RESEARCH INSTITUTE

MATRIX SPIKE SUMMARY

010004

Sample ID
60-0

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 5/2/05

Matrix: Liquid

Project No.: 06002.01.222

Lab System ID: 262525S

SRR: 27541

Task Order: 050502-4

Analysis	Original Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Aluminum	<2.50	99.2	100	99.2%
Antimony	<0.500	24.7	25.0	98.8%
Arsenic	<0.250	102	100	102%
Barium	<0.250	101	100	101%
Beryllium	<0.250	2.53	2.50	101%
Bismuth	NA	NA	NA	NA
Boron	NA	NA	NA	NA
Cadmium	<0.250	2.59	2.50	104%
Calcium	12.0	1060	1000	105%
Chromium	<0.250	10.2	10.0	102%
Cobalt	<0.250	25.7	25.0	103%
Copper	<0.250	12.8	12.5	102%
Iron	<2.50	56.3	50.0	113%
Lanthanum	NA	NA	NA	NA
Lead	<0.250	24.8	25.0	99.2%
Lithium	<0.250	207	200	104%
Magnesium	<2.50	1050	1000	105%
Manganese	<0.250	26.1	25.0	104%
Molybdenum	NA	NA	NA	NA
Nickel	<0.250	24.9	25.0	100%
Palladium	NA	NA	NA	NA
Phosphorus	NA	NA	NA	NA
Potassium	<12.5	1000	1000	100%
Selenium	<0.250	105	100	105%
Silicon	NA	NA	NA	NA
Silver	<0.250	2.51	2.50	100%
Sodium	44.0	1040	1000	99.6%
Strontium	NA	NA	NA	NA
Sulfur	NA	NA	NA	NA
Thallium	<0.500	103	100	103%
Thorium	NA	NA	NA	NA
Tin	NA	NA	NA	NA
Titanium	NA	NA	NA	NA
Tungsten	NA	NA	NA	NA
Uranium	<5.00	NA	NA	NA
Vanadium	<0.250	25.5	25.0	102%
Yttrium	NA	NA	NA	NA
Zinc	<0.250	25.8	25.0	103%
Zirconium	NA	NA	NA	NA

NA - Not Applicable

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SOUTHWEST RESEARCH INSTITUTE

LABORATORY CONTROL SAMPLE

010005

Sample ID
LCSW - E17H1

Lab Name: Southwest Research Institute

Lab Code: SwRI

Matrix: Liquid

Lab System ID: NA

Client: Division 20

Date Received: NA

Project No.: 06002.01.222

SRR: 27541

Task Order: 050502-4

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Aluminum	1.98	2.00	99.0%
Antimony	0.490	0.500	98.0%
Arsenic	2.04	2.00	102.0%
Barium	2.00	2.00	100.0%
Beryllium	0.0504	0.050	100.8%
Bismuth	NA	NA	NA
Boron	NA	NA	NA
Cadmium	0.0517	0.050	103.4%
Calcium	20.8	20.0	104.0%
Chromium	0.202	0.200	101.0%
Cobalt	0.514	0.500	102.8%
Copper	0.253	0.250	101.2%
Iron	1.13	1.00	113.0%
Lanthanum	NA	NA	NA
Lead	0.497	0.500	99.4%
Lithium	4.17	4.00	104.3%
Magnesium	20.7	20.0	103.5%
Manganese	0.520	0.500	104.0%
Molybdenum	NA	NA	NA
Nickel	0.499	0.500	99.8%
Palladium	NA	NA	NA
Phosphorus	NA	NA	NA
Potassium	20.0	20.0	100.0%
Selenium	2.11	2.00	105.5%
Silicon	NA	NA	NA
Silver	0.0509	0.050	101.8%
Sodium	20.0	20.0	100.0%
Strontium	NA	NA	NA
Sulfur	NA	NA	NA
Thallium	2.06	2.00	103.0%
Thorium	NA	NA	NA
Tin	NA	NA	NA
Titanium	NA	NA	NA
Tungsten	NA	NA	NA
Uranium	NA	NA	NA
Vanadium	0.509	0.500	101.8%
Yttrium	NA	NA	NA
Zinc	0.516	0.500	103.2%
Zirconium	NA	NA	NA

NA- Not Applicable

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SOUTHWEST RESEARCH INSTITUTE

BLANK SUMMARY

010006

Sample ID
PBW - E17H1

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Liquid

Project No.: 06002.01.222

Lab System ID: NA

SRR: 27541

Task Order: 050502-4

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.0500	0.05
Antimony	<0.0100	0.01
Arsenic	<0.00500	0.005
Barium	<0.00500	0.005
Beryllium	<0.00500	0.005
Bismuth	<0.0100	0.01
Boron	<0.0200	0.02
Cadmium	<0.00500	0.005
Calcium	<0.0500	0.05
Chromium	<0.00500	0.005
Cobalt	<0.00500	0.005
Copper	<0.00500	0.005
Iron	<0.0500	0.05
Lanthanum	<0.00500	0.005
Lead	<0.00500	0.005
Lithium	<0.00500	0.005
Magnesium	<0.0500	0.05
Manganese	<0.00500	0.005
Molybdenum	<0.00500	0.005
Nickel	<0.00500	0.005
Palladium	<0.00500	0.005
Phosphorus	<0.0200	0.02
Potassium	<0.250	0.25
Selenium	<0.00500	0.005
Silicon	<0.0200	0.02
Silver	<0.00500	0.005
Sodium	<0.200	0.2
Strontium	<0.00500	0.005
Sulfur	<0.0200	0.02
Thallium	<0.0100	0.01
Thorium	<0.0250	0.025
Tin	<0.00500	0.005
Titanium	<0.00500	0.005
Tungsten	<0.0100	0.01
Uranium	<0.100	0.1
Vanadium	<0.00500	0.005
Yttrium	<0.00500	0.005
Zinc	<0.00500	0.005
Zirconium	<0.00500	0.005

NA- Not Applicable

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010007

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 5/2/05

Matrix: Liquid

Project No.: 06002.01.222

Task Order: 050502-4

SRR: 27541

Sample ID	Lab System ID	Iron Result (mg/L)
PBW - E17H2	----	<0.0500
LCSW - E17H2	----	1.13
True Value	----	1.00
Recovery	----	113%
60-1	262526	<2.50
Duplicate result	----	<2.50
RPD	----	0.00%
Spike result	----	57.6
Spike added	----	50.0
Recovery	----	115%
60-2	262527	<2.50
60-3	262528	12.2
60-4	262529	6.82
60-5	262530	8.91

Reporting Limit: 0.0500 mg/L

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SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010008

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 05/02/05

Matrix: Liquid

Project No.: 06002.01.222

Task Order: 050502-4

SRR: 27541

Sample ID	Lab System ID	Silicon Result (mg/L)
PBW - E17H2	----	<0.02
60-1	262526	3.32
Duplicate result	262526	3.31
RPD	262526	0.30%
60-2	262527	5.40
60-3	262528	7.40
60-4	262529	7.96
60-5	262530	11.2

Reporting Limit: 0.02 mg/L

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010009

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050502-4
SRR: 27541
SDG: 262525
CASE: CNWRA
VTSR: May 02, 2005
PROJECT#: 06002.01.222

Task Orders/01-QPP-015

Southwest Research Institute

Laboratory Task Order

TO #: 050502-4 Revision: 2

SDG: 262525
VTSR: 05/02/05
CASE: CNWRA

SRR #'s: 27541
Client(s): Div. 20

Project(s): 06002.01.222
Manager(s): DAMMANN, MIKE
To PM: 06/01/05
To QA: 06/15/05
To Client: 06/29/05 010010

Instructions

DIVISION 20 - CNWRA. 2-WEEK TAT.
SIX samples received on 05/02/05.
Sample 60-0 requires Total ICP Analysis; Samples 60-1 thru 60-5 require IRON by ICP only.
Point of contact is XIHUA HE (x5194) or Brian K. Derby.
Work is 10 CFR 50 Appendix B, 10 CFR Part 21. CONTACT Charlie Butcher (ext. 5928, pager 271-5172) BEFORE STARTING ANY WORK ON THIS TASK ORDER. If Charlie Butcher is not available, contact MARK EHNSTROM (ext. 3530) or JOANN BOYD (ext. 2169)
CONTACT PM WITH ANY ADDITIONAL QUESTIONS.
Rev 1 (JR052505) - TAT changed to 30 day, revised to PM, to QAU and to client dates.
Rev 2 (JR052705) - received call from Xihua He to add Silicon to samples 60-1 thru 60-5.

Documents Related to this task order: 16972[COC 27541]

Test: DIL-DILUTION
Section: METALPREP
Holding: 28 days from CED
Prep, Dilution
Cnt: 6

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
262525		1	Liquid	60-0	02 May 05	30 May 05
262525		2	Liquid	60-0	02 May 05	30 May 05
262526		1	Liquid	60-1	02 May 05	30 May 05
262526		2	Liquid	60-1	02 May 05	30 May 05
262527		1	Liquid	60-2	02 May 05	30 May 05
262528		1	Liquid	60-3	02 May 05	30 May 05
262528		2	Liquid	60-3	02 May 05	30 May 05
262529		1	Liquid	60-4	02 May 05	30 May 05
262529		2	Liquid	60-4	02 May 05	30 May 05
262530		1	Liquid	60-5	02 May 05	30 May 05
262530		2	Liquid	60-5	02 May 05	30 May 05

Test: ICP-6010B
Section: METALS
Holding: 180 days from CED
ICP Method 6010B Total Metals - TOTAL ICP ANALYSIS
Cnt: 1

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
262525		1	Liquid	60-0	02 May 05	29 Oct 05
262525		2	Liquid	60-0	02 May 05	29 Oct 05

Test: ICP-SWRI
Section: METALS
Holding: 180 days from CED
ICP Analysis by SwRI Method - IRON and Silicon ONLY
Cnt: 5

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
262526		1	Liquid	60-1	02 May 05	29 Oct 05
262526		2	Liquid	60-1	02 May 05	29 Oct 05
262527		1	Liquid	60-2	02 May 05	29 Oct 05
262528		1	Liquid	60-3	02 May 05	29 Oct 05
262528		2	Liquid	60-3	02 May 05	29 Oct 05
262529		1	Liquid	60-4	02 May 05	29 Oct 05
262529		2	Liquid	60-4	02 May 05	29 Oct 05
262530		1	Liquid	60-5	02 May 05	29 Oct 05
262530		2	Liquid	60-5	02 May 05	29 Oct 05

ver 5/1/2005

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01-QPP-015
Division 01
Revision 5
June 2004

010011

Document No. 3

Division 01

Chemistry and Chemical
Engineering Division

QUALITY PROJECT PLAN FOR

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

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

010012

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:

JO ANN BOYD Quality Assurance Manager	(210) 522-2169	6/4/04 DATE
REZA KARIMI Director, Department of Analytical and Environmental Chemistry	(210) 522-2412	6/4/04 DATE
MICHAEL G. MACNAUGHTON Vice President, Chemistry and Chemical Engineering Division	(210) 522-5162	6/4/04 DATE
CHRISTOPHER HOBSON Quality Assurance Engineer	(210) 522-5838	6/4/2004 DATE

010013

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

010014

1.0 INTRODUCTION

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

2.0 SCOPE

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

3.0 REFERENCES

3.1 *SwRI Quality System Manual – 2000*

3.2 *10 CFR 50, Appendix B, ASME NQA-1*

3.3 *SwRI Program Quality Plan (PQP-Nuclear), Nuclear Services*

3.4 01-QAP-004, *Quality Assurance Plan for Analytical and Environmental Services*

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

4.1 Indoctrination and Training

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

010015

01 Quality Assurance.

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

4.2 Qualification of Personnel

4.2.1 Testing personnel shall be designated as qualified to perform applicable project activities as specified in **SOP-01-6.2.1**, *Qualification and Training*.

4.2.2 During the performance of each testing process, testing personnel shall have access to the necessary documented procedures, i.e., QPP, QAP, Task Order, Division Quality System Standard Operating Procedures (SOPs), and applicable test/analytical procedures (TAPs) available for ready reference.

4.2.3 Any person who has not performed testing activities associated with any particular method being used for nuclear utilities projects for a period of one year shall be reevaluated prior to the conduct of the test.

4.2.4 Quality Assurance personnel witnessing the testing process for nuclear utilities shall have documented evidence of qualifications maintained by Institute Quality Systems or Division 01 Quality Assurance.

4.3 Design Control

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

4.4 Right of Access

4.4.1 Procurement documents shall provide for access to the suppliers' facilities and records for surveillance, inspection, or audit by SwRI and clients.

4.4.2 Where appropriate, quality clause **Q32** shall be noted on the procurement documents to indicate that right of access for inspection and surveillance of activities associated with the order shall be afforded to SwRI and clients.

4.5 Control of Supplier-Generated Documents

4.5.1 Client documents shall be controlled in accordance with **SOP-01-4.2.1**, *Preparation and Revision of Documented Procedures*. These procedures provide the requirements for the preparation, review, approval, issue, distribution, and revision of documents controlled by the Chemistry and Chemical Engineering Division.

4.5.2 Documents may be controlled as Plans or Work Instructions and shall be accessible through the Division Intranet link, ***Contract Requirements*** as PDF files.

4.5.3 Nationally recognized test methods shall be of the most current issue or as specified in the purchase order. Task orders shall identify the applicable test methods to be used on the nuclear project.

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4.6 Acceptance of Services Only

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

4.7 Commercial Grade Items

4.7.1 Where an item is to be incorporated into a test or deliverable to a client, and that item is not subject to design or specification requirements that are unique to nuclear facilities, used in applications other then nuclear facilities, and procured from the supplier on the specifications set forth in the manufacturers' published product and description, the item shall be considered "commercial grade".

4.7.2 Chemical reagents and standards used for testing purposes shall be ordered to specific chemical grades and certificates of analysis shall be required with each lot.

4.7.3 Controls for procurement planning, supplier selection, supplier performance evaluation, and acceptance of procured items and services other than chemical reagents and standards shall be as identified in **SOP-01-7.4.1**, *Purchasing*, and any referenced document within that procedure.

4.7.4 Receipt inspection of chemical reagents, standards, and test items for use on nuclear safety-related projects shall be performed by department personnel and documented on the *SwRI Receipt Traveler* or **FRM-109**, *Item Receipt Report*, as specified in **SOP-01-8.2.4**, *Monitoring and Measurement*. Any discrepancy such as a damaged container or container label shall be documented on the form and the client shall be contacted for disposition.

4.7.5 Prior or acceptance of a commercial grade item, the receipt inspection shall determine the following:

(a) Damage was not sustained during shipment;

(b) The item has satisfied the specified acceptance criteria; and

(c) Specified documentation, as applicable to the item, was received and is acceptable.

4.7.6 Receipt inspection of chemical reagents and standards shall also consist of verification of chemical type, grade, container integrity, certificate of analysis, and shelf life, where applicable. Upon acceptance of chemical reagents and standards, the containers shall be labeled with the following:

(a) Chemical name;

(b) Chemical grade;

(c) Lot code;

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(d) Date received; and

(e) Shelf life, when applicable.

4.7.7 Expired shelf life items shall not be used for testing purposes.

4.7.8 Lot codes of chemical reagents and standards used during equipment standardization and testing shall be recorded on the individual testing data sheets to provide traceability.

4.7.9 Samples supplied to SwRI for testing shall be received by the Sample Custodian and logged into the laboratory logbook. Sample documentation and sample custody shall be maintained in accordance with **TAP-01-0407-001**, *Sample Receipt Inspection*, and **TAP-01-0407-035**, *Organic and Inorganic Sample Security*.

4.7.10 Samples supplied to SwRI for testing shall be labeled with the following:

(a) Sample control number;

(b) Purchase order number;

(c) Purchase order line item number, as applicable;

(d) Task order number;

(e) Nuclear QA label; and

(f) Sample retention date, when applicable.

4.7.11 In the event that samples are damaged upon receipt, a ***Sample Discrepancy Record*** shall be generated from the Division Intranet.

4.7.12 The testing task order shall list the project number, tests required, test methods required, and shall be labeled *Nuclear Quality*.

4.7.13 Identification and traceability shall be maintained in accordance with **SOP-01-7.5.1**, *Item Identification and Traceability*.

010018

4.8 Inspection

4.8.1 Inspection for acceptance shall be performed by qualified persons other than those who conduct or directly supervise the work being inspected.

4.8.2 Institute Quality System (IQS) personnel shall perform surveillance activities as required to ensure compliance with the contract and this Quality Project Plan. Specific areas in which IQS may perform surveillance activities include, but are not limited to, the following:

(a) Receiving inspection and labeling of chemical reagents, standards, and testing samples;

(b) Testing processes;

(c) Calibration and major equipment;

(d) Sample and record retention; and

(e) Test records.

4.9 Inspection and Testing

4.9.1 Required tests for acceptance shall be conducted under appropriate environmental conditions using the tools and equipment necessary to conduct the test in a manner to fulfill test requirements and acceptance criteria.

4.9.2 Tests shall be conducted, controlled, and verified in accordance with **SOP-01-8.2.4**, *Monitoring and Measurement.*

4.9.3 Controls for measuring and test equipment shall be as specified in **SOP-01-7.6.1**, *Control of Measuring and Test Equipment.*

4.9.4 Controls for identification, segregation, reporting, and resolution of nonconforming items and conditions shall be as specified in **SOP-01-8.3.1**, *Nonconformance Reporting.*

4.10 Handling, Storage, Packaging, Preservation, and Delivery

4.10.1 Controls for handling, storage, packaging, preservation, and delivery of items are identified in **SOP-01-7.5.3**, *Handling, Storage, Packaging, Protection, and Delivery of Items.*

4.10.2 Samples specified on the purchase order to be returned to the client shall be prepared and packaged as specified on the purchase order. Each package shall be marked legibly and indelibly with the purchase order/release number and line item number(s) relevant to the package.

4.11 Quality Assurance Records

010019

4.11.1 Quality assurance records shall furnish documentary evidence that items or activities meet specified quality requirements. Documents that ensure this evidence include **TAP-01-0407-014**, *Inventory of Case File Purges*, and **SOP-01-4.2.4**, *Storage and Maintenance of Quality Records*. These documents and this QPP ensure that QA records shall be legible, identifiable, retrievable, and maintained in dual storage.

4.11.2 Records shall be traceable to associated items and activities and shall accurately reflect the work accomplished or information required.

4.11.3 Documents shall be considered valid records only if stamped, initialed or signed and dated by authorized personnel or otherwise authenticated.

4.11.4 Records of test analyses performed by the Department of Analytical and Environmental Chemistry are classified as *nonpermanent* and shall be retained for a minimum of five years. Nonpermanent records are those required to show evidence that an activity was performed in accordance with the applicable requirements, but need not be retained for the life of the item. Based on the use of the final data, the client shall be responsible for determining and implementing permanent storage requirements.

4.11.5 In order to satisfy duplicate storage requirements, one copy of the QA record shall maintained by the Project Manager in Building 70 and a separate copy shall be maintained in the Division Quality Assurance Archives in Building 201. Storage requirements shall be as stated in **SOP-01-4.2.4**, *Storage and Maintenance of Quality Records*, to ensure protection against the risk of damage or destruction.

4.12 10 CFR, Part 21

4.12.1 SwRI procurement documents shall include requirements for reporting and approving disposition of supplier nonconformances and, when required, compliance to 10 CFR, Part 21.

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

4.13 Certified Test Report

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

010020

order/release line item number.

4.14 Valid Documents List

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

5.0 HISTORY OF REVISIONS

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

Revision 4
Title of document changed from the Standard Project Quality Plan *SPQP-CH/AN* to Quality Project Plan, *QPP-015*
Extensive revision to comply with Project Quality Plan PQP-Nuclear, *Nuclear Services*, which replaces SwRI NQAPM, *Nuclear Quality Assurance Program Manual.*

Revision 5
Revised 4.1.1 to include designated Division 01 QA staff to conduct pertinent nuclear training sessions to the SwRI Program Quality Plan (PQP-Nuclear), *Nuclear Services*
Revised step 4.2.4 to include Division QA as an entity along with IQS, to maintain documented evidence of qualifications

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050502-4
SRR: 27541
SDG: 262525
CASE: CNWRA
VTSR: May 02, 2005
PROJECT#: 06002.01.222

010021

Chain of Custody/Login Paperwork

16972

SAMPLE LIST/CHAIN OF CUSTODY

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

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

Shipper Name/Address:

Client: Div 20 Xihua He X 5194

Client Purchase Order/Other ID: CNWRA

Site/Zone ID:

SwRI Contact: Xihua He X 5194

Analyses Requested

Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Total ICP Analysis	ICP Analysis Fe Only
60-0	5/2/04	10:00	L		2	✓	
60-1	↓	↓	↓		2		✓
60-2					1		✓
60-3					2		✓
60-4					2		✓
60-5					2		✓

REMARKS
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)

QA Nuke

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

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

Temp: 22.0°C Therm #: 027

Comments: Rush Intact

Relinquished by (Print/Signature)	Date	Time
Brian K. Derby	5/2/05	10:20
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time
Received by (Print/Signature)	Date	Time
Relinquished by (Print/Signature)	Date	Time

SwRI Project#: 20.06002.01.222

Received by SwRI Lab: (Signature)

Date: 5/2/05 Time: 10:30

Samples Disposed: Date: Time:

Samples Disposed by:

SRP# 27541 01 0022

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

Southwest Research Institute

Traffic Report

Sample Custodian Signature: _____

Project: 06002.01-222 010023

Case: CNWRA / SDG: _____

Airbill: HAND DELIVERED

Sample Receipt: 27541

1. Custody Seal — Not Present or Damaged
2. Chain of Custody — Present
3. Sample Tags — Not Present
   Sample Tag Numbers — Not on COC
4. SMO Forms — Not Present

Date Received	Time Received	COC Record	SMO Sample #	Corresponding		Traffic Rpt, Tags, COC Agree	Sample Condition
				Sample Tag #	SwRI #		
05/02/05	10:30:00	SwRI COC	60-0	None	262525	YES	Intact
05/02/05	10:30:00	SwRI COC	60-1	None	262526	YES	Intact
05/02/05	10:30:00	SwRI COC	60-2	None	262527	YES	Intact
05/02/05	10:30:00	SwRI COC	60-3	None	262528	YES	Intact
05/02/05	10:30:00	SwRI COC	60-4	None	262529	YES	Intact
05/02/05	10:30:00	SwRI COC	60-5	None	262530	YES	Intact

Client: Div. 20

WO: 27541

FRM-217

SAMPLE LOG-IN SHEET

010024

Lab Name: Southwest Research Institute

Page 1 of 1

Received By (Print Name): DINO ROMAN

Log-in Date: 05/02/2005

Received By (Signature)

Case Number: CNWRA

Sample Delivery Group No.

SAS Number: N/A

Remarks: 06002.01.222

1.	Custody Seal(s)	Present/~~Absent~~/ Intact/Broken	EPA Sample #	Corresponding Sample Tag #	Corresponding Assigned Lab #	Remarks: Condition of Sample Shipment, etc
2.	Custody Seal Nos.	N/A	60-0	None	262525	Intact
3.	Chain-of Custody Records	Present/Absent*	60-1	None	262526	Intact
4.	Traffic Reports or Packing Lists	Present/Absent*	60-2	None	262527	Intact
5.	Airbill	Airbill/Sticker Present/Absent*	60-3	None	262528	Intact
6.	Airbill No.	HAND DELIVERED	60-4	None	262529	Intact
7.	Sample Tags	Present/Absent*	60-5	None	262530	Intact
	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	05/02/2005				
12.	Time Received	10:30:00				

Sample Transfer

Fraction: Inorg	Fraction
Area #: Inorg. Lab.	Area #
By: DINO ROMAN	By
On: 05/02/2005	On

05.02.2005

* Contact SMO and attach record of resolution

Reviewed By: Cynthia Smallcomb

Date: 05.02.2005

Logbook No.: Sample Receipt (27541)

Logbook Page No.: 5425 (SECTION 1-2 OF 2)

FORM DC-1

OLMO4.2

SOUTHWEST RESEARCH INSTITUTE 010025
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050502-4
SRR: 27541
SDG: 262525
CASE: CNWRA
VTSR: May 02, 2005
PROJECT#: 06002.01.222

Copies of Login Book

Sample Login Book

May 02, 2005

SwRI Login Area
Division 1

010026

Sample Receipt: 27539	Project: 06657.03.00X	Client: Environmental Pr
VTSR Date: May 02, 2005	VTSR Time: 08:45:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
262500	66135-D	Liquid
262501	66135-T	Liquid
262502	66136-D	Liquid
262503	66136-T	Liquid
262504	66137-D	Liquid
262505	66137-T	Liquid
262506	66138-D	Liquid
262507	66138-T	Liquid
262508	66139-D	Liquid
262511	66139-T	Liquid
262514	66140-D	Liquid
262515	66140-T	Liquid
262516	66141-D	Liquid
262517	66141-T	Liquid
262518	66142-D	Liquid
262519	66142-T	Liquid

Sample Receipt: 27540	Project: 01852.008	Client: NATION'S AG.
VTSR Date: May 02, 2005	VTSR Time: 09:15:00	Manager: SUN, GANG

System ID	Customer Sample ID	Matrix
259045	FXP-1101 Tech. Lot #20041013	Liquid
262520	Paraquat Batch #20050404	Liquid
262521	Paraquat Batch #20050405	Liquid
262522	Paraquat Batch #20050406	Liquid
262523	Paraquat Batch #20050407	Liquid
262524	Paraquat Batch #20050408	Liquid

Sample Receipt: 27541	Project: 06002.01.222	Client: Div. 20
VTSR Date: May 02, 2005	VTSR Time: 10:30:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
262525	60-0	Liquid

Sample Login Book

May 02, 2005

010027

SwRI Login Area
Division 1

Sample Receipt: 27541	Project: 06002.01.222	Client: Div. 20
VTSR Date: May 02, 2005	VTSR Time: 10:30:00	Manager: DAMMANN, MIKE

System ID	Customer Sample ID	Matrix
262526	60-1	Liquid
262527	60-2	Liquid
262528	60-3	Liquid
262529	60-4	Liquid
262530	60-5	Liquid

Number of samples for today: 28

Number of Containers for today: 37

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050502-4
SRR: 27541
SDG: 262525
CASE: CNWRA
VTSR: May 02, 2005
PROJECT#: 06002.01.222

010028

RAW DATA

Div 20
to#050502-4
06002.01.222

5/20/05

5/3/05

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
pbw	K_766	0.250	U		mg/L	0.25				0.25	-0.041521718	-0.0415	1	0.25	-0.041521718	05/17/05	2:41 PM
pbw	Na589	0.200	U		mg/L	0.2				0.2	-0.035802051	-0.0358	1	0.2	-0.035802051	05/17/05	2:41 PM
lcsw-E17H1	K_766	20.0			mg/L	0.25		100.0%	20	0.25	20.02137981	20	1	0.25	20.02137981	05/17/05	2:43 PM
lcsw-E17H1	Na589	20.0			mg/L	0.2		100.0%	20	0.2	19.98886759	20	1	0.2	19.98886759	05/17/05	2:43 PM
262525	K_766	12.5	U		mg/L	12.5				0.25	10.24018151	10.2	1	12.5	0.20480363	05/17/05	2:46 PM
262525	Na589	44.0			mg/L	10				0.2	43.99243397	44	1	10	0.879848679	05/17/05	2:46 PM
262525d	K_766	12.5	U		mg/L	12.5	0.0%			0.25	7.843736583	7.84	1	12.5	0.156874732	05/17/05	2:49 PM
262525d	Na589	41.4			mg/L	10	6.1%			0.2	41.3630987	41.4	1	10	0.827261974	05/17/05	2:49 PM
262525s	K_766	1000			mg/L	12.5		100.0%	1000	0.25	1001.518078	1000	1	12.5	20.03036157	05/17/05	2:55 PM
262525s	Na589	1040			mg/L	10		99.6%	1000	0.2	1038.613747	1040	1	10	20.77227494	05/17/05	2:55 PM

262525 for Na

$$0.8798\ \text{ug/ml} \times \frac{10\text{ml}}{0.2\text{ml}} = 44.0\ \text{mg/L}$$

010029

div20_050502(4)spec

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

☑ 6010B TAP No. 01-0406-130 Rev3/Mar05

☐ Other_____

QC STD. ID's	
CCV	05E02
CRI	
ICSA	
ICSAB	05E02

ICP CAL.STD. ID's	
Std0	05E02
Std1	05E02
Std2	
Std3	
Std4	
Std5	
Std6	

010030

K Li Na

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
06002.01.222	DIV 20	0505024	5-17-05	Liquid	60-013

INSTRUMENT: Spectro FILENAME: 0505174

EVOLUTION by Micro-Active Australia Pty Ltd 2:12:42 PM May 17, 2005

Keep last result visible enabled ...
Starting run ...
Creating high priority queue entries ...
BACKGROUND CORRECTED INTENSITIES

010031

Identity 1 : BLK_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 2:12:00 PM May 17, 2005

	K_766	Li670	Na589	Sc361
# 1	20.0	-18.0	27.0	4913.0
# 2	14.0	-17.0	38.0	4847.0
Mean	17.0	-17.5	32.5	4880.0
SD	4.2	0.7	7.8	46.7
%RSD	25.0	4.0	23.9	1.0

INTENSITIES
Identity 1 : BLK_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 2:12:00 PM May 17, 2005

	K_766	Li670	Na589	Sc361
# 1	0.0	-0.0	0.0	4913.0
# 2	0.0	-0.0	0.0	4847.0
Mean	0.0	-0.0	0.0	4880.0
SD	0.0	0.0	0.0	46.7
%RSD	24.0	3.1	24.9	1.0

5/20/05

5-17-05

EVOLUTION by Micro-Active Australia Pty Ltd 2:22:12 PM May 17, 2005

010032

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_STD1_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 2:14:52 PM May 17, 2005

	K_766	Li670	Na589
# 1	4625.5	32908.5	26255.0
# 2	4562.5	32744.5	26052.0
Mean	4594.0	32826.5	26153.5
SD	44.5	116.0	143.5
%RSD	1.0	0.4	0.5

INTENSITIES
Identity 1 : CLP_STD1_SC Identity 2 : Type : STD
Weight : 1.0000 Volume : 1.00 Printed : 2:14:52 PM May 17, 2005

	K_766	Li670	Na589
# 1	0.9	6.7	5.4
# 2	0.9	6.8	5.4
Mean	0.9	6.8	5.4
SD	0.0	0.0	0.0
%RSD	0.3	0.3	0.1

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:17:44 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	1889.5	18272.0	16038.0	4974.5	4974.5
# 2	1883.5	18110.0	15938.0	4919.5	4919.5
Mean	1886.5	18191.0	15988.0	4947.0	4947.0
SD	4.2	114.6	70.7	38.9	38.9
%RSD	0.2	0.6	0.4	0.8	0.8

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:17:44 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	19.9830	5.4411	29.9338	4974.500 H	101.9391
# 2	20.1437	5.4531	30.0800	4919.500 H	100.8105
Mean	20.0633	5.4471	30.0069	4947.000 H	101.3748
SD	0.1136	0.0085	0.1034	38.891	0.7980
%RSD	0.5664	0.1563	0.3446	0.786	0.7872

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

Report name	Low limit	Value	High limit
K_766	18.000	20.063	22.000
Li670	4.500	5.447	5.500
Na589	27.000	30.007	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 2:21:56 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	5.5	-12.5	53.5	4964.5	4964.5
# 2	7.5	-12.5	31.5	4913.5	4913.5

EVOLUTION by Micro-Active Australia Pty Ltd 2:27:44 PM May 17, 2005

Mean	6.5	-12.5	42.5	4939.0	4939.0
SD	1.4	0.0	15.6	36.1	36.1
%RSD	21.8	0.0	36.6	0.7	0.7

010033

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 2:21:56 PM May 17, 2005

		K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	L	-0.1261	0.0016	0.0383	4964.500 H	101.7339
# 2	L	-0.1039	0.0015 L	-0.0023	4913.500 H	100.6874
Mean	L	-0.1150	0.0016	0.0180	4939.000 H	101.2106
SD		0.0157	0.0000	0.0287	36.062	0.7400
%RSD		13.6606	1.7514	159.6250	0.730	0.7311

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

Report name	CRDL	Value	
K_766	0.100	-0.115	Contaminated
Li670	0.010	0.002	
Na589	0.050	0.018	
Sc361	0.000	101.211	

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CRI Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:24:48 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	22.0	347.5	46.5	5081.5	5081.5
# 2	27.0	345.5	43.5	4991.5	4991.5
Mean	24.5	346.5	45.0	5036.5	5036.5
SD	3.5	1.4	2.1	63.6	63.6
%RSD	14.4	0.4	4.7	1.3	1.3

APPARENT CONCENTRATIONS
Identity 1 : CRI Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:24:48 PM May 17, 2005

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.0449	0.1065	0.0232	5081.500 H	104.1346
# 2	0.1022	0.1077	0.0191	4991.500 H	102.2879
Mean	0.0736	0.1071	0.0211	5036.500 H	103.2112
SD	0.0405	0.0009	0.0029	63.640	1.3058
%RSD	55.0989	0.8131	13.5644	1.264	1.2652

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

Report name	Low limit	Value	High limit
Li670	0.090	0.107	0.110

BACKGROUND CORRECTED INTENSITIES
Identity 1 : ICSA Identity 2 : Type : INTRF
Weight : 1.0000 Volume : 1.00 Printed : 2:27:42 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	17.0	-4.5	58.0	4782.5	4782.5
# 2	16.0	-6.5	26.0	4759.5	4759.5
Mean	16.5	-5.5	42.0	4771.0	4771.0

EVOLUTION by Micro-Active Australia Pty Ltd 2:34:42 PM May 17, 2005

SD		0.7	1.4	22.6	16.3	16.3
%RSD		4.3	25.7	53.9	0.3	0.3

APPARENT CONCENTRATIONS
Identity 1 : ICSA Identity 2 : Type : INTRF
Weight : 1.0000 Volume : 1.00 Printed : 2:27:42 PM May 17, 2005

010034

		K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1		0.0038	0.0039	0.0509	4782.500	97.9994
# 2	L	-0.0065	0.0033 L	-0.0111	4759.500	97.5274
Mean	L	-0.0014	0.0036	0.0199	4771.000	97.7634
SD		0.0072	0.0004	0.0438	16.263	0.3337
%RSD		536.1494	12.3461	220.7034	0.341	0.3413

BACKGROUND CORRECTED INTENSITIES
Identity 1 : ICSAB Identity 2 : Type : ICSAB
Weight : 1.0000 Volume : 1.00 Printed : 2:30:36 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	8.5	3794.0	42.0	4818.5	4818.5
# 2	9.5	3771.0	40.0	4801.5	4801.5
Mean	9.0	3782.5	41.0	4810.0	4810.0
SD	0.7	16.3	1.4	12.0	12.0
%RSD	7.9	0.4	3.4	0.2	0.2

APPARENT CONCENTRATIONS
Identity 1 : ICSAB Identity 2 : Type : ICSAB
Weight : 1.0000 Volume : 1.00 Printed : 2:30:36 PM May 17, 2005

		K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	L	-0.0913	1.1705	0.0191	4818.500	98.7381
# 2	L	-0.0799	1.1676	0.0155	4801.500	98.3892
Mean	L	-0.0856	1.1691	0.0173	4810.000	98.5637
SD		0.0081	0.0021	0.0025	12.021	0.2467
%RSD		9.4079	0.1792	14.6327	0.250	0.2503

Checking interference check standard ...
Identity 1 : ICSAB Identity 2 :

Report name	Low limit	Value	High limit
Li670	0.800	1.169	1.200

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:34:32 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	1935.0	18329.5	16180.5	5070.0	5070.0
# 2	1918.0	18241.5	16108.5	5032.0	5032.0
Mean	1926.5	18285.5	16144.5	5051.0	5051.0
SD	12.0	62.2	50.9	26.9	26.9
%RSD	0.6	0.3	0.3	0.5	0.5

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:34:32 PM May 17, 2005

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm

EVOLUTION by Micro-Active Australia Pty Ltd 2:41:42 PM May 17, 2005

# 1	20.0796	5.3555	29.6303	5070.000	H	103.8986
# 2	20.0532	5.3700	29.7214	5032.000	H	103.1189
Mean	20.0664	5.3627	29.6758	5051.000	H	103.5088
SD	0.0186	0.0103	0.0644	26.870		0.5514
%RSD	0.0928	0.1915	0.2171	0.532		0.5327

010035

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

Report name	Low limit	Value	High limit
K_766	18.000	20.066	22.000
Li670	4.500	5.363	5.500
Na589	27.000	29.676	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 2:38:24 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	13.5	-9.5	43.5	5043.0	5043.0
# 2	18.5	-0.5	33.5	4960.0	4960.0
Mean	16.0	-5.0	38.5	5001.5	5001.5
SD	3.5	6.4	7.1	58.7	58.7
%RSD	22.1	127.3	18.4	1.2	1.2

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 2:38:24 PM May 17, 2005

		K_766	Li670	Na589	Sc		Sc361
		ppm	ppm	ppm			ppm
# 1	L	-0.0428	0.0025	0.0183	5043.000	H	103.3446
# 2		0.0131	0.0052	0.0009	4960.000	H	101.6415
Mean	L	-0.0149	0.0038	0.0096	5001.500	H	102.4931
SD		0.0395	0.0019	0.0123	58.690		1.2043
%RSD		265.6994	48.6076	128.4891	1.173		1.1750

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

Report name	CRDL	Value
K_766	0.100	-0.015
Li670	0.010	0.004
Na589	0.050	0.010
Sc361	0.000	102.493

BACKGROUND CORRECTED INTENSITIES
Identity 1 : pbw Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:41:20 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	13.0	-11.5	2.0	4824.5	4824.5
# 2	13.0	-9.5	25.0	4799.5	4799.5
Mean	13.0	-10.5	13.5	4812.0	4812.0
SD	0.0	1.4	16.3	17.7	17.7
%RSD	0.0	13.5	120.5	0.4	0.4

APPARENT CONCENTRATIONS
Identity 1 : pbw Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:41:20 PM May 17, 2005

	K 766	Li670	Na589	Sc	Sc361

EVOLUTION by Micro-Active Australia Pty Ltd 2:49:42 PM May 17, 2005

		ppm		ppm		ppm		ppm
# 1	L	-0.0419		0.0018	L	-0.0581	4824.500	98.8612
# 2	L	-0.0411		0.0024	L	-0.0135	4799.500	98.3482
Mean	L	-0.0415		0.0021	L	-0.0358	4812.000	98.6047
SD		0.0005		0.0004		0.0315	17.678	0.3627
%RSD		1.2691		20.3538		88.0975	0.367	0.3679

010036

BACKGROUND CORRECTED INTENSITIES
Identity 1 : lcsw-E17H1 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:43:18 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	1858.0	14037.0	10550.5	4866.5	4866.5
# 2	1857.0	13947.0	10487.5	4895.5	4895.5
Mean	1857.5	13992.0	10519.0	4881.0	4881.0
SD	0.7	63.6	44.5	20.5	20.5
%RSD	0.0	0.5	0.4	0.4	0.4

APPARENT CONCENTRATIONS
Identity 1 : lcsw-E17H1 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:43:18 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	20.0868	4.2739	20.1085	4866.500	99.7230
# 2	19.9559	4.2214	19.8693	4895.500 H	100.3180
Mean	20.0214	4.2476	19.9889	4881.000 H	100.0205
SD	0.0926	0.0371	0.1692	20.506	0.4208
%RSD	0.4624	0.8738	0.8462	0.420	0.4207

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262525 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:46:22 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	42.0	-8.0	485.5	4859.0	4859.0
# 2	29.0	-6.0	492.5	4803.0	4803.0
Mean	35.5	-7.0	489.0	4831.0	4831.0
SD	9.2	1.4	4.9	39.6	39.6
%RSD	25.9	20.2	1.0	0.8	0.8

APPARENT CONCENTRATIONS
Identity 1 : 262525 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:46:22 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	0.2740	0.0029	0.8676	4859.000	99.5691
# 2	0.1356	0.0035	0.8920	4803.000	98.4200
Mean	0.2048	0.0032	0.8798	4831.000	98.9946
SD	0.0978	0.0004	0.0173	39.598	0.8125
%RSD	47.7708	13.1356	1.9608	0.820	0.8208

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262525d Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:49:24 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	28.5	-14.5	455.5	4863.0	4863.0

# 2	33.5	-6.5	465.5	4775.0	4775.0
Mean	31.0	-10.5	460.5	4819.0	4819.0
SD	3.5	5.7	7.1	62.2	62.2
%RSD	11.4	53.9	1.5	1.3	1.3

010037

APPARENT CONCENTRATIONS
Identity 1 : 262525d Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:49:24 PM May 17, 2005

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.1262	0.0009	0.8095	4863.000	99.6512
# 2	0.1875	0.0033	0.8450	4775.000	97.8455
Mean	0.1569	0.0021	0.8273	4819.000	98.7483
SD	0.0434	0.0017	0.0251	62.225	1.2768
%RSD	27.6456	81.0007	3.0382	1.291	1.2930

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262525L df250 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:52:28 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	28.0	-7.5	117.0	4824.0	4824.0
# 2	23.0	-8.5	140.0	4783.0	4783.0
Mean	25.5	-8.0	128.5	4803.5	4803.5
SD	3.5	0.7	16.3	29.0	29.0
%RSD	13.9	8.8	12.7	0.6	0.6

APPARENT CONCENTRATIONS
Identity 1 : 262525L df250 Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:52:28 PM May 17, 2005

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.1232	0.0030	0.1637	4824.000	98.8509
# 2	0.0704	0.0027	0.2104	4783.000	98.0096
Mean	0.0968	0.0028	0.1870	4803.500	98.4303
SD	0.0374	0.0002	0.0330	28.991	0.5949
%RSD	38.6201	8.1901	17.6462	0.604	0.6044

BACKGROUND CORRECTED INTENSITIES
Identity 1 : 262525s Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:55:32 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	1844.5	14091.0	10782.0	4844.5	4844.5
# 2	1826.5	14003.0	10809.0	4797.5	4797.5
Mean	1835.5	14047.0	10795.5	4821.0	4821.0
SD	12.7	62.2	19.1	33.2	33.2
%RSD	0.7	0.4	0.2	0.7	0.7

APPARENT CONCENTRATIONS
Identity 1 : 262525s Identity 2 : Type : SAMPLE
Weight : 1.0000 Volume : 1.00 Printed : 2:55:32 PM May 17, 2005

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	20.0309	4.3098	20.6447	4844.500	99.2716
# 2	20.0298	4.3248	20.8999	4797.500	98.3072

EVOLUTION by Micro-Active Australia Pty Ltd 3:04:42 PM May 17, 2005

Mean	20.0304	4.3173	20.7723	4821.000	98.7894
SD	0.0008	0.0106	0.1805	33.234	0.6819
%RSD	0.0041	0.2461	0.8688	0.689	0.6903

010038

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CRI Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:58:34 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	30.5	351.5	42.5	5089.5	5089.5
# 2	22.5	362.5	37.5	5005.5	5005.5
Mean	26.5	357.0	40.0	5047.5	5047.5
SD	5.7	7.8	3.5	59.4	59.4
%RSD	21.3	2.2	8.8	1.2	1.2

APPARENT CONCENTRATIONS
Identity 1 : CRI Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 2:58:34 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	0.1332	0.1075	0.0157	5089.500 H	104.2988
# 2	0.0537	0.1125	0.0077	5005.500 H	102.5752
Mean	0.0935	0.1100	0.0117	5047.500 H	103.4370
SD	0.0562	0.0035	0.0056	59.397	1.2188
%RSD	60.1616	3.1932	48.1437	1.177	1.1783

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

Report name	Low limit	Value	High limit
Li670	0.090	0.110	0.110

BACKGROUND CORRECTED INTENSITIES
Identity 1 : ICSA Identity 2 : Type : INTRF
Weight : 1.0000 Volume : 1.00 Printed : 3:01:28 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	18.5	-15.5	40.0	4882.5	4882.5
# 2	22.5	-22.5	33.0	4835.5	4835.5
Mean	20.5	-19.0	36.5	4859.0	4859.0
SD	2.8	4.9	4.9	33.2	33.2
%RSD	13.8	26.1	13.6	0.7	0.7

APPARENT CONCENTRATIONS
Identity 1 : ICSA Identity 2 : Type : INTRF
Weight : 1.0000 Volume : 1.00 Printed : 3:01:28 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	0.0162	0.0006	0.0143	4882.500 H	100.0513
# 2	0.0621 L	-0.0016	0.0015	4835.500	99.0869
Mean	0.0392 L	-0.0005	0.0079	4859.000	99.5691
SD	0.0324	0.0015	0.0090	33.234	0.6819
%RSD	82.8483	318.9480	113.9781	0.684	0.6849

BACKGROUND CORRECTED INTENSITIES
Identity 1 : ICSAB Identity 2 : Type : ICSAB
Weight : 1.0000 Volume : 1.00 Printed : 3:04:20 PM May 17, 2005

EVOLUTION by Micro-Active Australia Pty Ltd 3:12:18 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	-6.5	3827.0	19.5	4891.0	4891.0
# 2	11.5	3765.0	35.5	4838.0	4838.0
Mean	2.5	3796.0	27.5	4864.5	4864.5
SD	12.7	43.8	11.3	37.5	37.5
%RSD	509.1	1.2	41.1	0.8	0.8

010039

APPARENT CONCENTRATIONS
Identity 1 : ICSAB Identity 2 : Type : ICSAB
Weight : 1.0000 Volume : 1.00 Printed : 3:04:20 PM May 17, 2005

		K_766		Li670		Na589		Sc		Sc361
		ppm		ppm		ppm				ppm
# 1	L	-0.2555		1.1632	L	-0.0249		4891.000	H	100.2257
# 2	L	-0.0588		1.1570		0.0063		4838.000		99.1382
Mean	L	-0.1571		1.1601	L	-0.0093		4864.500		99.6820
SD		0.1391		0.0044		0.0220		37.477		0.7690
%RSD		88.5438		0.3828		237.5314		0.770		0.7714

Checking interference check standard ...
Identity 1 : ICSAB Identity 2 :

Report name	Low limit	Value	High limit
Li670	0.800	1.160	1.200

BACKGROUND CORRECTED INTENSITIES
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 3:08:14 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	1925.5	18297.0	16303.5	5117.0	5117.0
# 2	1913.5	18229.0	16251.5	5077.0	5077.0
Mean	1919.5	18263.0	16277.5	5097.0	5097.0
SD	8.5	48.1	36.8	28.3	28.3
%RSD	0.4	0.3	0.2	0.6	0.6

APPARENT CONCENTRATIONS
Identity 1 : CLP_CCV_SC Identity 2 : Type : CV
Weight : 1.0000 Volume : 1.00 Printed : 3:08:14 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	19.7949	5.2969	29.5812	5117.000 H	104.8630
# 2	19.8268	5.3188	29.7195	5077.000 H	104.0423
Mean	19.8108	5.3079	29.6503	5097.000 H	104.4527
SD	0.0226	0.0155	0.0978	28.284	0.5804
%RSD	0.1139	0.2913	0.3297	0.555	0.5556

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

Report name	Low limit	Value	High limit
K_766	18.000	19.811	22.000
Li670	4.500	5.308	5.500
Na589	27.000	29.650	33.000

BACKGROUND CORRECTED INTENSITIES
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 3:12:08 PM May 17, 2005

	K_766	Li670	Na589	Sc	Sc361
# 1	11.5	-3.0	19.0	5030.5	5030.5

EVOLUTION by Micro-Active Australia Pty Ltd 3:22:42 PM May 17, 2005

# 2	15.5	-1.0	25.0	4940.5	4940.5
Mean	13.5	-2.0	22.0	4985.5	4985.5
SD	2.8	1.4	4.2	63.6	63.6
%RSD	21.0	70.7	19.3	1.3	1.3

010040

APPARENT CONCENTRATIONS
Identity 1 : Calibration blank Identity 2 : Type : CB
Weight : 1.0000 Volume : 1.00 Printed : 3:12:08 PM May 17, 2005

		K_766 ppm		Li670 ppm		Na589 ppm		Sc		Sc361 ppm
# 1	L	-0.0636		0.0044	L	-0.0268		5030.500	H	103.0881
# 2	L	-0.0184		0.0050	L	-0.0149		4940.500	H	101.2414
Mean	L	-0.0410		0.0047	L	-0.0209		4985.500	H	102.1648
SD		0.0320		0.0004		0.0084		63.640		1.3058
%RSD		77.9811		8.7416		40.4863		1.276		1.2782

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

Report name	CRDL	Value
K_766	0.100	-0.041
Li670	0.010	0.005
Na589	0.050	-0.021
Sc361	0.000	102.165

Div 20
to#050502-4
06002.01.222

5/27/05

5/31/05

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
pbw-E17H2	Si2881	0.02 ~~1.00~~	U	*JR 5/27/05	mg/L	0.02 ~~1~~				0.02	0.3535	0.354	1	1	0.00707	05/17/05	16:54
262526	Si2881	✓ 3.32			mg/L	1				0.02	3.3235	3.32	1	1	0.06647	05/17/05	17:04
262526d	Si2881	3.31			mg/L	1	0.3%			0.02	3.314	3.31	1	1	0.06628	05/17/05	17:09
262527	Si2881	5.40			mg/L	1				0.02	5.399	5.4	1	1	0.10798	05/17/05	17:19
262528	Si2881	7.40			mg/L	1				0.02	7.3965	7.4	1	1	0.14793	05/17/05	17:23
262529	Si2881	7.96			mg/L	1				0.02	7.9575	7.96	1	1	0.15915	05/17/05	17:28
262530	Si2881	11.2			mg/L	1				0.02	11.197	11.2	1	1	0.22394	05/17/05	17:33

262526
0.06647 ug/ml x df 50 = 3.32 mg/L

010041

Div 20
to#050502-4
06002.01.222

5/20/05

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
pbw-E17H2	Fe2714	0.0500	U		mg/L	0.05				0.05	0.02072	0.0207	1	0.05	0.02072	05/17/05	16:54
lcsw-E17H2	Fe2714	1.13			mg/L	0.05		113.0%	1	0.05	1.12949	1.13	1	0.05	1.12949	05/17/05	16:59
262526	Fe2714	2.50	U		mg/L	2.5				0.05	1.1625	1.16	1	2.5	0.02325	05/17/05	17:04
262526d	Fe2714	2.50	U		mg/L	2.5	0.0%			0.05	0.54	0.54	1	2.5	0.0108	05/17/05	17:09
262526s	Fe2714	57.6			mg/L	2.5		115.2%	50	0.05	57.6155	57.6	1	2.5	1.15231	05/17/05	17:14
262527	Fe2714	2.50	U		mg/L	2.5				0.05	1.5855	1.59	1	2.5	0.03171	05/17/05	17:19
262528	Fe2714	12.2			mg/L	2.5				0.05	12.208	12.2	1	2.5	0.24416	05/17/05	17:23
262529	Fe2714	6.82			mg/L	2.5				0.05	6.8175	6.82	1	2.5	0.13635	05/17/05	17:28
262530	Fe2714	8.91			mg/L	2.5				0.05	8.912	8.91	1	2.5	0.17824	05/17/05	17:33

262530

$$0.17824\,mg/ml \times \frac{5\,ml}{0.1\,ml} = 8.91\,mg/L$$

010042

div20_050502(4)Fe

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

☐ 6010B TAP No. 01-0406-130 Rev3/Mar05

☑ Other SWRI

QC STD. ID's	
CCV	05602
CRI	—
ICSA	—
ICSAB	—

ICP CAL.STD. ID's	
Std0	05602
Std1	
Std2	
Std3	
Std4	
Std5	
Std6	05602

010043

Fe

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
06002.01.222	Div 20	050502-4	5-17-05	Liquid	61-014

INSTRUMENT: Icap 2 FILENAME: B050524A

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 61 014

010044

CLIENT(S): DIV 20
TASK ORDER(S): 0505002-4 SDG(S): 262525
PROJECT NO(S): 06002.01.222
METHOD: 3005A___3050B___3050B-7.5___3010A___3020A___7760A___7740A___$HClO_4$___$HClO_4/H_2SO_4$___
Microwave___Fusion___Teflon___Rock___OTHER dilutions
MATRIX: Water ✓ Soil___Biota___Solid___Liquid___TCLP Ext___OTHER___
INSTRUMENT: GFAA___ICP ✓ ICP-MS___IC___FLAA___HYDRIDE___OTHER___
ACID INORG #: HNO_3# 5219 HCl# 5090 H_2SO_4#___ $HClO_4$#___ HF#___ H_2O_2#___
INTERNAL STD: Sc @ 10 PPM ✓ Be @ 10 PPM___SOURCE: IV INORG# 4961 EXP: 2/06 AMT: 50u
Oven/Hotplate/ Block ID: NA Temperature (°C): NA

Sample Identification		df	WT(g)	I.V.(ml)	F.V.(ml)
PBW-E17H2		1		5	5
LCSW-E17H2*		1		5	5
262526		50		0.1	5
262526d		50		0.1	5
262526s		50		0.1	5
262527		50		0.1	5
262528		50		0.1	5
262529		50		0.1	5
262530		50		0.1	5

* 20uL ICAL-1 Spex#4837 exp. 10/05 and 50ul Spike-1 #5197 exp. 3/06
*20ul Li IV #4628 exp. 8/05
PBW&LCSW are prepared as 5mls 1%HNO_3 / 5% HCL

Note: Contacted Charlie Bircher

LOCATION: NA

PREPARED BY: [signature] DATE: 5-17-05
REVIEWED BY: John Walker DATE: 5-17-05
DISPOSAL INT/DATE/LOC: ___

FRM-191 (Rev 4/Jan 05)

Method: DAILY2 Standard: blk
Run Time: 05/17/05 14:35:09

010045

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Avge	-.0000	.0004	-.0000	.0001	-.0000	-.0001	-.0000
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	111.7	.2976	164.1	7.175	117.5	2.675	52.66
#1	-.0000	.0004	.0000	.0001	-.0000	-.0001	-.0000
#2	-.0000	.0004	-.0001	.0001	-.0000	-.0001	-.0000

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Avge	.0000	.0000	-.0000	-.0000	.0003	.0000	.0004
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0001
%RSD	29.38	15.31	159.4	69.85	.7898	129.0	25.11
#1	.0000	.0000	.0000	-.0000	.0003	.0001	.0005
#2	.0000	.0000	-.0000	-.0000	.0003	.0000	.0003

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Avge	.0000	.0000	.0000	.0000	-.0000	-.0001	-.0170
SDev	.0001	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	184.6	167.9	203.0	46.12	1063.	32.95	.1669
#1	.0001	.0000	.0000	.0000	-.0000	-.0001	-.0171
#2	-.0000	-.0000	-.0000	.0000	.0000	-.0002	-.0170

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Avge	-.0000	.0000	.0001	.0000	.0001	.0001	-.0010
SDev	.0000	.0000	.0001	.0000	.0001	.0000	.0001
%RSD	233.7	8.587	133.6	74.60	89.08	1.861	5.208
#1	-.0000	.0000	.0001	.0000	.0002	.0001	-.0009
#2	.0000	.0000	.0000	.0000	.0001	.0001	-.0010

Elem	Sc3613	1960/1	1960/2	Si2881	Sn1899	Sr4215	Th2837
Avge	70.64	-.0000	-.0000	.0012	.0000	.0000	.0000
SDev	.81	.0000	.0000	.0000	.0001	.0000	.0000
%RSD	1.146	63.91	334.1	1.148	1333.	220.6	42.39
#1	70.07	-.0000	-.0000	.0012	.0000	.0000	.0001
#2	71.21	-.0000	.0000	.0012	-.0000	-.0000	.0000

Elem	Ti3349	Tl1908	U_4090	V_2924	W_2079	Y_3710	Zn2062
Avge	-.0001	-.0002	-.0001	-.0000	.0002	.0000	-.0000
SDev	.0001	.0001	.0002	.0000	.0001	.0000	.0000
%RSD	67.47	65.19	160.7	23.48	38.74	34.28	141.4
#1	-.0000	-.0002	.0000	-.0000	.0002	.0000	.0000
#2	-.0001	-.0001	-.0003	-.0000	.0001	.0000	-.0000

Elem	Zr3496
Avge	.0001
SDev	.0000
%RSD	28.74
#1	.0001
#2	.0001

5-17-05

5/17/05

010046

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	706363	10000	--	--	--	--	--
SDev	8107.686	.0000000	--	--	--	--	--
%RSD	1.147807	.0000000	--	--	--	--	--
#1	700630	10000	--	--	--	--	--
#2	712096	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std4
Run Time: 05/17/05 14:39:55

010047

Elem	Ag3280	As1890	2203/1	2203/2	Sb2068	1960/1	1960/2
Avge	.0771	.0949	.2743	.2390	.1377	.1870	.1990
SDev	.0000	.0000	.0014	.0009	.0005	.0019	.0012
%RSD	.0548	.0028	.5084	.3674	.3688	.9919	.6166
#1	.0771	.0949	.2733	.2384	.1373	.1857	.1981
#2	.0772	.0949	.2753	.2396	.1380	.1883	.1998

Elem	Tl1908
Avge	.1771
SDev	.0002
%RSD	.1233
#1	.1770
#2	.1773

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	722378	10000	--	--	--	--	--
SDev	2482.652	.0000000	--	--	--	--	--
%RSD	.3436774	.0000000	--	--	--	--	--
#1	720623	10000	--	--	--	--	--
#2	724134	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std1
Run Time: 05/17/05 14:44:22

010048

Elem	Al3082	Ca3179	Fe2714	K_7664	Li6707	Mg2790	Na3302
Avge	.0940	.2146	.0844	.2327	3.525	.0811	.0078
SDev	.0001	.0001	.0001	.0006	.002	.0000	.0000
%RSD	.1114	.0670	.0549	.2499	.0646	.0377	.0618
#1	.0939	.2145	.0844	.2323	3.523	.0811	.0078
#2	.0941	.2147	.0845	.2331	3.526	.0811	.0078

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	703228	10000	--	--	--	--	--
SDev	2438.104	.0000000	--	--	--	--	--
%RSD	.3467018	.0000000	--	--	--	--	--
#1	704952	10000	--	--	--	--	--
#2	701504	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std5
Run Time: 05/17/05 14:48:02

010049

Elem	B_2496	Bi2230	Mo2020	P_1782	Si2881	Sn1899	Sr4215
Avge	.1389	.0248	.2467	.0255	.1428	.1279	2.681
SDev	.0002	.0000	.0008	.0001	.0004	.0002	.001
%RSD	.1127	.0299	.3100	.5160	.2556	.1234	.0390
#1	.1388	.0248	.2462	.0256	.1431	.1277	2.680
#2	.1390	.0249	.2473	.0254	.1426	.1280	2.681

Elem	Ti3349
Avge	2.641
SDev	.003
%RSD	.0980
#1	2.639
#2	2.643

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	738896	10000	--	--	--	--	--
SDev	2155.968	.0000000	--	--	--	--	--
%RSD	.2917826	.0000000	--	--	--	--	--
#1	740420	10000	--	--	--	--	--
#2	737371	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std2
Run Time: 05/17/05 14:51:42

010050

Elem	Ba4934	Be3130	Cr2677	Cu3247	Ni2316
Avge	1.183	1.354	.3748	.2864	.2857
SDev	.001	.000	.0001	.0002	.0002
%RSD	.0637	.0344	.0128	.0642	.0665
#1	1.184	1.354	.3748	.2865	.2855
#2	1.183	1.354	.3748	.2863	.2858

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	719370	10000	--	--	--	--	--
SDev	1671.601	.0000000	--	--	--	--	--
%RSD	.2323700	.0000000	--	--	--	--	--
#1	720552	10000	--	--	--	--	--
#2	718188	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std3
Run Time: 05/17/05 14:55:04

010051

Elem	Cd2265	Co2286	Mn2576	V_2924	Zn2062
Avge	.8293	.1753	.7778	.1797	.2472
SDev	.0015	.0003	.0008	.0001	.0008
%RSD	.1829	.1479	.1072	.0722	.3154
#1	.8303	.1755	.7784	.1796	.2477
#2	.8282	.1752	.7772	.1798	.2466

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	741304	10000	--	--	--	--	--
SDev	3233.599	.0000000	--	--	--	--	--
%RSD	.4362039	.0000000	--	--	--	--	--
#1	739018	10000	--	--	--	--	--
#2	743591	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std6
Run Time: 05/17/05 14:58:44

010052

Elem	La3988	Na5889	Pd3404	S_1820	Th2837	U_4090	W_2079
Avge	.5171	.0473	.1995	.0270	.0968	.0705	.1611
SDev	.0003	.0003	.0001	.0000	.0002	.0002	.0001
%RSD	.0529	.6814	.0464	.1027	.2307	.2974	.0772
#1	.5173	.0475	.1995	.0270	.0969	.0707	.1612
#2	.5169	.0470	.1994	.0270	.0966	.0704	.1610

Elem	Y_3710	Zr3496
Avge	.7778	1.992
SDev	.0000	.001
%RSD	.0046	.0515
#1	.7777	1.993
#2	.7778	1.992

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	713918	10000	--	--	--	--	--
SDev	5996.973	.0000000	--	--	--	--	--
%RSD	.8400092	.0000000	--	--	--	--	--
#1	718158	10000	--	--	--	--	--
#2	709677	10000	--	--	--	--	--

Standardization Report 05/17/05 03:02:36 PM page 1

Method: DAILY2 Slope = Conc(SIR)/IR

010053

Element	Wavelen	High std	Low std	Slope	Y-intercept	Date Standardized
Ag3280	328.068	clp_std4	blk	25.9230	.000529	05/17/05 02:58:44
Al3082	308.215	clp_std1	blk	533.810	-.188554	05/17/05 02:58:44
As1890	189.042	clp_std4	blk	105.310	.002806	05/17/05 02:58:44
B_2496	249.678	clp_std5	blk	72.0339	-.006932	05/17/05 02:58:44
Ba4934	493.409	clp_std2	blk	8.45145	.000071	05/17/05 02:58:44
Be3130	313.042	clp_std2	blk	3.69229	.000290	05/17/05 02:58:44
Bi2230	223.061	clp_std5	blk	199.358	.004080	05/17/05 02:58:44
Ca3179	317.933	clp_std1	blk	233.031	-.004131	05/17/05 02:58:44
Cd2265	226.502	clp_std3	blk	12.0559	-.000367	05/17/05 02:58:44
Co2286	228.616	clp_std3	blk	57.0268	.000640	05/17/05 02:58:44
Cr2677	267.716	clp_std2	blk	26.6809	.000075	05/17/05 02:58:44
Cu3247	324.753	clp_std2	blk	34.9519	-.009773	05/17/05 02:58:44
Fe2714	271.441	clp_std1	blk	592.696	-.019020	05/17/05 02:58:44
K_7664	766.491	clp_std1	blk	215.259	-.084536	05/17/05 02:58:44
La3988	398.853	clp_std6	blk	19.3560	-.000623	05/17/05 02:58:44
Li6707	670.784	clp_std1	blk	2.83710	-.000043	05/17/05 02:58:44
Mg2790	279.078	clp_std1	blk	308.260	-.001987	05/17/05 02:58:44
Mn2576	257.610	clp_std3	blk	12.8576	-.000136	05/17/05 02:58:44
Mo2020	202.030	clp_std5	blk	40.5374	.000061	05/17/05 02:58:44
Na3302	330.232	clp_std1	blk	6325.83	.835759	05/17/05 02:58:44
Na5889	588.991	clp_std6	blk	15.6322	.266421	05/17/05 02:58:44
Ni2316	231.604	clp_std2	blk	35.0032	.000301	05/17/05 02:58:44
P_1782	178.287	clp_std5	blk	392.812	-.005286	05/17/05 02:58:44
2203/1	220.351	clp_std4	blk	36.4595	-.001847	05/17/05 02:58:44
2203/2	220.352	clp_std4	blk	41.8463	-.000885	05/17/05 02:58:44
Pd3404	340.458	clp_std6	blk	51.5120	-.007037	05/17/05 02:58:44
S_1820	182.040	clp_std6	blk	371.843	-.049478	05/17/05 02:58:44
Sb2068	206.838	clp_std4	blk	72.1291	.070437	05/17/05 02:58:44
Sc3613	361.384	blk	dark	1.41566	.000000	05/17/05 02:58:44
1960/1	196.021	clp_std4	blk	53.4638	.001810	05/17/05 02:58:44
1960/2	196.022	clp_std4	blk	50.2578	.000363	05/17/05 02:58:44
Si2881	288.158	clp_std5	blk	70.3466	-.086350	05/17/05 02:58:44
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	78.2636	-.000300	05/17/05 02:58:44
Sr4215	421.552	clp_std5	blk	3.73041	-.000019	05/17/05 02:58:44
Th2837	283.730	clp_std6	blk	107.929	-.004978	05/17/05 02:58:44
Ti3349	334.941	clp_std5	blk	3.78642	.000320	05/17/05 02:58:44
Tl1908	190.864	clp_std4	blk	56.4003	.009257	05/17/05 02:58:44
U_4090	409.014	clp_std6	blk	149.664	.018790	05/17/05 02:58:44
V_2924	292.402	clp_std3	blk	55.6293	.001809	05/17/05 02:58:44
W_2079	207.914	clp_std6	blk	31.0581	-.005707	05/17/05 02:58:44
Y_3710	371.030	clp_std6	blk	12.8551	-.000145	05/17/05 02:58:44
Zn2062	206.200	clp_std3	blk	40.4561	.000028	05/17/05 02:58:44
Zr3496	349.621	clp_std6	blk	5.48653	-.000677	05/17/05 02:58:44

Analysis Report QC Standard 05/17/05 03:09:12 PM page 1

Method: DAILY2 Sample Name: ICV/CCV Operator:
Run Time: 05/17/05 15:04:38
Comment:
Mode: CONC Corr. Factor: 1

010054

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9851	9.867	5.104	4.901	10.01	.9897	5.070
SDev	.0030	.014	.005	.005	.02	.0010	.016
%RSD	.3062	.1447	.0953	.1119	.1665	.0997	.3248
#1	.9872	9.877	5.101	4.898	10.02	.9890	5.082
#2	.9829	9.857	5.108	4.905	9.994	.9904	5.059
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.11	1.034	5.191	1.984	2.027	10.55	18.75
SDev	.02	.005	.003	.003	.008	.05	.08
%RSD	.0751	.4537	.0571	.1639	.3849	.4593	.4099
#1	20.10	1.030	5.189	1.982	2.033	10.59	18.81
#2	20.12	1.037	5.193	1.987	2.022	10.52	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	4.921	5.202	20.07	1.044	5.170	28.44	Q41.19
SDev	.000	.008	.01	.000	.001	.08	.08
%RSD	.0066	.1600	.0251	.0036	.0238	.2836	.1988
#1	4.922	5.208	20.07	1.044	5.169	28.38	Q41.25
#2	4.921	5.197	20.07	1.044	5.170	28.49	Q41.14
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	4.975	5.143	4.955	4.970	.9956	.9884	1.009
SDev	.006	.018	.016	.034	.0025	.0041	.001
%RSD	.1121	.3480	.3321	.6827	.2521	.4182	.0820
#1	4.979	5.130	4.943	4.994	.9939	.9913	1.010
#2	4.971	5.156	4.966	4.946	.9974	.9854	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

010055

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.02	5.209	5.232	5.139	4.965	5.224	4.949
SDev	.76	.007	.059	.005	.017	.042	.006
%RSD	.7656	.1338	1.136	.1068	.3452	.8028	.1299
#1	99.56	5.214	5.274	5.143	4.977	5.254	4.944
#2	98.48	5.204	5.190	5.135	4.953	5.194	4.953
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	5.200	.9832	4.968	5.161	Q.8712	5.069	1.066
SDev	.001	.0030	.002	.014	.0375	.003	.005
%RSD	.0168	.3043	.0345	.2729	4.302	.0598	.4433
#1	5.200	.9853	4.969	5.152	Q.8977	5.071	1.063
#2	5.201	.9811	4.967	5.171	Q.8447	5.067	1.070
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail	QC Pass	QC Pass
Value	5.000	1.000	5.000	5.000	1.000	5.000	1.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.991	1.049	4.856
SDev	.007	.002	.000
%RSD	.1365	.1444	.0079
#1	4.995	1.048	4.857
#2	4.986	1.050	4.856
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

010056

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	699388	10000	--	--	--	--	--
SDev	5338.656	.0000000	--	--	--	--	--
%RSD	.7633325	.0000000	--	--	--	--	--
#1	703163	10000	--	--	--	--	--
#2	695613	10000	--	--	--	--	--

Analysis Report Blank Sample 05/17/05 03:15:48 PM page 1

Method: DAILY2 Sample Name: ICB/CCB Operator:
Run Time: 05/17/05 15:11:14
Comment:
Mode: CONC Corr. Factor: 1

010057

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	-.0020	.0010	.0059	.0000	.0001	.0029
SDev	.0005	.0028	.0011	.0025	.0000	.0000	.0032
%RSD	1636.	142.0	108.6	41.94	70.44	49.29	109.6
#1	-.0004	-.0039	.0002	.0077	.0001	.0001	.0007
#2	.0003	.0000	.0018	.0042	.0000	.0000	.0052
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0013	-.0003	-.0001	.0001	.0001	-.0039	-.0139
SDev	.0005	.0004	.0003	.0006	.0003	.0112	.0139
%RSD	36.35	144.5	242.8	426.7	538.8	284.4	100.2
#1	-.0010	-.0005	-.0003	-.0003	-.0001	.0040	-.0040
#2	-.0016	.0000	.0001	.0006	.0002	-.0118	-.0237
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	-.0010	.0000	-.0038	-.0000	.0014	L-.1282	-.0014
SDev	.0001	.0000	.0010	.0001	.0013	.1752	.0023
%RSD	13.27	46.82	27.03	1625.	99.36	136.6	164.8
#1	-.0009	.0000	-.0045	.0000	.0023	-.0044	-.0030
#2	-.0010	.0000	-.0031	-.0000	.0004	L-.2521	.0002
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	.0001	H.0130	-.0017	-.0024	-.0046	-.0002	-.0023
SDev	.0020	.0045	.0043	.0007	.0006	.0078	.0011
%RSD	2010.	34.96	253.7	30.92	13.91	3334.	48.88
#1	-.0013	.0098	.0013	-.0030	-.0042	.0053	-.0031
#2	.0015	H.0162	-.0047	-.0019	L-.0051	-.0058	-.0015
Errors	LC Pass	LC High	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

010058

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.6	.0034	.0017	.0044	-.0022	.0023	.0009
SDev	.9	.0011	.0023	.0040	.0009	.0012	.0015
%RSD	.8507	32.27	137.2	90.90	43.10	51.27	170.7
#1	99.96	.0042	.0000	.0072	-.0015	.0014	-.0002
#2	101.2	.0026	.0033	.0016	-.0028	.0031	.0019
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	-.0009	.0002	-.0001	-.0361	.0003	.0038
SDev	.0000	.0019	.0000	.0041	.0075	.0003	.0026
%RSD	14.71	205.3	3.203	6118.	20.69	100.3	66.66
#1	-.0000	.0004	.0002	-.0030	-.0414	.0001	.0056
#2	-.0000	-.0022	.0002	.0028	-.0309	.0005	.0020
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	-.0000	.0000
SDev	.0001	.0000	.0005
%RSD	62.80	2847.	1939.
#1	.0002	.0000	.0004
#2	.0001	-.0000	-.0004
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010059

IntStd	1	2	3	4	5	6	
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	710290	10000	--	--	--	--	--
SDev	6078.997	.0000000	--	--	--	--	--
%RSD	.8558478	.0000000	--	--	--	--	--
#1	705991	10000	--	--	--	--	--
#2	714588	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: CRI Operator:
Run Time: 05/17/05 15:16:04 010060
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0192	.0959	.0218	.1052	.0206	.0099	.0059
SDev	.0006	.0008	.0041	.0006	.0001	.0000	.0031
%RSD	2.894	.8523	18.83	.5672	.4041	.3801	52.58
#1	.0196	.0953	.0247	.1056	.0207	.0099	.0037
#2	.0188	.0965	.0189	.1048	.0205	.0099	.0081
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value	.0200	.1000	.0200	.1000	.0200	.0100	
Range	50.00	50.00	50.00	50.00	50.00	50.00	

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0104	.1020	.0201	.0488	.0779	-.0189
SDev	.0000	.0002	.0012	.0005	.0004	.0125	.0014
%RSD	7.067	1.997	1.212	2.661	.8725	16.09	7.287
#1	.0003	.0105	.1029	.0205	.0491	.0867	-.0199
#2	.0002	.0102	.1011	.0198	.0485	.0690	-.0179
Errors	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value		.0100	.1000	.0200	.0500	.1000	
Range		50.00	50.00	50.00	50.00	50.00	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0784	-.0074	.0312	.0206	-.2751	.0016
SDev	.0001	.0000	.0022	.0001	.0001	.1448	.0016
%RSD	10.39	.0297	29.68	.1960	.7443	52.63	99.62
#1	-.0007	.0784	-.0058	.0312	.0205	-.1727	.0005
#2	-.0006	.0784	-.0089	.0311	.0207	-.3774	.0027
Errors	NOCHECK	QC Pass	NOCHECK	QC Pass	QC Pass	NOCHECK	NOCHECK
Value		.1000		.0300	.0200		
Range		50.00		50.00	50.00		

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0805	.1086	.0025	.0064	-.0036	-.0082	.1242
SDev	.0001	.0052	.0022	.0002	.0009	.0168	.0025
%RSD	.1388	4.808	87.66	2.782	24.25	204.3	1.997
#1	.0806	.1049	.0041	.0065	-.0030	.0037	.1260
#2	.0805	.1123	.0010	.0063	-.0042	-.0201	.1225
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	QC Pass
Value	.0800	.1000					.1200
Range	50.00	50.00					50.00

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

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Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.7	.0106	.0104	.1073	.0051	.0104	.1021
SDev	.2	.0034	.0021	.0003	.0009	.0003	.0016
%RSD	.1627	31.84	20.29	.3159	16.68	2.641	1.525
#1	101.8	.0082	.0118	.1071	.0057	.0106	.1010
#2	101.6	.0130	.0089	.1076	.0045	.0103	.1032
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				.1000	.0060	.0100	.1000
Range				50.00	50.00	50.00	50.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0216	-.0020	.0201	.0233	.1445	.1014	-.0001
SDev	.0000	.0009	.0001	.0036	.0136	.0013	.0022
%RSD	.0398	45.73	.5677	15.58	9.434	1.246	1491.
#1	.0216	-.0014	.0202	.0207	.1541	.1023	.0014
#2	.0216	-.0027	.0200	.0258	.1349	.1006	-.0017
Errors	QC Pass	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value	.0200		.0200	.0200	.2000	.1000	
Range	50.00		50.00	50.00	50.00	50.00	

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0419	.0935
SDev	.0003	.0002	.0004
%RSD	1233.	.4059	.4534
#1	.0002	.0420	.0938
#2	-.0002	.0418	.0932
Errors	NOCHECK	QC Pass	QC Pass
Value		.0400	.1000
Range		50.00	50.00

010062

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	718260	10000	--	--	--	--	--
SDev	1167.433	.0000000	--	--	--	--	--
%RSD	.1625362	.0000000	--	--	--	--	--
#1	719086	10000	--	--	--	--	--
#2	717435	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: ICSA Operator: 010063
Run Time: 05/17/05 15:20:49
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0015	514.6	.0024	-.0165	.0023	.0001	.0153
SDev	.0004	.0	.0022	.0002	.0000	.0000	.0044
%RSD	25.35	.0032	89.20	1.084	1.555	36.27	28.87
#1	-.0017	514.6	.0009	-.0163	.0023	.0000	.0184
#2	-.0012	514.6	.0039	-.0166	.0023	.0001	.0121
Errors	NOCHECK	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value		500.0					
Range		20.00					

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	466.4	.0000	.0004	.0002	.0008	191.8	-.0221
SDev	1.1	.0003	.0001	.0007	.0006	.3	.0145
%RSD	.2271	8899.	15.29	282.0	79.92	.1774	65.72
#1	465.6	.0002	.0005	-.0002	.0012	192.0	-.0323
#2	467.1	-.0002	.0004	.0007	.0003	191.5	-.0118
Errors	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	QC Pass	NOCHECK
Value	500.0					200.0	
Range	20.00					20.00	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0042	.0003	542.5	-.0032	-.0006	.2437	-.0255
SDev	.0007	.0000	.2	.0001	.0015	.1936	.0020
%RSD	16.49	12.73	.0323	4.189	261.5	79.46	7.914
#1	.0037	.0002	542.3	-.0033	-.0017	.1067	-.0270
#2	.0047	.0003	542.6	-.0031	.0005	.3806	-.0241
Errors	NOCHECK	NOCHECK	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value			500.0				
Range			20.00				

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	-.0217	.0363	-.0360	.0120	.0126	.0034
SDev	.0003	.0034	.0130	.0072	.0032	.0158	.0056
%RSD	32.07	15.89	35.90	20.00	26.77	125.1	164.8
#1	.0012	-.0241	.0456	-.0411	.0097	.0238	-.0006
#2	.0007	-.0192	.0271	-.0309	.0142	.0015	.0074
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value							
Range							

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

010064

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	93.21	-.0019	-.0035	-.0073	-.0119	-.0030	-.0049
SDev	.25	.0044	.0020	.0019	.0005	.0001	.0012
%RSD	.2712	236.0	56.67	26.51	3.857	4.013	23.80
#1	93.39	.0012	-.0050	-.0086	-.0122	-.0029	-.0057
#2	93.03	-.0049	-.0021	-.0059	-.0116	-.0031	-.0041
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value							
Range							

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0168	.0151	-.0013	.0070	-.0216	.0001	.0038
SDev	.0001	.0002	.0001	.0006	.0211	.0003	.0013
%RSD	.2899	1.451	5.372	8.460	97.54	270.4	35.32
#1	.0168	.0150	-.0013	.0074	-.0365	-.0001	.0028
#2	.0168	.0153	-.0012	.0066	-.0067	.0003	.0047
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value							
Range							

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0005	.0080	-.0003
SDev	.0000	.0001	.0005
%RSD	6.228	1.393	142.6
#1	-.0004	.0080	-.0007
#2	-.0005	.0081	.0000
Errors	NOCHECK	NOCHECK	NOCHECK
Value			
Range			

010065

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	658363	10000	--	--	--	--	--
SDev	1770.595	.0000000	--	--	--	--	--
%RSD	.2689391	.0000000	--	--	--	--	--
#1	659615	10000	--	--	--	--	--
#2	657111	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: ICSAB Operator:
Run Time: 05/17/05 15:25:34
Comment:
Mode: CONC Corr. Factor: 1

010066

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.094	517.0	1.042	1.053	.5282	.4863	.0142
SDev	.003	.4	.007	.000	.0009	.0006	.0056
%RSD	.2528	.0719	.6789	.0084	.1740	.1213	39.48
#1	1.096	517.3	1.037	1.053	.5288	.4859	.0102
#2	1.092	516.8	1.047	1.053	.5275	.4868	.0181
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value	1.000	500.0	1.000	1.000	.5000	.5000	
Range	20.00	20.00	20.00	20.00	20.00	20.00	

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	467.2	.9898	.4990	.4843	.5476	192.7	-.0232
SDev	1.3	.0008	.0019	.0011	.0019	.0	.0254
%RSD	.2701	.0755	.3706	.2294	.3541	.0257	109.7
#1	466.3	.9893	.4977	.4836	.5490	192.6	-.0411
#2	468.1	.9904	.5003	.4851	.5463	192.7	-.0052
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value	500.0	1.000	.5000	.5000	.5000	200.0	
Range	20.00	20.00	20.00	20.00	20.00	20.00	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0041	1.300	546.9	.5080	1.049	.3526	-.0188
SDev	.0011	.007	.8	.0006	.005	.2302	.0019
%RSD	26.18	.5549	.1521	.1288	.4835	65.29	10.09
#1	.0034	1.305	546.3	.5075	1.045	.1898	-.0202
#2	.0049	1.295	547.5	.5085	1.053	.5154	-.0175
Errors	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	NOCHECK	NOCHECK
Value			500.0	.5000	1.000		
Range			20.00	20.00	20.00		

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9406	1.035	1.015	.9485	.0073	-.0005	1.064
SDev	.0040	.021	.002	.0001	.0040	.0171	.002
%RSD	.4296	2.043	.2223	.0142	55.66	3314.	.1940
#1	.9434	1.050	1.013	.9484	.0044	.0116	1.065
#2	.9377	1.020	1.016	.9486	.0101	-.0126	1.062
Errors	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	QC Pass
Value	1.000						1.000
Range	20.00						20.00

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

010067

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	94.38	1.025	1.029	1.076	.9706	1.027	1.024
SDev	.45	.007	.009	.005	.0008	.004	.001
%RSD	.4752	.7302	.9049	.4785	.0867	.3611	.1400
#1	94.69	1.030	1.022	1.072	.9700	1.025	1.025
#2	94.06	1.020	1.035	1.079	.9712	1.030	1.023
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				1.000	1.000	1.000	1.000
Range				20.00	20.00	20.00	20.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.090	.0111	1.000	.9933	1.043	.5108	.0009
SDev	.001	.0007	.000	.0010	.036	.0014	.0009
%RSD	.0776	6.190	.0043	.0998	3.419	.2790	99.84
#1	1.090	.0115	1.000	.9940	1.018	.5118	.0003
#2	1.089	.0106	1.000	.9926	1.069	.5098	.0015
Errors	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	NOCHECK
Value	1.000			1.000	1.000	.5000	
Range	20.00			20.00	20.00	20.00	

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0004	1.007	.9471
SDev	.0001	.004	.0007
%RSD	16.58	.3909	.0745
#1	-.0005	1.004	.9466
#2	-.0004	1.010	.9476
Errors	NOCHECK	QC Pass	QC Pass
Value		1.000	1.000
Range		20.00	20.00

010068

IntStd	1	2	3	4	5	6	
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	666618	10000	--	--	--	--	--
SDev	3114.098	.0000000	--	--	--	--	--
%RSD	.4671488	.0000000	--	--	--	--	--
#1	668820	10000	--	--	--	--	--
#2	664416	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: ICV/CCV Operator:
Run Time: 05/17/05 15:34:01
Comment:
Mode: CONC Corr. Factor: 1

010069

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9826	9.824	5.080	4.892	9.986	.9882	5.063
SDev	.0004	.000	.015	.026	.023	.0018	.025
%RSD	.0438	.0035	.2883	.5274	.2269	.1786	.4872
#1	.9829	9.824	5.090	4.873	9.970	.9894	5.045
#2	.9823	9.823	5.070	4.910	10.00	.9869	5.080
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.05	1.032	5.184	1.983	2.028	10.54	18.73
SDev	.07	.002	.015	.005	.001	.08	.07
%RSD	.3588	.1575	.2933	.2330	.0539	.7404	.3989
#1	20.10	1.033	5.194	1.986	2.027	10.60	18.68
#2	20.00	1.031	5.173	1.979	2.029	10.49	18.78
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	4.915	5.199	20.06	1.044	5.153	28.24	Q41.12
SDev	.006	.006	.05	.002	.003	.33	.04
%RSD	.1127	.1112	.2610	.2275	.0650	1.168	.0910
#1	4.911	5.195	20.09	1.045	5.150	28.47	Q41.10
#2	4.918	5.203	20.02	1.042	5.155	28.00	Q41.15
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	4.959	5.137	4.949	4.904	.9979	.9908	1.012
SDev	.009	.036	.046	.016	.0025	.0084	.004
%RSD	.1810	.7068	.9204	.3233	.2481	.8502	.4045
#1	4.965	5.163	4.981	4.915	.9962	.9849	1.009
#2	4.952	5.111	4.916	4.893	.9997	.9968	1.015
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

010070

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	98.83	5.209	5.162	5.143	4.919	5.178	4.936
SDev	1.00	.038	.021	.002	.026	.001	.018
%RSD	1.015	.7318	.4054	.0369	.5235	.0241	.3633
#1	98.12	5.236	5.147	5.144	4.937	5.177	4.948
#2	99.54	5.182	5.177	5.141	4.901	5.178	4.923
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	5.206	.9855	4.969	5.147	Q.8274	5.062	1.056
SDev	.005	.0002	.001	.006	.0263	.011	.006
%RSD	.0936	.0218	.0255	.1206	3.175	.2153	.5636
#1	5.203	.9854	4.970	5.151	Q.8459	5.070	1.052
#2	5.209	.9857	4.968	5.142	Q.8088	5.055	1.060
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail	QC Pass	QC Pass
Value	5.000	1.000	5.000	5.000	1.000	5.000	1.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.990	1.044	4.856
SDev	.001	.005	.007
%RSD	.0130	.4755	.1462
#1	4.989	1.048	4.851
#2	4.990	1.041	4.861
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

010071

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	698051	10000	--	--	--	--	--
SDev	7032.884	.0000000	--	--	--	--	--
%RSD	1.007503	.0000000	--	--	--	--	--
#1	693078	10000	--	--	--	--	--
#2	703024	10000	--	--	--	--	--

Analysis Report Blank Sample 05/17/05 03:45:12 PM page 1

Method: DAILY2 Sample Name: ICB/CCB Operator: 010072
Run Time: 05/17/05 15:40:38
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	-.0098	-.0001	.0056	-.0000	.0001	.0018
SDev	.0013	.0029	.0015	.0005	.0002	.0000	.0047
%RSD	186.1	29.55	1307.	9.529	919.8	44.90	259.9
#1	.0002	-.0077	.0009	.0060	-.0001	.0000	-.0015
#2	-.0016	-.0118	-.0012	.0052	.0001	.0001	.0051
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0012	-.0005	-.0001	.0006	-.0002	-.0145	-.0137
SDev	.0017	.0001	.0003	.0005	.0004	.0214	.0096
%RSD	139.4	13.04	227.3	86.85	183.7	148.0	69.76
#1	-.0000	-.0005	-.0004	.0002	-.0005	.0007	-.0069
#2	-.0024	-.0006	.0001	.0009	.0001	L-.0296	-.0205
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	-.0010	.0001	-.0065	-.0000	.0012	L-.1776	.0069
SDev	.0003	.0001	.0024	.0001	.0008	.1019	.0057
%RSD	30.94	108.3	36.08	494.3	65.49	57.36	83.04
#1	-.0008	.0001	-.0049	-.0001	.0006	L-.1056	.0110
#2	-.0012	.0000	-.0082	.0000	.0017	L-.2497	.0029
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	.0007	.0033	-.0010	-.0000	-.0033	-.0077	-.0048
SDev	.0015	.0128	.0041	.0009	.0030	.0100	.0004
%RSD	233.9	394.1	402.2	13240.	90.42	129.7	7.951
#1	-.0004	-.0058	.0019	-.0007	-.0012	L-.0148	-.0045
#2	.0017	H.0123	-.0039	.0007	L-.0054	-.0006	-.0051
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

010073

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.5	-.0039	-.0001	-.0012	-.0003	-.0013	-.0011
SDev	.3	.0077	.0018	.0030	.0007	.0038	.0015
%RSD	.2838	201.0	2656.	263.3	226.5	286.7	146.5
#1	101.7	.0016	.0012	.0010	.0002	.0014	.0000
#2	101.3	-.0093	-.0013	-.0033	-.0008	-.0040	-.0021
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	-.0036	.0001	.0033	-.0436	.0001	.0011
SDev	.0000	.0009	.0003	.0008	.0149	.0006	.0001
%RSD	41.97	24.41	260.5	24.60	34.23	417.8	12.93
#1	-.0000	-.0043	-.0001	.0038	-.0331	-.0003	.0012
#2	-.0000	-.0030	.0003	.0027	-.0542	.0006	.0010
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0000	-.0003
SDev	.0002	.0001	.0009
%RSD	1716.	282.6	334.9
#1	-.0001	-.0000	-.0009
#2	.0001	.0001	.0004
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010074

IntStd	1	2	3	4	5	6	
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	717155	10000	--	--	--	--	--
SDev	2002.526	.0000000	--	--	--	--	--
%RSD	.2792320	.0000000	--	--	--	--	--
#1	718571	10000	--	--	--	--	--
#2	715739	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: pbw-E17H1 Operator:
Run Time: 05/17/05 15:45:23
Comment:
Mode: CONC Corr. Factor: 1

010075

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	.0041	-.0025	.0050	-.0000	.0000	.0013
SDev	.0001	.0009	.0056	.0008	.0002	.0000	.0031
%RSD	38.79	21.15	220.9	15.99	2862.	96.89	236.3
#1	-.0004	.0035	L-.0064	.0056	.0002	.0001	.0035
#2	-.0002	.0047	.0014	.0044	-.0002	.0000	-.0009
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0028	-.0003	-.0003	-.0001	.0005	L-.0303	-.0140
SDev	.0005	.0003	.0007	.0015	.0008	.0156	.0112
%RSD	17.66	76.48	266.6	1247.	165.2	51.30	79.62
#1	.0032	-.0005	-.0008	.0010	.0011	L-.0413	-.0061
#2	.0025	-.0002	.0002	-.0012	-.0001	-.0193	-.0219
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	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	-.0013	.0000	-.0043	-.0000	.0006	L-.1945	-.0080
SDev	.0000	.0000	.0011	.0001	.0014	.0547	.0000
%RSD	.6561	8.676	25.53	2619.	238.4	28.10	.0367
#1	-.0012	.0000	-.0050	.0001	.0016	L-.1559	-.0080
#2	-.0013	.0000	-.0035	-.0001	-.0004	L-.2332	-.0080
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	.0009	.0033	.0010	-.0013	-.0044	-.0039	-.0008
SDev	.0005	.0040	.0083	.0041	.0006	.0062	.0022
%RSD	49.80	121.4	868.9	310.3	14.15	161.6	285.1
#1	.0013	.0005	-.0049	.0016	-.0040	-.0083	-.0023
#2	.0006	.0061	.0068	-.0042	-.0048	.0006	.0008
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

010076

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.52	.0023	.0012	.0044	-.0005	.0016	.0023
SDev	.48	.0019	.0001	.0022	.0000	.0007	.0008
%RSD	.4873	86.63	8.779	49.70	7.780	45.76	34.02
#1	97.18	.0009	.0011	.0029	-.0006	.0011	.0018
#2	97.85	.0036	.0013	.0060	-.0005	.0021	.0029
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0017	.0001	-.0022	-.0494	-.0003	.0024
SDev	.0000	.0037	.0006	.0013	.0079	.0015	.0009
%RSD	18.06	223.5	847.8	61.57	15.93	488.3	38.09
#1	-.0000	.0043	.0005	-.0031	-.0549	.0007	.0031
#2	-.0000	-.0010	-.0003	-.0012	-.0438	-.0013	.0018
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0002	-.0001
SDev	.0002	.0000	.0008
%RSD	244.0	17.24	1228.
#1	.0003	.0002	.0005
#2	-.0001	.0003	-.0006
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010077

IntStd	1	2	3	4	5	6	
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	688788	10000	--	--	--	--	--
SDev	3381.385	.0000000	--	--	--	--	--
%RSD	.4909180	.0000000	--	--	--	--	--
#1	686397	10000	--	--	--	--	--
#2	691179	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: pbw-E17H1 Operator:
Run Time: 05/17/05 15:51:14
Comment:
Mode: CONC Corr. Factor: 1

010078

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	-.0084	-.0024	.0034	-.0000	.0001	.0011
SDev	.0011	.0093	.0012	.0002	.0001	.0000	.0010
%RSD	186.4	109.9	48.97	4.822	187.3	7.623	90.74
#1	-.0014	-.0150	-.0016	.0035	-.0001	.0001	.0004
#2	.0002	-.0019	-.0032	.0033	.0000	.0001	.0018
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0015	-.0002	-.0003	-.0002	-.0006	.0020	-.0130
SDev	.0041	.0004	.0009	.0000	.0002	.0179	.0194
%RSD	269.3	145.7	350.2	21.93	38.29	881.1	149.6
#1	-.0014	-.0005	-.0009	-.0001	-.0007	-.0106	-.0267
#2	.0044	.0000	.0004	-.0002	-.0004	.0147	.0008
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	-.0008	.0000	-.0081	-.0002	.0003	-.0486	.0044
SDev	.0016	.0001	.0098	.0002	.0008	.4127	.0045
%RSD	210.4	879.6	120.5	88.18	269.6	849.3	101.6
#1	-.0019	-.0001	-.0150	-.0001	.0009	L-.3404	.0012
#2	.0004	.0001	-.0012	-.0003	-.0003	H.2432	.0076
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	.0011	.0000	-.0040	-.0012	.0006	-.0072
SDev	.0006	.0028	.0001	.0007	.0071	.0006	.0007
%RSD	140.1	253.5	368.0	18.07	588.0	88.53	10.13
#1	.0008	-.0009	-.0001	-.0045	L-.0062	.0002	-.0077
#2	.0000	.0031	.0001	-.0035	.0038	.0010	-.0067
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

010079

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.9	-.0042	.0039	-.0007	-.0026	.0012	.0013
SDev	1.2	.0043	.0036	.0074	.0005	.0010	.0005
%RSD	1.148	101.2	91.98	1019.	20.19	80.18	41.44
#1	101.7	-.0072	.0064	-.0059	L-.0030	.0019	.0017
#2	100.1	-.0012	.0014	.0045	-.0023	.0005	.0009
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	-.0018	-.0000	.0033	-.0345	-.0003	-.0009
SDev	.0001	.0049	.0001	.0027	.0543	.0002	.0031
%RSD	268.6	268.3	117.1	82.93	157.6	49.01	356.7
#1	-.0001	.0016	-.0001	.0014	-.0729	-.0002	-.0030
#2	.0000	-.0053	-.0000	.0053	.0040	-.0005	.0013
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0007	-.0003
SDev	.0001	.0007	.0000
%RSD	105.4	110.9	12.09
#1	-.0001	.0001	-.0003
#2	-.0000	.0012	-.0003
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010080

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	712538	10000	--	--	--	--	--
SDev	8249.815	.0000000	--	--	--	--	--
%RSD	1.157806	.0000000	--	--	--	--	--
#1	718372	10000	--	--	--	--	--
#2	706705	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: lcsw-E17H1 Operator:
Run Time: 05/17/05 15:55:59
Comment:
Mode: CONC Corr. Factor: 1

010081

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0509	1.980	2.035	.0035	2.002	.0504	.0051
SDev	.0008	.005	.004	.0016	.001	.0001	.0022
%RSD	1.491	.2635	.2026	45.52	.0552	.1691	42.09
#1	.0515	1.984	2.038	.0047	2.001	.0505	.0066
#2	.0504	1.976	2.032	.0024	2.002	.0503	.0036

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.83	.0517	.5138	.2017	.2532	1.125	18.39
SDev	.05	.0004	.0001	.0003	.0003	.010	.05
%RSD	.2411	.7899	.0289	.1711	.1335	.8878	.2736
#1	20.87	.0520	.5137	.2019	.2535	1.132	18.36
#2	20.80	.0514	.5139	.2014	.2530	1.118	18.43

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	4.165	20.71	.5205	-.0000	18.76	27.39
SDev	.0013	.009	.03	.0001	.0003	.27	.10
%RSD	220.2	.2232	.1664	.0241	1312.	1.433	.3545
#1	.0015	4.159	20.73	.5206	.0002	18.95	27.32
#2	-.0003	4.172	20.69	.5204	-.0002	18.57	27.46

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4989	.0078	.5023	.4938	.0021	.0065	.4900
SDev	.0041	.0091	.0022	.0014	.0050	.0085	.0019
%RSD	.8291	117.3	.4467	.2796	236.1	130.0	.3876
#1	.5019	.0142	.5007	.4948	.0057	.0005	.4887
#2	.4960	.0013	.5039	.4928	-.0014	.0126	.4914

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	95.69	2.117	2.110	.0123	.4967	2.112	.0017
SDev	.77	.005	.007	.0039	.0002	.003	.0023
%RSD	.8037	.2197	.3278	31.65	.0347	.1449	137.2
#1	95.15	2.120	2.105	.0150	.4968	2.110	.0001
#2	96.24	2.114	2.115	.0095	.4965	2.114	.0033

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	-.0213	.0002	2.058	-.0059	.5093	-.0017
SDev	.0000	.0001	.0001	.019	.0663	.0011	.0011
%RSD	5.352	.3010	51.44	.9118	1126.	.2260	66.68
#1	.0008	-.0213	.0003	2.071	.0410	.5085	-.0025
#2	.0007	-.0213	.0001	2.045	-.0528	.5101	-.0009

010082

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.5158	.0007
SDev	.0001	.0013	.0007
%RSD	326.5	.2532	94.54
#1	.0000	.5167	.0012
#2	-.0001	.5148	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	675892	10000	--	--	--	--	--
SDev	5482.199	.0000000	--	--	--	--	--
%RSD	.8111051	.0000000	--	--	--	--	--
#1	672016	10000	--	--	--	--	--
#2	679769	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 262525 Operator:
Run Time: 05/17/05 16:00:45
Comment:
Mode: CONC Corr. Factor: 1

010083

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0055	-.0012	.0019	-.0001	.0001	.0056
SDev	.0001	.0003	.0019	.0003	.0001	.0000	.0035
%RSD	32.60	4.931	153.8	14.08	98.23	4.969	61.85
#1	-.0005	.0057	-.0026	.0021	-.0000	.0001	.0081
#2	-.0003	.0053	.0001	.0017	-.0002	.0001	.0032

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.2401	-.0003	-.0002	.0003	.0006	-.0094	.0477
SDev	.0008	.0005	.0010	.0007	.0004	.0080	.0011
%RSD	.3203	159.7	440.5	214.5	63.68	84.67	2.411
#1	.2407	-.0006	-.0009	.0008	.0009	-.0150	.0469
#2	.2396	.0000	.0005	-.0002	.0003	-.0038	.0485

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0010	.0001	.0299	-.0001	.0002	.7406	.8759
SDev	.0003	.0000	.0029	.0001	.0002	.1620	.0004
%RSD	31.99	16.46	9.734	65.64	93.65	21.87	.0504
#1	-.0008	.0001	.0320	-.0001	.0003	.6261	.8763
#2	-.0013	.0001	.0279	-.0002	.0001	.8552	.8756

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0025	-.0001	.0014	-.0033	.1253	-.0001
SDev	.0002	.0004	.0033	.0024	.0020	.0033	.0006
%RSD	14770.	17.46	3297.	176.6	59.32	2.649	1212.
#1	.0002	.0022	.0022	-.0003	-.0047	.1230	-.0005
#2	-.0002	.0028	-.0024	.0031	-.0019	.1277	.0004

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.13	.0001	.0022	.0086	.0009	.0015	.0026
SDev	.36	.0003	.0024	.0040	.0005	.0015	.0011
%RSD	.3663	415.8	105.2	46.62	57.41	95.05	40.34
#1	97.39	-.0002	.0039	.0058	.0005	.0026	.0019
#2	96.88	.0003	.0006	.0115	.0013	.0005	.0034

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0016	.0001	.0049	-.0336	.0004	.0023
SDev	.0000	.0020	.0002	.0029	.0072	.0001	.0019
%RSD	9.423	126.9	127.3	59.89	21.50	27.24	83.83
#1	.0001	-.0002	.0003	.0069	-.0387	.0005	.0036
#2	.0001	-.0030	.0000	.0028	-.0285	.0003	.0009

010084

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	-.0002	-.0004
SDev	.0001	.0001	.0002
%RSD	317.7	40.48	66.27
#1	.0001	-.0001	-.0005
#2	-.0001	-.0003	-.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	686058	10000	--	--	--	--	--
SDev	2514.472	.0000000	--	--	--	--	--
%RSD	.3665101	.0000000	--	--	--	--	--
#1	687836	10000	--	--	--	--	--
#2	684280	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262525d Operator:
Run Time: 05/17/05 16:05:31
Comment:
Mode: CONC Corr. Factor: 1

010085

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0021	-.0003	.0012	-.0000	.0000	.0013
SDev	.0006	.0015	.0008	.0009	.0001	.0000	.0010
%RSD	165.6	73.20	239.2	73.30	454.9	2.142	83.55
#1	-.0008	.0032	-.0008	.0006	.0000	.0000	.0020
#2	.0001	.0010	.0002	.0019	-.0001	.0000	.0005

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.2412	-.0003	.0011	-.0004	.0000	.0002	.0584
SDev	.0004	.0001	.0004	.0001	.0003	.0037	.0167
%RSD	.1803	42.22	36.78	39.10	1632.	2076.	28.62
#1	.2415	-.0002	.0014	-.0003	.0002	.0028	.0703
#2	.2409	-.0004	.0008	-.0005	-.0002	-.0025	.0466

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0010	.0001	.0337	-.0001	-.0003	.4928	.8761
SDev	.0003	.0001	.0028	.0001	.0000	.0321	.0042
%RSD	29.43	78.74	8.324	193.2	15.93	6.508	.4787
#1	-.0012	.0001	.0317	.0000	-.0002	.5155	.8790
#2	-.0008	.0000	.0357	-.0001	-.0003	.4701	.8731

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0011	.0045	.0036	-.0055	.0002	.1210	-.0036
SDev	.0004	.0016	.0059	.0026	.0005	.0034	.0004
%RSD	32.36	36.91	164.0	46.89	258.0	2.833	12.52
#1	.0009	.0033	.0078	-.0073	.0005	.1234	-.0032
#2	.0014	.0056	-.0006	-.0036	-.0002	.1186	-.0039

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.28	.0045	.0019	.0109	-.0024	.0027	.0010
SDev	.23	.0002	.0001	.0004	.0003	.0000	.0008
%RSD	.2352	4.123	8.255	4.006	11.23	1.501	83.73
#1	97.45	.0046	.0018	.0112	-.0022	.0027	.0004
#2	97.12	.0043	.0020	.0106	-.0026	.0028	.0015

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0022	-.0000	.0003	-.0617	-.0002	.0006
SDev	.0000	.0017	.0000	.0028	.0213	.0000	.0010
%RSD	11.58	75.57	368.5	876.9	34.48	7.061	184.1
#1	.0001	-.0034	-.0000	.0023	-.0467	-.0002	-.0002
#2	.0002	-.0010	.0000	-.0016	-.0768	-.0003	.0013

010086

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0004	-.0008
SDev	.0002	.0002	.0004
%RSD	146.1	37.72	57.54
#1	.0000	.0006	-.0005
#2	-.0002	.0003	-.0011

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	687163	10000	--	--	--	--	--
SDev	1578.262	.0000000	--	--	--	--	--
%RSD	.2296780	.0000000	--	--	--	--	--
#1	688279	10000	--	--	--	--	--
#2	686047	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 252525L df250 Operator:
Run Time: 05/17/05 16:10:16
Comment:
Mode: CONC Corr. Factor: 1

010087

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	-.0019	-.0013	.0015	.0000	.0001	.0030
SDev	.0015	.0067	.0031	.0010	.0001	.0000	.0175
%RSD	834.8	348.3	240.6	64.00	1116.	17.38	586.0
#1	-.0012	-.0066	-.0034	.0022	.0001	.0001	-.0094
#2	.0009	.0028	.0009	.0008	-.0001	.0001	.0154

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0502	-.0004	.0003	.0007	.0008	-.0076	.0028
SDev	.0029	.0003	.0006	.0009	.0002	.0325	.0296
%RSD	5.826	74.83	233.4	143.4	27.35	425.8	1060.
#1	.0481	-.0007	-.0002	-.0000	.0010	-.0306	-.0181
#2	.0522	-.0002	.0007	.0013	.0007	.0154	.0237

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0014	.0000	.0044	.0000	-.0002	-.0341	.1680
SDev	.0019	.0001	.0036	.0000	.0002	.2910	.0110
%RSD	135.5	405.6	82.93	985.2	72.00	852.3	6.537
#1	-.0028	-.0001	.0018	-.0000	-.0001	-.2399	.1602
#2	-.0001	.0001	.0069	.0000	-.0004	.1716	.1758

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0031	.0006	.0004	-.0021	.0186	-.0000
SDev	.0001	.0021	.0020	.0021	.0080	.0064	.0068
%RSD	507.6	67.88	307.8	485.3	387.0	34.18	36250.
#1	.0001	.0045	-.0008	.0019	-.0077	.0141	.0048
#2	-.0001	.0016	.0020	-.0011	.0036	.0232	-.0048

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.99	-.0013	.0012	.0056	.0005	.0004	-.0023
SDev	.19	.0031	.0007	.0039	.0008	.0006	.0004
%RSD	.1980	237.2	56.70	69.81	145.2	152.7	17.10
#1	96.85	.0009	.0007	.0029	.0011	.0008	-.0026
#2	97.12	-.0035	.0017	.0084	-.0000	-.0000	-.0020

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0017	-.0000	.0017	-.0526	.0007	-.0006
SDev	.0001	.0047	.0002	.0069	.0667	.0003	.0017
%RSD	759.2	281.6	663.6	418.1	126.8	36.75	262.9
#1	-.0001	.0050	.0001	-.0032	-.0998	.0009	.0005
#2	.0001	-.0017	-.0001	.0065	-.0054	.0005	-.0018

010088

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	-.0000	.0002
SDev	.0000	.0004	.0000
%RSD	869.3	1384.	8.650
#1	-.0000	-.0003	.0002
#2	.0000	.0003	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	685018	10000	--	--	--	--	--
SDev	1370.373	.0000000	--	--	--	--	--
%RSD	.2000492	.0000000	--	--	--	--	--
#1	684049	10000	--	--	--	--	--
#2	685987	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 262525s Operator:
Run Time: 05/17/05 16:15:01
Comment:
Mode: CONC Corr. Factor: 1

010089

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0502	1.985	2.042	-.0001	2.013	.0506	-.0020
SDev	.0002	.004	.000	.0001	.002	.0000	.0006
%RSD	.3462	.1825	.0207	100.6	.0840	.0292	29.80
#1	.0501	1.988	2.042	-.0001	2.012	.0506	-.0025
#2	.0503	1.982	2.042	-.0000	2.014	.0506	-.0016

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	21.27	.0518	.5147	.2032	.2550	1.126	18.93
SDev	.01	.0002	.0001	.0003	.0014	.010	.02
%RSD	.0288	.3937	.0149	.1650	.5605	.9293	.0962
#1	21.27	.0516	.5148	.2029	.2540	1.118	18.92
#2	21.27	.0519	.5147	.2034	.2560	1.133	18.94

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	4.146	20.95	.5226	-.0016	19.65	29.13
SDev	.0005	.002	.00	.0004	.0006	.01	.04
%RSD	79.08	.0480	.0123	.0709	39.46	.0540	.1374
#1	-.0010	4.147	20.95	.5228	-.0011	19.65	29.16
#2	-.0003	4.145	20.94	.5223	-.0020	19.66	29.10

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4980	.0064	.4976	.4965	-.0036	.1298	.4939
SDev	.0018	.0089	.0061	.0050	.0012	.0090	.0056
%RSD	.3584	139.1	1.223	1.010	32.33	6.903	1.123
#1	.4968	.0001	.5019	.5001	-.0045	.1362	.4978
#2	.4993	.0127	.4933	.4930	-.0028	.1235	.4900

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.17	2.124	2.099	.0085	.4969	2.108	-.0003
SDev	.09	.005	.001	.0015	.0054	.003	.0003
%RSD	.0903	.2531	.0666	17.77	1.081	.1292	119.3
#1	97.11	2.128	2.100	.0095	.5007	2.109	-.0005
#2	97.23	2.120	2.098	.0074	.4931	2.106	-.0000

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	-.0223	-.0002	2.062	-.0396	.5109	-.0018
SDev	.0000	.0003	.0000	.005	.0117	.0008	.0008
%RSD	2.764	1.339	10.61	.2276	29.49	.1531	46.71
#1	.0008	-.0221	-.0002	2.065	-.0313	.5114	-.0024
#2	.0008	-.0225	-.0002	2.059	-.0479	.5103	-.0012

010090

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0003	.5163	-.0003
SDev	.0001	.0006	.0001
%RSD	33.51	.1242	31.11
#1	-.0004	.5168	-.0004
#2	-.0002	.5159	-.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	686327	10000	--	--	--	--	--
SDev	575.5849	.0000000	--	--	--	--	--
%RSD	.0838645	.0000000	--	--	--	--	--
#1	685920	10000	--	--	--	--	--
#2	686734	10000	--	--	--	--	--

Method: DAILY2 Sample Name: cri Operator:
Run Time: 05/17/05 16:23:28
Comment:
Mode: CONC Corr. Factor: 1

010091

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0193	.0894	.0195	.1018	.0203	.0099	.0024
SDev	.0002	.0004	.0001	.0003	.0000	.0000	.0058
%RSD	1.200	.4889	.4419	.2826	.0373	.0527	238.8
#1	.0192	.0891	.0195	.1016	.0203	.0099	-.0017
#2	.0195	.0897	.0196	.1020	.0203	.0099	.0065
Errors	LC Pass	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass	NOCHECK
High	.0300		.0300	.1500	.0300	.0150	
Low	.0100		.0100	.0500	.0100	.0050	

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0016	.0101	.1018	.0200	.0491	.0931	-.0284
SDev	.0003	.0001	.0003	.0002	.0002	.0175	.0048
%RSD	16.10	1.078	.2426	.9086	.4610	18.76	17.03
#1	.0014	.0102	.1016	.0198	.0489	.0808	-.0319
#2	.0017	.0101	.1020	.0201	.0492	.1055	-.0250
Errors	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	NOCHECK
High		.0150	.1500	.0300	.0750	.1500	
Low		.0050	.0500	.0100	.0250	.0500	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0010	.0781	-.0043	.0311	.0197	-.3141	.0000
SDev	.0000	.0000	.0027	.0000	.0013	.0357	.0019
%RSD	.5228	.0174	61.43	.0841	6.355	11.38	30370.
#1	-.0010	.0781	-.0025	.0311	.0188	-.3393	-.0014
#2	-.0010	.0781	-.0062	.0312	.0206	-.2888	.0014
Errors	NOCHECK	LC Pass	NOCHECK	LC Pass	LC Pass	NOCHECK	NOCHECK
High		.1500		.0450	.0300		
Low		.0500		.0150	.0100		

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0813	.1084	.0054	.0046	-.0065	.0039	.1189
SDev	.0015	.0089	.0042	.0028	.0019	.0014	.0019
%RSD	1.820	8.257	76.10	60.23	29.65	36.80	1.611
#1	.0803	.1148	.0025	.0066	-.0078	.0049	.1175
#2	.0824	.1021	.0084	.0027	-.0051	.0029	.1202
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	LC Pass
High	.1200	.1500					.1800
Low	.0400	.0500					.0600

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

010092

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.40	.0108	.0150	.1114	.0049	.0136	.1066
SDev	.13	.0037	.0006	.0011	.0005	.0008	.0002
%RSD	.1305	34.11	3.792	1.016	9.667	6.219	.1653
#1	99.49	.0082	.0154	.1106	.0052	.0130	.1067
#2	99.30	.0134	.0146	.1122	.0046	.0142	.1065
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.1500	.0090	.0150	.1500
Low				.0500	.0030	.0050	.0500

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0216	-.0019	.0197	.0198	.1624	.1018	-.0014
SDev	.0000	.0028	.0000	.0010	.0049	.0001	.0027
%RSD	.0607	147.5	.0547	4.947	2.990	.0726	185.0
#1	.0216	.0001	.0197	.0191	.1590	.1018	.0004
#2	.0216	-.0038	.0197	.0205	.1659	.1017	-.0033
Errors	LC Pass	NOCHECK	LC Pass	LC Pass	NOCHECK	LC Pass	NOCHECK
High	.0300		.0300	.0300		.1500	
Low	.0100		.0100	.0100		.0500	

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0410	.0943
SDev	.0001	.0003	.0004
%RSD	297.5	.7281	.4152
#1	.0000	.0408	.0940
#2	-.0001	.0413	.0945
Errors	NOCHECK	LC Pass	NOCHECK
High		.0600	
Low		.0200	

010093

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	702058	10000	--	--	--	--	--
SDev	917.8246	.0000000	--	--	--	--	--
%RSD	.1307335	.0000000	--	--	--	--	--
#1	702707	10000	--	--	--	--	--
#2	701409	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: icsa Operator: 010094
Run Time: 05/17/05 16:28:14
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	514.7	-.0033	-.0197	.0023	.0001	.0112
SDev	.0015	.0	.0009	.0004	.0001	.0000	.0004
%RSD	789700.	.0054	27.95	1.983	2.325	12.32	3.351
#1	-.0011	514.6	-.0026	-.0199	.0023	.0001	.0115
#2	.0011	514.7	-.0039	-.0194	.0024	.0001	.0109
Errors	NOCHECK	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High		600.0					
Low		400.0					

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	467.5	.0005	.0007	-.0001	.0012	191.9	.0087
SDev	3.7	.0002	.0001	.0002	.0003	.7	.0309
%RSD	.7980	37.57	17.90	141.8	25.48	.3550	354.0
#1	464.8	.0007	.0008	-.0002	.0010	191.4	-.0131
#2	470.1	.0004	.0006	.0000	.0014	192.3	.0306
Errors	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	LC Pass	NOCHECK
High	600.0					240.0	
Low	400.0					160.0	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0047	.0004	542.3	-.0037	-.0022	.2982	-.0191
SDev	.0009	.0001	2.7	.0001	.0035	.0455	.0026
%RSD	19.68	17.63	.5051	2.933	161.5	15.26	13.86
#1	.0041	.0004	540.4	-.0037	.0003	.2660	-.0172
#2	.0054	.0005	544.2	-.0036	-.0047	.3303	-.0209
Errors	NOCHECK	NOCHECK	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High			600.0				
Low			400.0				

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0024	-.0151	.0409	-.0333	.0126	.0086	.0034
SDev	.0034	.0111	.0035	.0006	.0060	.0055	.0023
%RSD	139.4	73.57	8.592	1.830	47.80	63.27	66.34
#1	.0000	-.0230	.0384	-.0329	.0084	.0125	.0018
#2	.0048	-.0073	.0434	-.0337	.0169	.0048	.0050
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High							
Low							

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

010095

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	90.48	.0029	.0010	.0024	-.0086	.0016	-.0075
SDev	1.79	.0051	.0066	.0042	.0008	.0027	.0014
%RSD	1.984	176.2	678.5	177.8	8.943	166.3	18.83
#1	91.75	-.0007	.0057	-.0006	-.0091	.0035	-.0065
#2	89.21	.0065	-.0037	.0053	-.0080	-.0003	-.0085
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High							
Low							

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0169	.0148	-.0012	.0043	.0068	.0002	.0029
SDev	.0000	.0081	.0001	.0019	.0396	.0001	.0027
%RSD	.2389	54.51	5.352	43.15	584.3	36.27	91.58
#1	.0168	.0206	-.0012	.0056	-.0212	.0002	.0048
#2	.0169	.0091	-.0013	.0030	.0348	.0001	.0010
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High							
Low							

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0004	.0077	-.0002
SDev	.0001	.0006	.0002
%RSD	13.34	7.679	100.2
#1	-.0004	.0081	-.0001
#2	-.0003	.0073	-.0004
Errors	NOCHECK	NOCHECK	NOCHECK
High			
Low			

010096

IntStd	1	2	3	4	5	6	
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	639108	10000	--	--	--	--	--
SDev	12658.63	.0000000	--	--	--	--	--
%RSD	1.980671	.0000000	--	--	--	--	--
#1	648059	10000	--	--	--	--	--
#2	630157	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: icsab Operator:
Run Time: 05/17/05 16:32:59 010097
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.091	517.8	1.038	1.044	.5242	.4869	.0066
SDev	.002	.7	.000	.004	.0007	.0001	.0054
%RSD	.2231	.1369	.0266	.3480	.1394	.0295	82.85
#1	1.092	518.3	1.037	1.042	.5247	.4870	.0104
#2	1.089	517.3	1.038	1.047	.5237	.4868	.0027
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	NOCHECK
High	1.200	600.0	1.200	1.200	.6000	.6000	
Low	.8000	400.0	.8000	.8000	.4000	.4000	

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	471.4	.9892	.5001	.4857	.5486	193.2	-.0169
SDev	.6	.0032	.0000	.0003	.0000	.1	.0131
%RSD	.1224	.3249	.0005	.0672	.0035	.0382	77.44
#1	471.0	.9869	.5001	.4855	.5485	193.1	-.0262
#2	471.8	.9914	.5001	.4860	.5486	193.2	-.0076
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	NOCHECK
High	600.0	1.200	.6000	.6000	.6000	240.0	
Low	400.0	.8000	.4000	.4000	.4000	160.0	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0038	H1.294	547.5	.5086	1.047	.4059	-.0243
SDev	.0002	.005	.0	.0002	.003	.3599	.0024
%RSD	4.479	.3494	.0077	.0312	.3315	88.68	9.867
#1	.0037	H1.297	547.4	.5085	1.044	.1514	-.0260
#2	.0039	H1.291	547.5	.5088	1.049	.6604	-.0226
Errors	NOCHECK	LC High	LC Pass	LC Pass	LC Pass	NOCHECK	NOCHECK
High		1.200	600.0	.6000	1.200		
Low		.8000	400.0	.4000	.8000		

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9326	1.046	1.034	.9427	.0074	.0172	1.062
SDev	.0036	.009	.005	.0091	.0041	.0001	.002
%RSD	.3881	.8836	.4856	.9598	55.28	.5718	.1576
#1	.9351	1.053	1.030	.9363	.0045	.0173	1.063
#2	.9300	1.040	1.037	.9490	.0103	.0172	1.061
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	LC Pass
High	1.200	1.200					1.200
Low	.8000	.8000					.8000

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

010098

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	91.01	1.041	1.020	1.078	.9730	1.027	1.027
SDev	.41	.002	.012	.001	.0077	.007	.001
%RSD	.4553	.1476	1.155	.0505	.7919	.7147	.0595
#1	91.30	1.042	1.012	1.078	.9676	1.022	1.027
#2	90.71	1.040	1.029	1.078	.9785	1.032	1.026
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High					1.200	1.200	1.200
Low					.8000	.8000	.8000

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.092	.0135	1.000	1.008	.9890	.5135	.0007
SDev	.001	.0008	.000	.010	.0112	.0004	.0009
%RSD	.0938	5.978	.0418	.9857	1.134	.0795	124.9
#1	1.091	.0129	1.000	1.001	.9811	.5132	.0001
#2	1.093	.0141	.9998	1.015	.9969	.5138	.0013
Errors	LC Pass	NOCHECK	LC Pass	LC Pass	NOCHECK	LC Pass	NOCHECK
High	1.200		1.200	1.200		.6000	
Low	.8000		.8000	.8000		.4000	

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0003	1.009	.9584
SDev	.0000	.001	.0017
%RSD	5.346	.1336	.1728
#1	-.0003	1.008	.9573
#2	-.0003	1.010	.9596
Errors	NOCHECK	LC Pass	NOCHECK
High		1.200	
Low		.8000	

010099

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	642832	10000	--	--	--	--	--
SDev	2897.724	.0000000	--	--	--	--	--
%RSD	.4507746	.0000000	--	--	--	--	--
#1	644881	10000	--	--	--	--	--
#2	640783	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: ccv2 Operator: 010100
Run Time: 05/17/05 16:41:25
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9828	9.841	5.071	4.898	9.949	.9872	5.045
SDev	.0009	.015	.017	.029	.042	.0014	.015
%RSD	.0933	.1535	.3267	.5934	.4187	.1460	.2923
#1	.9834	9.831	5.059	4.877	9.919	.9882	5.035
#2	.9821	9.852	5.083	4.919	9.978	.9862	5.056
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	1.100	11.00	5.500	5.500	11.00	1.100	5.500
Low	.9000	9.000	4.500	4.500	9.000	.9000	4.500

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.11	1.026	5.177	1.982	2.031	10.50	18.78
SDev	.06	.001	.007	.007	.006	.05	.08
%RSD	.3084	.0572	.1445	.3306	.2877	.4895	.4489
#1	20.15	1.026	5.183	1.986	2.027	10.53	18.72
#2	20.07	1.025	5.172	1.977	2.035	10.46	18.84
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	22.00	1.100	5.500	2.200	2.200	11.00	22.00
Low	18.00	.9000	4.500	1.800	1.800	9.000	18.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.921	5.212	20.07	1.043	5.145	28.26	H41.20
SDev	.005	.015	.02	.002	.008	.03	.10
%RSD	.0938	.2869	.0897	.1480	.1631	.1232	.2452
#1	4.917	5.201	20.09	1.044	5.151	28.29	H41.13
#2	4.924	5.222	20.06	1.042	5.139	28.24	H41.27
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High
High	5.500	5.500	22.00	1.100	5.500	33.00	33.00
Low	4.500	4.500	18.00	.9000	4.500	27.00	27.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.893	5.116	4.905	4.866	.9987	.9867	1.016
SDev	.004	.032	.010	.026	.0019	.0164	.003
%RSD	.0825	.6251	.2099	.5264	.1944	1.662	.2659
#1	4.890	5.139	4.897	4.884	1.000	.9751	1.014
#2	4.896	5.093	4.912	4.848	.9973	.9983	1.017
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	5.500	5.500			1.100	1.100	1.100
Low	4.500	4.500			.9000	.9000	.9000

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

010101

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.17	5.176	5.136	5.147	4.879	5.149	4.926
SDev	1.39	.030	.016	.006	.014	.001	.011
%RSD	1.398	.5760	.3151	.1158	.2797	.0165	.2310
#1	98.19	5.155	5.147	5.151	4.888	5.150	4.934
#2	100.1	5.198	5.125	5.143	4.869	5.149	4.918
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				5.500	5.500	5.500	5.500
Low				4.500	4.500	4.500	4.500

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.217	.9777	4.964	5.146	L.8355	5.062	1.063
SDev	.006	.0027	.001	.021	.0015	.003	.000
%RSD	.1145	.2774	.0103	.4138	.1795	.0554	.0143
#1	5.213	.9758	4.964	5.131	L.8344	5.060	1.063
#2	5.221	.9796	4.965	5.161	L.8365	5.064	1.063
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	LC Pass	LC Pass
High	5.500	1.100	5.500	5.500	1.100	5.500	1.100
Low	4.500	.9000	4.500	4.500	.9000	4.500	.9000

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.986	1.042	4.895
SDev	.003	.004	.005
%RSD	.0519	.3960	.1016
#1	4.984	1.045	4.892
#2	4.988	1.039	4.899
Errors	LC Pass	LC Pass	LC Pass
High	5.500	1.100	5.500
Low	4.500	.9000	4.500

010102

IntStd	1	2	3	4	5	6	
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	700436	10000	--	--	--	--	--
SDev	9736.860	.0000000	--	--	--	--	--
%RSD	1.390114	.0000000	--	--	--	--	--
#1	693551	10000	--	--	--	--	--
#2	707321	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: ccb2 Operator:
Run Time: 05/17/05 16:48:01 010103
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	-.0082	.0001	.0043	-.0000	.0001	.0090
SDev	.0002	.0039	.0029	.0009	.0000	.0000	.0036
%RSD	56.05	47.68	2120.	20.96	144.1	19.98	39.27
#1	.0002	-.0109	-.0019	.0050	-.0001	.0001	.0065
#2	.0005	-.0054	.0022	.0037	.0000	.0001	H.0115
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0034	-.0004	.0010	-.0005	-.0005	.0012	-.0001
SDev	.0007	.0001	.0005	.0005	.0008	.0081	.0141
%RSD	21.82	26.66	50.49	95.64	168.7	688.9	10260.
#1	.0029	-.0003	.0006	-.0008	-.0010	.0069	-.0101
#2	.0039	-.0004	.0014	-.0002	.0001	-.0045	.0098
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0001	.0011	-.0001	.0008	-.0428	.0209
SDev	.0002	.0000	.0036	.0001	.0001	.1732	.0010
%RSD	25.26	9.755	323.9	71.13	8.717	404.9	5.015
#1	-.0008	.0001	-.0014	-.0001	.0009	L-.1653	.0217
#2	-.0006	.0001	.0037	-.0002	.0008	H.0797	.0202
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0083	-.0022	.0008	-.0001	-.0083	.0008
SDev	.0005	.0068	.0023	.0036	.0026	.0003	.0038
%RSD	597.5	82.19	104.3	422.0	2915.	3.681	468.2
#1	-.0004	H.0131	-.0006	.0034	-.0019	-.0085	.0035
#2	.0003	.0035	-.0038	-.0017	.0017	-.0081	-.0019
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

010104

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.3	-.0030	.0047	.0046	-.0001	.0022	.0036
SDev	.7	.0056	.0024	.0006	.0031	.0002	.0022
%RSD	.7200	183.1	51.17	14.10	2199.	10.93	60.11
#1	102.8	-.0070	.0065	.0042	.0021	.0020	.0021
#2	101.7	.0009	.0030	.0051	-.0023	.0023	H.0052
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	-.0006	.0001	.0047	-.0248	-.0002	-.0003
SDev	.0000	.0001	.0001	.0004	.0010	.0001	.0005
%RSD	10.56	24.00	140.8	9.038	4.214	48.57	150.5
#1	.0000	-.0005	.0001	.0050	-.0241	-.0003	.0000
#2	.0000	-.0007	.0000	.0044	-.0256	-.0001	-.0007
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0002	-.0003
SDev	.0000	.0002	.0003
%RSD	125.7	81.38	95.92
#1	-.0000	.0001	-.0004
#2	-.0000	.0003	-.0001
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010105

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	722232	10000	--	--	--	--	--
SDev	5205.013	.0000000	--	--	--	--	--
%RSD	.7206839	.0000000	--	--	--	--	--
#1	725913	10000	--	--	--	--	--
#2	718552	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: pbw-E17H2 Operator:
Run Time: 05/17/05 16:54:37
Comment:
Mode: CONC Corr. Factor: 1

010106

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	-.0009	.0011	.0017	.0000	.0001	.0087
SDev	.0011	.0071	.0022	.0029	.0001	.0000	.0143
%RSD	590.0	823.7	190.8	173.0	322.7	29.65	164.6
#1	-.0010	-.0059	.0027	.0037	.0001	.0001	-.0014
#2	.0006	.0042	-.0004	-.0004	-.0001	.0001	.0188

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0061	-.0002	-.0000	.0006	.0006	.0207	.0114
SDev	.0030	.0002	.0003	.0013	.0006	.0504	.0471
%RSD	48.79	86.06	4135.	221.0	88.35	242.9	412.9
#1	.0040	-.0004	-.0002	.0015	.0010	-.0149	-.0219
#2	.0083	-.0001	.0002	-.0003	.0002	.0563	.0447

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0011	.0001	-.0029	.0000	-.0002	.2294	.0117
SDev	.0017	.0002	.0120	.0001	.0005	.5992	.0132
%RSD	150.5	159.7	413.7	151.3	214.5	261.2	112.2
#1	-.0023	-.0000	-.0114	.0001	.0001	-.1943	.0024
#2	.0001	.0002	.0056	-.0000	-.0006	.6531	.0211

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0083	-.0050	-.0034	.0010	.0030	-.0015
SDev	.0007	.0047	.0018	.0001	.0095	.0042	.0037
%RSD	758.5	56.99	35.36	1.752	988.8	141.2	238.9
#1	-.0006	.0117	-.0037	-.0034	-.0058	.0060	.0011
#2	.0004	.0050	-.0062	-.0033	.0077	.0000	-.0041

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	98.31	-.0083	.0041	.0071	-.0039	-.0000	.0009
SDev	.62	.0001	.0033	.0041	.0005	.0022	.0035
%RSD	.6284	.8886	79.20	57.46	14.02	17930.	412.3
#1	98.74	-.0084	.0018	.0042	-.0035	-.0016	-.0016
#2	97.87	-.0083	.0064	.0100	-.0043	.0015	.0033

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	-.0011	.0003	.0000	-.0480	.0001	-.0012
SDev	.0000	.0034	.0002	.0014	.0345	.0012	.0000
%RSD	1089.	303.1	63.54	6821.	71.80	1912.	.0529
#1	-.0000	.0013	.0004	-.0010	-.0724	.0009	-.0012
#2	.0000	-.0035	.0002	.0010	-.0236	-.0008	-.0012

010107

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0003	-.0001
SDev	.0002	.0003	.0010
%RSD	1153.	99.09	1538.
#1	.0002	.0001	.0006
#2	-.0001	.0005	-.0008

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	694399	10000	--	--	--	--	--
SDev	4324.665	.0000000	--	--	--	--	--
%RSD	.6227925	.0000000	--	--	--	--	--
#1	697457	10000	--	--	--	--	--
#2	691341	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: lcsw-E17H2 Operator:
Run Time: 05/17/05 16:59:23
Comment:
Mode: CONC Corr. Factor: 1

010108

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0507	1.989	2.044	.0017	2.014	.0507	.0036
SDev	.0004	.001	.011	.0001	.000	.0000	.0008
%RSD	.7446	.0715	.5518	5.073	.0093	.0072	22.98
#1	.0504	1.988	2.052	.0018	2.013	.0507	.0042
#2	.0510	1.990	2.036	.0017	2.014	.0507	.0030

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.61	.0517	.5147	.2030	.2555	1.129	18.32
SDev	.01	.0003	.0005	.0006	.0004	.026	.00
%RSD	.0570	.6779	.1046	.2863	.1612	2.317	.0007
#1	20.60	.0514	.5151	.2026	.2552	1.148	18.32
#2	20.62	.0519	.5143	.2034	.2558	1.111	18.32

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	4.108	20.49	.5235	.0003	18.53	27.24
SDev	.0003	.001	.01	.0000	.0019	.02	.01
%RSD	52.17	.0219	.0414	.0056	651.3	.1090	.0431
#1	-.0004	4.108	20.49	.5235	-.0010	18.54	27.23
#2	-.0008	4.107	20.50	.5235	.0016	18.52	27.25

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4980	-.0001	.5051	.4954	-.0020	-.0099	.5048
SDev	.0047	.0013	.0027	.0048	.0009	.0044	.0101
%RSD	.9495	894.3	.5345	.9758	45.64	44.18	1.995
#1	.5013	-.0010	.5032	.4988	-.0026	-.0068	.4977
#2	.4946	.0007	.5070	.4919	-.0013	-.0131	.5119

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.43	2.119	2.099	.0087	.4986	2.106	-.0018
SDev	.60	.018	.013	.0017	.0023	.014	.0017
%RSD	.6207	.8356	.6064	19.85	.4658	.6850	92.94
#1	96.85	2.132	2.108	.0075	.5003	2.116	-.0030
#2	96.00	2.107	2.090	.0099	.4970	2.096	-.0006

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	-.0182	.0002	2.062	-.0386	.5127	-.0045
SDev	.0000	.0016	.0001	.000	.0048	.0003	.0030
%RSD	2.156	8.530	61.50	.0024	12.31	.0595	65.39
#1	.0007	-.0193	.0001	2.062	-.0420	.5125	-.0024
#2	.0007	-.0171	.0003	2.062	-.0353	.5129	-.0066

010109

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.5164	-.0000
SDev	.0001	.0005	.0002
%RSD	49.07	.0945	1346.
#1	-.0001	.5167	-.0002
#2	-.0001	.5160	.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	681050	10000	--	--	--	--	--
SDev	4230.620	.0000000	--	--	--	--	--
%RSD	.6211913	.0000000	--	--	--	--	--
#1	684041	10000	--	--	--	--	--
#2	678058	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 262526 Operator:
Run Time: 05/17/05 17:04:48
Comment:
Mode: CONC Corr. Factor: 1

010110

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0015	.0006	.0048	.0001	.0001	-.0002
SDev	.0004	.0004	.0015	.0005	.0001	.0000	.0011
%RSD	1920.	24.46	245.3	9.941	68.66	5.465	558.7
#1	.0003	.0012	-.0005	.0051	.0002	.0001	.0006
#2	-.0003	.0017	.0017	.0044	.0001	.0001	-.0010

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.2095	-.0004	-.0005	.0001	.0006	.0233	.0814
SDev	.0016	.0000	.0001	.0011	.0001	.0221	.0201
%RSD	.7850	7.899	15.93	743.6	27.19	95.18	24.64
#1	.2083	-.0005	-.0004	.0009	.0007	.0076	.0672
#2	.2106	-.0004	-.0005	-.0006	.0004	.0389	.0956

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0001	.0308	.0006	.0003	.7287	.8796
SDev	.0003	.0001	.0043	.0001	.0011	.1678	.0041
%RSD	74.53	31.38	13.98	10.29	383.8	23.03	.4677
#1	-.0002	.0001	.0338	.0007	.0010	.6100	.8767
#2	-.0006	.0002	.0277	.0006	-.0005	.8474	.8825

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	-.0015	-.0012	-.0017	-.0005	.1135	-.0017
SDev	.0012	.0005	.0009	.0023	.0045	.0020	.0010
%RSD	279.8	30.81	80.67	135.7	921.4	1.727	61.65
#1	.0013	-.0019	-.0005	-.0033	-.0037	.1121	-.0010
#2	-.0004	-.0012	-.0018	-.0001	.0027	.1149	-.0024

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.23	-.0072	.0024	.0665	-.0015	-.0008	.0003
SDev	1.63	.0045	.0006	.0007	.0012	.0019	.0020
%RSD	1.676	62.17	26.13	1.059	82.12	237.6	618.1
#1	98.39	-.0040	.0028	.0660	-.0024	.0005	.0017
#2	96.08	-.0104	.0019	.0670	-.0006	-.0021	-.0011

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0003	.0001	-.0002	-.0548	-.0001	.0001
SDev	.0000	.0014	.0003	.0024	.0075	.0004	.0018
%RSD	12.55	551.8	244.7	1250.	13.76	378.4	1317.
#1	.0001	.0007	.0003	-.0019	-.0495	.0002	.0014
#2	.0002	-.0012	-.0001	.0015	-.0602	-.0004	-.0011

010111

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0010	.0001
SDev	.0002	.0002	.0005
%RSD	2964.	24.16	410.4
#1	.0001	.0011	.0005
#2	-.0001	.0008	-.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	686794	10000	--	--	--	--	--
SDev	11491.19	.0000000	--	--	--	--	--
%RSD	1.673163	.0000000	--	--	--	--	--
#1	694920	10000	--	--	--	--	--
#2	678669	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 262526d Operator:
Run Time: 05/17/05 17:09:34
Comment:
Mode: CONC Corr. Factor: 1

010112

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	.0020	-.0012	.0049	-.0000	.0001	.0007
SDev	.0001	.0022	.0000	.0003	.0000	.0000	.0018
%RSD	14.54	105.5	.7144	7.201	4.472	20.03	271.8
#1	-.0006	.0005	-.0012	.0051	-.0000	.0001	-.0006
#2	-.0005	.0036	-.0012	.0046	-.0000	.0001	.0019

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.2076	-.0003	-.0001	.0004	.0003	.0108	.0579
SDev	.0017	.0002	.0006	.0002	.0001	.0219	.0144
%RSD	.8035	50.84	1096.	50.20	40.94	202.6	24.94
#1	.2064	-.0002	-.0005	.0002	.0003	-.0047	.0477
#2	.2088	-.0004	.0004	.0005	.0002	.0263	.0681

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0008	.0000	.0286	.0006	-.0010	.3163	.8816
SDev	.0001	.0001	.0019	.0000	.0006	.0450	.0056
%RSD	8.868	193.3	6.472	.1138	56.72	14.24	.6324
#1	-.0009	-.0000	.0273	.0006	-.0006	.2844	.8856
#2	-.0008	.0001	.0299	.0006	-.0014	.3481	.8777

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	-.0027	-.0016	.0007	-.0048	.1193	-.0021
SDev	.0004	.0036	.0023	.0023	.0029	.0068	.0025
%RSD	66.45	135.3	149.3	321.2	59.00	5.682	118.1
#1	.0004	-.0001	.0001	-.0009	-.0069	.1145	-.0003
#2	.0010	-.0053	-.0032	.0023	-.0028	.1241	-.0038

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.24	-.0057	.0043	.0663	-.0000	.0010	.0024
SDev	1.43	.0028	.0006	.0012	.0007	.0013	.0007
%RSD	1.491	49.43	13.39	1.859	2318.	139.2	29.32
#1	97.25	-.0037	.0047	.0672	-.0005	.0019	.0019
#2	95.22	-.0077	.0039	.0654	.0005	.0000	.0029

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0020	-.0001	-.0010	-.0472	-.0004	.0003
SDev	.0000	.0015	.0001	.0002	.0114	.0002	.0021
%RSD	3.611	76.45	116.6	16.47	24.18	36.80	755.3
#1	.0001	-.0009	-.0000	-.0009	-.0392	-.0003	-.0012
#2	.0001	-.0031	-.0001	-.0011	-.0553	-.0005	.0018

010113

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0010	-.0005
SDev	.0000	.0003	.0002
%RSD	15.81	33.69	32.69
#1	-.0001	.0008	-.0004
#2	-.0001	.0013	-.0006

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	679720	10000	--	--	--	--	--
SDev	10149.81	.0000000	--	--	--	--	--
%RSD	1.493234	.0000000	--	--	--	--	--
#1	686897	10000	--	--	--	--	--
#2	672543	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 262526s Operator:
Run Time: 05/17/05 17:14:19
Comment: 010114
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0522	2.008	2.056	.0047	2.023	.0509	.0070
SDev	.0004	.003	.004	.0020	.002	.0000	.0024
%RSD	.8379	.1368	.2183	42.53	.0951	.0595	33.41
#1	.0519	2.006	2.059	.0033	2.024	.0510	.0054
#2	.0525	2.009	2.053	.0061	2.021	.0509	.0087

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.88	.0523	.5187	.2032	.2565	1.152	18.51
SDev	.04	.0003	.0016	.0006	.0000	.005	.00
%RSD	.1684	.6160	.3011	.3039	.0126	.4753	.0098
#1	20.85	.0521	.5176	.2037	.2565	1.156	18.51
#2	20.90	.0525	.5198	.2028	.2565	1.148	18.51

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	4.063	20.56	.5273	-.0009	19.53	28.43
SDev	.0011	.009	.04	.0009	.0005	.13	.01
%RSD	363.4	.2221	.1932	.1623	54.12	.6546	.0506
#1	-.0005	4.070	20.54	.5279	-.0013	19.44	28.44
#2	.0011	4.057	20.59	.5267	-.0006	19.62	28.42

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4966	.0054	.5061	.5029	-.0022	.1353	.5011
SDev	.0012	.0082	.0025	.0051	.0017	.0013	.0075
%RSD	.2329	151.4	.5001	1.007	75.44	.9923	1.497
#1	.4958	.0112	.5043	.4993	-.0034	.1343	.5064
#2	.4974	-.0004	.5079	.5065	-.0010	.1362	.4958

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	95.56	2.142	2.145	.0716	.5040	2.144	.0007
SDev	.70	.004	.046	.0053	.0042	.029	.0001
%RSD	.7294	.1804	2.126	7.399	.8373	1.358	12.18
#1	96.06	2.145	2.113	.0679	.5010	2.124	.0008
#2	95.07	2.139	2.178	.0754	.5070	2.165	.0006

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	-.0209	.0000	2.072	-.0200	.5152	-.0001
SDev	.0000	.0034	.0002	.008	.0428	.0001	.0011
%RSD	3.313	16.13	2674.	.3907	214.5	.0249	1104.
#1	.0009	-.0186	.0002	2.066	-.0502	.5152	.0007
#2	.0009	-.0233	-.0001	2.078	.0103	.5151	-.0009

010115

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0002	.5205	-.0004
SDev	.0001	.0002	.0005
%RSD	40.72	.0434	114.7
#1	-.0002	.5207	-.0008
#2	-.0003	.5203	-.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	674996	10000	--	--	--	--	--
SDev	4927.827	.0000000	--	--	--	--	--
%RSD	.7300533	.0000000	--	--	--	--	--
#1	678480	10000	--	--	--	--	--
#2	671511	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 262527 Operator:
Run Time: 05/17/05 17:19:05
Comment:
Mode: CONC Corr. Factor: 1

010116

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0003	.0027	.0005	.0112	.0001	.0001	.0086
SDev	.0000	.0004	.0012	.0004	.0000	.0000	.0040
%RSD	2.566	15.26	226.7	3.441	19.25	22.20	46.30
#1	.0003	.0024	-.0003	.0115	.0002	.0001	.0114
#2	.0003	.0030	.0014	.0109	.0001	.0001	.0058

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.1101	-.0006	.0008	.0004	.0010	.0317	.0985
SDev	.0015	.0000	.0001	.0004	.0003	.0195	.0224
%RSD	1.394	2.553	7.151	125.9	26.10	61.58	22.71
#1	.1112	-.0006	.0008	.0007	.0011	.0455	.1144
#2	.1090	-.0006	.0007	.0000	.0008	.0179	.0827

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0002	.0327	.0015	-.0001	.5436	.8882
SDev	.0003	.0001	.0046	.0001	.0010	.2542	.0008
%RSD	38.91	34.73	14.23	4.749	792.5	46.77	.0909
#1	-.0005	.0002	.0360	.0015	.0006	.7234	.8887
#2	-.0008	.0001	.0294	.0014	-.0008	.3638	.8876

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0013	.0052	-.0017	-.0024	-.0019	.1122	.0022
SDev	.0001	.0058	.0000	.0006	.0051	.0062	.0010
%RSD	11.03	111.8	.9754	24.89	264.4	5.492	43.52
#1	.0014	.0092	-.0017	-.0029	.0017	.1165	.0029
#2	.0012	.0011	-.0017	-.0020	-.0055	.1078	.0015

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.07	.0009	.0015	.1080	-.0022	.0014	-.0001
SDev	.45	.0071	.0022	.0037	.0004	.0038	.0013
%RSD	.4692	754.4	141.4	3.400	18.76	280.8	2127.
#1	95.76	.0059	.0031	.1106	-.0025	.0041	.0009
#2	96.39	-.0041	.0000	.1054	-.0019	-.0013	-.0010

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0004	.0001	-.0011	-.0201	.0002	.0020
SDev	.0000	.0022	.0000	.0003	.0259	.0000	.0036
%RSD	20.48	527.2	2.311	29.99	128.7	7.083	177.3
#1	.0002	-.0019	.0001	-.0013	-.0018	.0003	.0046
#2	.0001	.0011	.0001	-.0009	-.0384	.0002	-.0005

010117

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	.0004	.0004
SDev	.0001	.0002	.0007
%RSD	271.3	59.32	174.5
#1	.0001	.0005	.0009
#2	-.0000	.0002	-.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	678622	10000	--	--	--	--	--
SDev	3135.311	.0000000	--	--	--	--	--
%RSD	.4620115	.0000000	--	--	--	--	--
#1	676405	10000	--	--	--	--	--
#2	680839	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262528 Operator:
Run Time: 05/17/05 17:23:52
Comment:
Mode: CONC Corr. Factor: 1

010118

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0008	-.0036	.0168	.0000	.0000	.0004
SDev	.0005	.0011	.0022	.0000	.0000	.0000	.0076
%RSD	511.2	129.7	61.46	.2067	348.4	40.76	2012.
#1	.0005	.0016	-.0052	.0167	.0000	.0000	-.0050
#2	-.0003	.0001	-.0020	.0168	-.0000	.0001	.0058

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0746	-.0003	.0010	.0002	.0012	.2442	.0983
SDev	.0003	.0001	.0006	.0000	.0004	.0135	.0154
%RSD	.4137	32.09	59.84	19.37	38.38	5.518	15.62
#1	.0744	-.0003	.0014	.0002	.0015	.2537	.1091
#2	.0749	-.0004	.0006	.0002	.0009	.2346	.0874

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0005	.0001	.0225	.0093	-.0003	.6841	.9026
SDev	.0002	.0000	.0072	.0000	.0009	.0448	.0013
%RSD	39.54	35.62	32.12	.4688	314.4	6.545	.1441
#1	-.0004	.0001	.0276	.0093	.0003	.7158	.9017
#2	-.0007	.0001	.0174	.0093	-.0009	.6525	.9036

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0062	-.0020	-.0021	-.0013	.1324	.0020
SDev	.0010	.0048	.0025	.0028	.0008	.0095	.0012
%RSD	4220.	77.81	123.8	133.0	62.04	7.175	62.03
#1	.0007	.0028	-.0038	-.0041	-.0007	.1257	.0028
#2	-.0007	.0096	-.0003	-.0001	-.0018	.1392	.0011

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.79	-.0081	.0040	.1479	-.0021	.0000	.0015
SDev	.47	.0021	.0065	.0024	.0027	.0036	.0010
%RSD	.4849	25.46	160.3	1.596	131.1	264100.	63.43
#1	96.46	-.0067	-.0005	.1496	-.0040	-.0026	.0022
#2	97.12	-.0096	.0086	.1463	-.0002	.0026	.0008

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0004	.0000	.0043	-.0225	.0004	-.0003
SDev	.0000	.0013	.0001	.0014	.0137	.0002	.0024
%RSD	32.75	309.5	248.5	33.18	60.87	57.87	777.8
#1	.0001	.0005	.0001	.0054	-.0128	.0006	.0014
#2	.0001	-.0013	-.0000	.0033	-.0323	.0002	-.0020

010119

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0010	.0002
SDev	.0001	.0002	.0007
%RSD	209.3	16.53	282.4
#1	.0000	.0012	.0007
#2	-.0001	.0009	-.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	683678	10000	--	--	--	--	--
SDev	3290.875	.0000000	--	--	--	--	--
%RSD	.4813487	.0000000	--	--	--	--	--
#1	681351	10000	--	--	--	--	--
#2	686005	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 262529 Operator:
Run Time: 05/17/05 17:28:38
Comment:
Mode: CONC Corr. Factor: 1

010120

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0035	.0006	.0227	-.0000	.0001	.0058
SDev	.0003	.0046	.0009	.0009	.0001	.0000	.0033
%RSD	891.1	130.3	150.7	4.191	346.6	1.522	57.40
#1	-.0002	.0003	-.0000	.0234	.0001	.0001	.0081
#2	.0003	.0068	.0013	.0220	-.0001	.0001	.0034

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0550	-.0004	.0003	.0001	.0006	.1364	.0842
SDev	.0011	.0002	.0002	.0007	.0000	.0170	.0096
%RSD	2.086	60.43	65.02	627.6	1.134	12.47	11.43
#1	.0558	-.0002	.0002	.0006	.0006	.1484	.0910
#2	.0542	-.0006	.0004	-.0004	.0006	.1243	.0774

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0011	.0000	.0249	.0056	-.0015	.4272	.8962
SDev	.0003	.0001	.0043	.0000	.0002	.1992	.0029
%RSD	28.24	284.0	17.11	.4496	10.48	46.64	.3224
#1	-.0013	.0001	.0280	.0056	-.0014	.5680	.8942
#2	-.0008	-.0000	.0219	.0056	-.0016	.2863	.8982

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0008	-.0046	-.0024	-.0011	-.0047	.1206	-.0030
SDev	.0013	.0089	.0013	.0008	.0030	.0099	.0016
%RSD	159.2	191.8	52.37	71.51	63.86	8.245	53.58
#1	.0001	.0017	-.0033	-.0005	-.0026	.1136	-.0041
#2	-.0017	-.0110	-.0015	-.0016	-.0068	.1276	-.0019

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.01	-.0026	-.0010	.1592	-.0015	-.0016	.0015
SDev	.68	.0023	.0013	.0023	.0001	.0016	.0014
%RSD	.7036	85.63	125.9	1.455	6.106	104.2	92.81
#1	96.53	-.0042	-.0020	.1575	-.0014	-.0027	.0025
#2	97.50	-.0010	-.0001	.1608	-.0016	-.0004	.0005

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	-.0027	.0000	-.0021	-.0521	-.0010	-.0003
SDev	.0000	.0008	.0002	.0018	.0083	.0002	.0000
%RSD	13.74	30.01	24120.	84.15	15.95	21.92	12.03
#1	.0000	-.0033	.0001	-.0033	-.0462	-.0008	-.0003
#2	.0000	-.0022	-.0001	-.0008	-.0579	-.0011	-.0004

010121

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0013	-.0008
SDev	.0000	.0001	.0004
%RSD	59.02	8.948	45.45
#1	-.0000	.0012	-.0006
#2	-.0000	.0014	-.0011

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	685257	10000	--	--	--	--	--
SDev	4798.427	.0000000	--	--	--	--	--
%RSD	.7002375	.0000000	--	--	--	--	--
#1	681864	10000	--	--	--	--	--
#2	688650	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262530 Operator:
Run Time: 05/17/05 17:33:24
Comment:
Mode: CONC Corr. Factor: 1

010122

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0017	.0006	.0389	-.0000	.0001	.0018
SDev	.0016	.0056	.0041	.0006	.0000	.0000	.0015
%RSD	764.1	329.1	728.9	1.562	123.1	17.30	82.66
#1	.0009	.0057	-.0023	.0393	-.0000	.0001	.0029
#2	-.0014	-.0023	.0035	.0384	-.0001	.0001	.0008

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0472	-.0003	.0001	.0005	.0006	.1782	.1137
SDev	.0027	.0001	.0011	.0004	.0007	.0015	.0169
%RSD	5.608	31.98	992.8	74.43	117.9	.8424	14.83
#1	.0491	-.0002	.0009	.0002	.0012	.1793	.1256
#2	.0454	-.0004	-.0007	.0008	.0001	.1772	.1018

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0010	.0001	.0137	.0080	-.0015	.6484	.9203
SDev	.0023	.0001	.0138	.0002	.0007	.1467	.0026
%RSD	225.6	96.61	100.8	2.047	48.02	22.62	.2852
#1	.0006	.0001	.0234	.0081	-.0010	.7522	.9184
#2	-.0026	.0000	.0039	.0078	-.0020	.5447	.9221

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0020	-.0031	.0017	-.0023	.1307	-.0014
SDev	.0002	.0126	.0006	.0004	.0054	.0132	.0013
%RSD	32.62	644.9	18.97	25.18	232.8	10.10	91.46
#1	.0007	.0109	-.0035	.0014	.0015	.1214	-.0005
#2	.0004	-.0070	-.0026	.0020	-.0062	.1401	-.0023

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.54	.0031	.0015	.2239	.0001	.0021	.0006
SDev	.17	.0061	.0015	.0053	.0005	.0010	.0013
%RSD	.1721	196.6	97.94	2.350	360.1	49.44	203.2
#1	96.42	.0074	.0005	.2277	-.0002	.0028	.0015
#2	96.66	-.0012	.0026	.2202	.0005	.0014	-.0003

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0010	.0001	-.0001	-.0514	-.0002	.0006
SDev	.0001	.0018	.0001	.0043	.0626	.0001	.0005
%RSD	182.3	178.9	105.9	6496.	121.8	60.11	85.23
#1	.0001	-.0003	.0002	.0030	-.0071	-.0003	.0009
#2	-.0000	.0023	.0000	-.0031	-.0956	-.0001	.0002

010123

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0006	-.0005
SDev	.0001	.0003	.0003
%RSD	165.2	54.18	73.80
#1	-.0001	.0009	-.0002
#2	.0000	.0004	-.0007

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	681896	10000	--	--	--	--	--
SDev	1176.626	.0000000	--	--	--	--	--
%RSD	.1725521	.0000000	--	--	--	--	--
#1	681064	10000	--	--	--	--	--
#2	682728	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: ccv3 Operator:
Run Time: 05/17/05 17:41:50
Comment:
Mode: CONC Corr. Factor: 1

010124

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9830	9.851	5.059	4.890	9.906	.9876	5.063
SDev	.0011	.013	.002	.011	.010	.0001	.003
%RSD	.1091	.1335	.0473	.2304	.0980	.0067	.0653
#1	.9838	9.861	5.061	4.882	9.913	.9875	5.065
#2	.9823	9.842	5.057	4.898	9.899	.9876	5.060
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	1.100	11.00	5.500	5.500	11.00	1.100	5.500
Low	.9000	9.000	4.500	4.500	9.000	.9000	4.500

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.17	1.025	5.167	1.981	2.031	10.46	18.84
SDev	.04	.001	.008	.001	.006	.01	.03
%RSD	.1901	.1157	.1547	.0474	.2827	.0592	.1786
#1	20.14	1.024	5.162	1.982	2.035	10.45	18.86
#2	20.19	1.026	5.173	1.980	2.027	10.46	18.82
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	22.00	1.100	5.500	2.200	2.200	11.00	22.00
Low	18.00	.9000	4.500	1.800	1.800	9.000	18.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.925	5.211	20.04	1.042	5.142	28.36	H41.12
SDev	.007	.006	.03	.000	.013	.01	.10
%RSD	.1448	.1136	.1680	.0384	.2508	.0338	.2455
#1	4.930	5.215	20.02	1.042	5.133	28.36	H41.19
#2	4.920	5.207	20.07	1.043	5.151	28.35	H41.05
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High
High	5.500	5.500	22.00	1.100	5.500	33.00	33.00
Low	4.500	4.500	18.00	.9000	4.500	27.00	27.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.892	5.163	4.925	4.881	1.000	.9777	1.009
SDev	.027	.008	.013	.034	.004	.0052	.004
%RSD	.5431	.1545	.2578	.7031	.3910	.5329	.4411
#1	4.873	5.168	4.916	4.857	.9973	.9814	1.012
#2	4.911	5.157	4.934	4.906	1.003	.9740	1.006
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	5.500	5.500			1.100	1.100	1.100
Low	4.500	4.500			.9000	.9000	.9000

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

010125

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.40	5.183	5.131	5.146	4.896	5.149	4.932
SDev	.83	.024	.042	.006	.027	.036	.006
%RSD	.8361	.4713	.8202	.1240	.5539	.7031	.1178
#1	99.98	5.166	5.101	5.151	4.877	5.123	4.928
#2	98.81	5.201	5.161	5.142	4.915	5.174	4.936
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				5.500	5.500	5.500	5.500
Low				4.500	4.500	4.500	4.500

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.219	.9803	4.958	5.112	L.8333	5.054	1.061
SDev	.001	.0037	.000	.018	.0158	.002	.010
%RSD	.0225	.3793	.0097	.3495	1.895	.0487	.8974
#1	5.218	.9777	4.959	5.099	L.8221	5.056	1.054
#2	5.220	.9829	4.958	5.124	L.8445	5.053	1.067
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	LC Pass	LC Pass
High	5.500	1.100	5.500	5.500	1.100	5.500	1.100
Low	4.500	.9000	4.500	4.500	.9000	4.500	.9000

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.986	1.044	4.905
SDev	.006	.007	.003
%RSD	.1126	.6575	.0630
#1	4.990	1.039	4.907
#2	4.982	1.049	4.903
Errors	LC Pass	LC Pass	LC Pass
High	5.500	1.100	5.500
Low	4.500	.9000	4.500

010126

IntStd	1	2	3	4	5	6	
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	702075	10000	--	--	--	--	--
SDev	5901.513	.0000000	--	--	--	--	--
%RSD	.8405816	.0000000	--	--	--	--	--
#1	706248	10000	--	--	--	--	--
#2	697902	10000	--	--	--	--	--

Analysis Report 05/17/05 05:53:01 PM page 1

Method: DAILY2 Sample Name: ccb3 Operator:
Run Time: 05/17/05 17:48:26
Comment:
Mode: CONC Corr. Factor: 1

010127

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0014	-.0140	-.0012	.0027	-.0001	.0001	.0016
SDev	.0007	.0051	.0014	.0002	.0001	.0000	.0025
%RSD	50.18	36.80	114.4	8.787	141.5	4.884	155.3
#1	-.0019	-.0176	-.0022	.0025	-.0001	.0001	.0034
#2	-.0009	-.0104	-.0002	.0028	.0000	.0001	-.0002
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	-.0004	-.0001	.0005	-.0004	-.0134	-.0253
SDev	.0012	.0002	.0009	.0012	.0001	.0215	.0204
%RSD	204.6	69.34	986.3	253.2	36.56	160.9	80.73
#1	-.0015	-.0005	-.0008	-.0004	-.0005	L-.0286	-.0397
#2	.0003	-.0002	.0006	.0014	-.0003	.0018	-.0109
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	-.0015	.0001	-.0056	-.0001	.0014	L-.2007	.0115
SDev	.0009	.0001	.0029	.0001	.0002	.2312	.0010
%RSD	60.59	67.19	52.19	138.5	14.66	115.2	9.088
#1	-.0022	.0000	-.0076	-.0002	.0013	L-.3641	.0108
#2	-.0009	.0001	-.0035	-.0000	.0016	-.0372	.0123
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	.0005	.0037	-.0012	-.0017	L-.0060	-.0064	-.0041
SDev	.0011	.0034	.0024	.0009	.0058	.0043	.0011
%RSD	232.6	90.94	195.9	54.73	97.34	67.68	27.82
#1	-.0003	.0061	-.0029	-.0011	L-.0101	-.0033	-.0049
#2	.0013	.0013	.0005	-.0024	-.0019	-.0095	-.0033
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Low	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

010128

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.0	.0023	.0049	-.0011	-.0015	.0041	-.0010
SDev	1.0	.0001	.0010	.0017	.0002	.0007	.0003
%RSD	.9564	3.015	21.18	149.4	11.40	16.51	28.11
#1	102.7	.0023	.0056	-.0023	-.0017	.0045	-.0012
#2	101.3	.0024	.0042	.0001	-.0014	.0036	-.0008
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	-.0025	.0000	-.0019	-.0717	-.0003	-.0018
SDev	.0000	.0007	.0002	.0017	.0242	.0009	.0004
%RSD	164.0	29.22	4222.	90.07	33.78	288.3	24.74
#1	-.0000	-.0030	-.0002	-.0031	-.0889	-.0010	-.0021
#2	.0000	-.0019	.0002	-.0007	-.0546	.0003	-.0015
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0000	-.0006
SDev	.0001	.0001	.0008
%RSD	215.7	275.2	149.1
#1	-.0002	.0001	-.0012
#2	.0000	-.0000	.0000
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010129

IntStd	1	2	3	4	5	6	
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	720670	10000	--	--	--	--	--
SDev	6909.848	.0000000	--	--	--	--	--
%RSD	.9588088	.0000000	--	--	--	--	--
#1	725556	10000	--	--	--	--	--
#2	715784	10000	--	--	--	--	--

Div 20
to#050502-4
06002.01.222

5/20/05

5/20/05

262525 for Ca

$0.24013\ ug/ml \times \frac{10ml}{0.2ml} = 12.0\ mg/L$

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
pbw-E17H1	Ag3280	0.00500	U		mg/L	0.005				0.005	-0.00059	-0.00059	1	0.005	-0.00059	05/17/05	15:51
pbw-E17H1	Al3082	0.0500	U		mg/L	0.05				0.05	-0.00843	-0.00843	1	0.05	-0.00843	05/17/05	15:51
pbw-E17H1	As1890	0.00500	U		mg/L	0.005				0.005	-0.0024	-0.0024	1	0.005	-0.0024	05/17/05	15:51
pbw-E17H1	B_2496	0.0200	U		mg/L	0.02				0.02	0.00337	0.00337	1	0.02	0.00337	05/17/05	15:51
pbw-E17H1	Ba4934	0.00500	U		mg/L	0.005				0.005	-0.00003	-0.00003	1	0.005	-0.00003	05/17/05	15:51
pbw-E17H1	Be3130	0.00500	U		mg/L	0.005				0.005	0.00007	0.00007	1	0.005	0.00007	05/17/05	15:51
pbw-E17H1	Bi2230	0.0100	U		mg/L	0.01				0.01	0.0011	0.0011	1	0.01	0.0011	05/17/05	15:51
pbw-E17H1	Ca3179	0.0500	U		mg/L	0.05				0.05	0.00152	0.00152	1	0.05	0.00152	05/17/05	15:51
pbw-E17H1	Cd2265	0.00500	U		mg/L	0.005				0.005	-0.00024	-0.00024	1	0.005	-0.00024	05/17/05	15:51
pbw-E17H1	Co2286	0.00500	U		mg/L	0.005				0.005	-0.00026	-0.00026	1	0.005	-0.00026	05/17/05	15:51
pbw-E17H1	Cr2677	0.00500	U		mg/L	0.005				0.005	-0.00017	-0.00017	1	0.005	-0.00017	05/17/05	15:51
pbw-E17H1	Cu3247	0.00500	U		mg/L	0.005				0.005	-0.00056	-0.00056	1	0.005	-0.00056	05/17/05	15:51
pbw-E17H1	Fe2714	0.0500	U		mg/L	0.05				0.05	0.00202	0.00202	1	0.05	0.00202	05/17/05	15:51
pbw-E17H1	La3988	0.00500	U		mg/L	0.005				0.005	-0.00076	-0.00076	1	0.005	-0.00076	05/17/05	15:51
pbw-E17H1	Li6707	0.00500	U		mg/L	0.005				0.005	0	0	1	0.005	0	05/17/05	15:51
pbw-E17H1	Mg2790	0.0500	U		mg/L	0.05				0.05	-0.0081	-0.0081	1	0.05	-0.0081	05/17/05	15:51
pbw-E17H1	Mn2576	0.00500	U		mg/L	0.005				0.005	-0.00018	-0.00018	1	0.005	-0.00018	05/17/05	15:51
pbw-E17H1	Mo2020	0.00500	U		mg/L	0.005				0.005	0.00031	0.00031	1	0.005	0.00031	05/17/05	15:51
pbw-E17H1	Ni2316	0.00500	U		mg/L	0.005				0.005	0.0004	0.0004	1	0.005	0.0004	05/17/05	15:51
pbw-E17H1	P_1782	0.0200	U		mg/L	0.02				0.02	0.00109	0.00109	1	0.02	0.00109	05/17/05	15:51
pbw-E17H1	Pd3404	0.00500	U		mg/L	0.005				0.005	-0.00119	-0.00119	1	0.005	-0.00119	05/17/05	15:51
pbw-E17H1	S_1820	0.0200	U		mg/L	0.02				0.02	0.00063	0.00063	1	0.02	0.00063	05/17/05	15:51
pbw-E17H1	Sb2068	0.0100	U		mg/L	0.01				0.01	-0.0072	-0.0072	1	0.01	-0.0072	05/17/05	15:51
pbw-E17H1	Si2881	0.0200	U		mg/L	0.02				0.02	-0.00072	-0.00072	1	0.02	-0.00072	05/17/05	15:51
pbw-E17H1	Pb220	0.00500	U		mg/L	0.005				0.005	-0.00264	-0.00264	1	0.005	-0.00264	05/17/05	15:51
pbw-E17H1	Se196	0.00500	U		mg/L	0.005				0.005	0.00119	0.00119	1	0.005	0.00119	05/17/05	15:51
pbw-E17H1	Sn1899	0.00500	U		mg/L	0.005				0.005	0.00129	0.00129	1	0.005	0.00129	05/17/05	15:51
pbw-E17H1	Sr4215	0.00500	U		mg/L	0.005				0.005	-0.00002	-0.00002	1	0.005	-0.00002	05/17/05	15:51
pbw-E17H1	Th2837	0.0250	U		mg/L	0.025				0.025	-0.00181	-0.00181	1	0.025	-0.00181	05/17/05	15:51
pbw-E17H1	Ti3349	0.00500	U		mg/L	0.005				0.005	-0.00004	-0.00004	1	0.005	-0.00004	05/17/05	15:51
pbw-E17H1	Tl1908	0.0100	U		mg/L	0.01				0.01	0.00331	0.00331	1	0.01	0.00331	05/17/05	15:51
pbw-E17H1	U_4090	0.100	U		mg/L	0.1				0.1	-0.03445	-0.0345	1	0.1	-0.03445	05/17/05	15:51
pbw-E17H1	V_2924	0.00500	U		mg/L	0.005				0.005	-0.00034	-0.00034	1	0.005	-0.00034	05/17/05	15:51
pbw-E17H1	W_2079	0.0100	U		mg/L	0.01				0.01	-0.00086	-0.00086	1	0.01	-0.00086	05/17/05	15:51
pbw-E17H1	Y_3710	0.00500	U		mg/L	0.005				0.005	-0.00007	-0.00007	1	0.005	-0.00007	05/17/05	15:51
pbw-E17H1	Zn2062	0.00500	U		mg/L	0.005				0.005	0.00065	0.00065	1	0.005	0.00065	05/17/05	15:51
pbw-E17H1	Zr3496	0.00500	U		mg/L	0.005				0.005	-0.00031	-0.00031	1	0.005	-0.00031	05/17/05	15:51
lcsw-E17H1	Ag3280	0.0509			mg/L	0.005		101.8%	0.05	0.005	0.05091	0.0509	1	0.005	0.05091	05/17/05	15:55
lcsw-E17H1	Al3082	1.98			mg/L	0.05		99.0%	2	0.05	1.98006	1.98	1	0.05	1.98006	05/17/05	15:55
lcsw-E17H1	As1890	2.04			mg/L	0.005		102.0%	2	0.005	2.03536	2.04	1	0.005	2.03536	05/17/05	15:55
lcsw-E17H1	B_2496	0.0200	U		mg/L	0.02			0	0.02	0.00353	0.00353	1	0.02	0.00353	05/17/05	15:55

010130

div20_050502(4)trace

Div 20
to#050502-4
06002.01.222

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
lcsw-E17H1	Ba4934	2.00			mg/L	0.005		100.0%	2	0.005	2.00156	2	1	0.005	2.00156	05/17/05	15:55
lcsw-E17H1	Be3130	0.0504			mg/L	0.005		100.8%	0.05	0.005	0.05039	0.0504	1	0.005	0.05039	05/17/05	15:55
lcsw-E17H1	Bi2230	0.0100	U		mg/L	0.01			0	0.01	0.00511	0.00511	1	0.01	0.00511	05/17/05	15:55
lcsw-E17H1	Ca3179	20.8			mg/L	0.05		104.0%	20	0.05	20.83129	20.8	1	0.05	20.83129	05/17/05	15:55
lcsw-E17H1	Cd2265	0.0517			mg/L	0.005		103.4%	0.05	0.005	0.05172	0.0517	1	0.005	0.05172	05/17/05	15:55
lcsw-E17H1	Co2286	0.514			mg/L	0.005		102.8%	0.5	0.005	0.51379	0.514	1	0.005	0.51379	05/17/05	15:55
lcsw-E17H1	Cr2677	0.202			mg/L	0.005		101.0%	0.2	0.005	0.20166	0.202	1	0.005	0.20166	05/17/05	15:55
lcsw-E17H1	Cu3247	0.253			mg/L	0.005		101.2%	0.25	0.005	0.25323	0.253	1	0.005	0.25323	05/17/05	15:55
lcsw-E17H1	Fe2714	1.13			mg/L	0.05		113.0%	1	0.05	1.12523	1.13	1	0.05	1.12523	05/17/05	15:55
lcsw-E17H1	La3988	0.00500	U		mg/L	0.005			0	0.005	0.00059	0.00059	1	0.005	0.00059	05/17/05	15:55
lcsw-E17H1	Li6707	4.17			mg/L	0.005		104.3%	4	0.005	4.16542	4.17	1	0.005	4.16542	05/17/05	15:55
lcsw-E17H1	Mg2790	20.7			mg/L	0.05		103.5%	20	0.05	20.71019	20.7	1	0.05	20.71019	05/17/05	15:55
lcsw-E17H1	Mn2576	0.520			mg/L	0.005		104.0%	0.5	0.005	0.52047	0.52	1	0.005	0.52047	05/17/05	15:55
lcsw-E17H1	Mo2020	0.00500	U		mg/L	0.005			0	0.005	-0.00001	-0.00001	1	0.005	-0.00001	05/17/05	15:55
lcsw-E17H1	Ni2316	0.499			mg/L	0.005		99.8%	0.5	0.005	0.49893	0.499	1	0.005	0.49893	05/17/05	15:55
lcsw-E17H1	P_1782	0.0200	U		mg/L	0.02			0	0.02	0.00777	0.00777	1	0.02	0.00777	05/17/05	15:55
lcsw-E17H1	Pd3404	0.00500	U		mg/L	0.005			0	0.005	0.00212	0.00212	1	0.005	0.00212	05/17/05	15:55
lcsw-E17H1	S_1820	0.0200	U		mg/L	0.02			0	0.02	0.00654	0.00654	1	0.02	0.00654	05/17/05	15:55
lcsw-E17H1	Sb2068	0.490			mg/L	0.01		98.0%	0.5	0.01	0.49002	0.49	1	0.01	0.49002	05/17/05	15:55
lcsw-E17H1	Si2881	0.0200	U		mg/L	0.02			0	0.02	0.01229	0.0123	1	0.02	0.01229	05/17/05	15:55
lcsw-E17H1	Pb220	0.497			mg/L	0.005		99.4%	0.5	0.005	0.49665	0.497	1	0.005	0.49665	05/17/05	15:55
lcsw-E17H1	Se196	2.11			mg/L	0.005		105.5%	2	0.005	2.11224	2.11	1	0.005	2.11224	05/17/05	15:55
lcsw-E17H1	Sn1899	0.00500	U		mg/L	0.005			0	0.005	0.00167	0.00167	1	0.005	0.00167	05/17/05	15:55
lcsw-E17H1	Sr4215	0.00500	U		mg/L	0.005			0	0.005	0.00074	0.00074	1	0.005	0.00074	05/17/05	15:55
lcsw-E17H1	Th2837	0.0250	U		mg/L	0.025			0	0.025	-0.0213	-0.0213	1	0.025	-0.0213	05/17/05	15:55
lcsw-E17H1	Ti3349	0.00500	U		mg/L	0.005			0	0.005	0.00018	0.00018	1	0.005	0.00018	05/17/05	15:55
lcsw-E17H1	Tl1908	2.06			mg/L	0.01		103.0%	2	0.01	2.05793	2.06	1	0.01	2.05793	05/17/05	15:55
lcsw-E17H1	U_4090	0.100	U		mg/L	0.1			0	0.1	-0.00588	-0.00588	1	0.1	-0.00588	05/17/05	15:55
lcsw-E17H1	V_2924	0.509			mg/L	0.005		101.8%	0.5	0.005	0.5093	0.509	1	0.005	0.5093	05/17/05	15:55
lcsw-E17H1	W_2079	0.0100	U		mg/L	0.01			0	0.01	-0.00169	-0.00169	1	0.01	-0.00169	05/17/05	15:55
lcsw-E17H1	Y_3710	0.00500	U		mg/L	0.005			0	0.005	-0.00003	-0.00003	1	0.005	-0.00003	05/17/05	15:55
lcsw-E17H1	Zn2062	0.516			mg/L	0.005		103.2%	0.5	0.005	0.51577	0.516	1	0.005	0.51577	05/17/05	15:55
lcsw-E17H1	Zr3496	0.00500	U		mg/L	0.005			0	0.005	0.00072	0.00072	1	0.005	0.00072	05/17/05	15:55
262525	Ag3280	0.250	U		mg/L	0.25				0.005	-0.0205	-0.0205	1	0.25	-0.00041	05/17/05	16:00
262525	Al3082	2.50	U		mg/L	2.5				0.05	0.2745	0.275	1	2.5	0.00549	05/17/05	16:00
262525	As1890	0.250	U		mg/L	0.25				0.005	-0.0615	-0.0615	1	0.25	-0.00123	05/17/05	16:00
262525	B_2496	1.00	U		mg/L	1				0.02	0.094	0.094	1	1	0.00188	05/17/05	16:00
262525	Ba4934	0.250	U		mg/L	0.25				0.005	-0.004	-0.004	1	0.25	-0.00008	05/17/05	16:00
262525	Be3130	0.250	U		mg/L	0.25				0.005	0.003	0.003	1	0.25	0.00006	05/17/05	16:00
262525	Bi2230	0.500	U		mg/L	0.5				0.01	0.2815	0.282	1	0.5	0.00563	05/17/05	16:00
262525	Ca3179	12.0		✓	mg/L	2.5				0.05	12.0065	12	1	2.5	0.24013	05/17/05	16:00

010131

Div 20
to#050502-4
06002.01.222

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
262525	Cd2265	0.250	U		mg/L	0.25				0.005	-0.015	-0.015	1	0.25	-0.0003	05/17/05	16:00
262525	Co2286	0.250	U		mg/L	0.25				0.005	-0.011	-0.011	1	0.25	-0.00022	05/17/05	16:00
262525	Cr2677	0.250	U		mg/L	0.25				0.005	0.016	0.016	1	0.25	0.00032	05/17/05	16:00
262525	Cu3247	0.250	U		mg/L	0.25				0.005	0.03	0.03	1	0.25	0.0006	05/17/05	16:00
262525	Fe2714	2.50	U		mg/L	2.5				0.05	-0.4695	-0.47	1	2.5	-0.00939	05/17/05	16:00
262525	La3988	0.250	U		mg/L	0.25				0.005	-0.052	-0.052	1	0.25	-0.00104	05/17/05	16:00
262525	Li6707	0.250	U		mg/L	0.25				0.005	0.0045	0.0045	1	0.25	0.00009	05/17/05	16:00
262525	Mg2790	2.50	U		mg/L	2.5				0.05	1.496	1.5	1	2.5	0.02992	05/17/05	16:00
262525	Mn2576	0.250	U		mg/L	0.25				0.005	-0.005	-0.005	1	0.25	-0.0001	05/17/05	16:00
262525	Mo2020	0.250	U		mg/L	0.25				0.005	0.0085	0.0085	1	0.25	0.00017	05/17/05	16:00
262525	Ni2316	0.250	U		mg/L	0.25				0.005	0	0	1	0.25	0	05/17/05	16:00
262525	P_1782	1.00	U		mg/L	1				0.02	0.123	0.123	1	1	0.00246	05/17/05	16:00
262525	Pd3404	0.250	U		mg/L	0.25				0.005	-0.165	-0.165	1	0.25	-0.0033	05/17/05	16:00
262525	S_1820	6.27			mg/L	1				0.02	6.266	6.27	1	1	0.12532	05/17/05	16:00
262525	Sb2068	0.500	U		mg/L	0.5				0.01	-0.0025	-0.0025	1	0.5	-0.00005	05/17/05	16:00
262525	Si2881	1.00	U		mg/L	1				0.02	0.432	0.432	1	1	0.00864	05/17/05	16:00
262525	Pb220	0.250	U		mg/L	0.25				0.005	0.0445	0.0445	1	0.25	0.00089	05/17/05	16:00
262525	Se196	0.250	U		mg/L	0.25				0.005	0.0765	0.0765	1	0.25	0.00153	05/17/05	16:00
262525	Sn1899	0.250	U		mg/L	0.25				0.005	0.131	0.131	1	0.25	0.00262	05/17/05	16:00
262525	Sr4215	0.250	U		mg/L	0.25				0.005	0.006	0.006	1	0.25	0.00012	05/17/05	16:00
262525	Th2837	1.25	U		mg/L	1.25				0.025	-0.0785	-0.0785	1	1.25	-0.00157	05/17/05	16:00
262525	Ti3349	0.250	U		mg/L	0.25				0.005	0.007	0.007	1	0.25	0.00014	05/17/05	16:00
262525	Tl1908	0.500	U		mg/L	0.5				0.01	0.2435	0.244	1	0.5	0.00487	05/17/05	16:00
262525	U_4090	5.00	U		mg/L	5				0.1	-1.6775	-1.68	1	5	-0.03355	05/17/05	16:00
262525	V_2924	0.250	U		mg/L	0.25				0.005	0.021	0.021	1	0.25	0.00042	05/17/05	16:00
262525	W_2079	0.500	U		mg/L	0.5				0.01	0.1125	0.113	1	0.5	0.00225	05/17/05	16:00
262525	Y_3710	0.250	U		mg/L	0.25				0.005	0.002	0.002	1	0.25	0.00004	05/17/05	16:00
262525	Zn2062	0.250	U		mg/L	0.25				0.005	-0.01	-0.01	1	0.25	-0.0002	05/17/05	16:00
262525	Zr3496	0.250	U		mg/L	0.25				0.005	-0.0175	-0.0175	1	0.25	-0.00035	05/17/05	16:00
262525d	Ag3280	0.250	U		mg/L	0.25	0.0%			0.005	-0.019	-0.019	1	0.25	-0.00038	05/17/05	16:05
262525d	Al3082	2.50	U		mg/L	2.5	0.0%			0.05	0.1035	0.104	1	2.5	0.00207	05/17/05	16:05
262525d	As1890	0.250	U		mg/L	0.25	0.0%			0.005	-0.0155	-0.0155	1	0.25	-0.00031	05/17/05	16:05
262525d	B_2496	1.00	U		mg/L	1	0.0%			0.02	0.0615	0.0615	1	1	0.00123	05/17/05	16:05
262525d	Ba4934	0.250	U		mg/L	0.25	0.0%			0.005	-0.0005	-0.0005	1	0.25	-0.00001	05/17/05	16:05
262525d	Be3130	0.250	U		mg/L	0.25	0.0%			0.005	0.002	0.002	1	0.25	0.00004	05/17/05	16:05
262525d	Bi2230	0.500	U		mg/L	0.5	0.0%			0.01	0.0625	0.0625	1	0.5	0.00125	05/17/05	16:05
262525d	Ca3179	12.1			mg/L	2.5	0.8%			0.05	12.0595	12.1	1	2.5	0.24119	05/17/05	16:05
262525d	Cd2265	0.250	U		mg/L	0.25	0.0%			0.005	-0.016	-0.016	1	0.25	-0.00032	05/17/05	16:05
262525d	Co2286	0.250	U		mg/L	0.25	0.0%			0.005	0.055	0.055	1	0.25	0.0011	05/17/05	16:05
262525d	Cr2677	0.250	U		mg/L	0.25	0.0%			0.005	-0.018	-0.018	1	0.25	-0.00036	05/17/05	16:05
262525d	Cu3247	0.250	U		mg/L	0.25	0.0%			0.005	0.0005	0.0005	1	0.25	0.00001	05/17/05	16:05

010132

Div 20
to#050502-4
06002.01.222

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
262525d	Fe2714	2.50	U		mg/L	2.5	0.0%			0.05	0.009	0.009	1	2.5	0.00018	05/17/05	16:05
262525d	La3988	0.250	U		mg/L	0.25	0.0%			0.005	-0.0485	-0.0485	1	0.25	-0.00097	05/17/05	16:05
262525d	Li6707	0.250	U		mg/L	0.25	0.0%			0.005	0.004	0.004	1	0.25	0.00008	05/17/05	16:05
262525d	Mg2790	2.50	U		mg/L	2.5	0.0%			0.05	1.6865	1.69	1	2.5	0.03373	05/17/05	16:05
262525d	Mn2576	0.250	U		mg/L	0.25	0.0%			0.005	-0.0025	-0.0025	1	0.25	-0.00005	05/17/05	16:05
262525d	Mo2020	0.250	U		mg/L	0.25	0.0%			0.005	-0.013	-0.013	1	0.25	-0.00026	05/17/05	16:05
262525d	Ni2316	0.250	U		mg/L	0.25	0.0%			0.005	0.056	0.056	1	0.25	0.00112	05/17/05	16:05
262525d	P_1782	1.00	U		mg/L	1	0.0%			0.02	0.2235	0.224	1	1	0.00447	05/17/05	16:05
262525d	Pd3404	0.250	U		mg/L	0.25	0.0%			0.005	0.009	0.009	1	0.25	0.00018	05/17/05	16:05
262525d	S_1820	6.05			mg/L	1	3.6%			0.02	6.0485	6.05	1	1	0.12097	05/17/05	16:05
262525d	Sb2068	0.500	U		mg/L	0.5	0.0%			0.01	-0.178	-0.178	1	0.5	-0.00356	05/17/05	16:05
262525d	Si2881	1.00	U		mg/L	1	0.0%			0.02	0.546	0.546	1	1	0.01092	05/17/05	16:05
262525d	Pb220	0.250	U		mg/L	0.25	0.0%			0.005	-0.1205	-0.121	1	0.25	-0.00241	05/17/05	16:05
262525d	Se196	0.250	U		mg/L	0.25	0.0%			0.005	0.137	0.137	1	0.25	0.00274	05/17/05	16:05
262525d	Sn1899	0.250	U		mg/L	0.25	0.0%			0.005	0.0485	0.0485	1	0.25	0.00097	05/17/05	16:05
262525d	Sr4215	0.250	U		mg/L	0.25	0.0%			0.005	0.007	0.007	1	0.25	0.00014	05/17/05	16:05
262525d	Th2837	1.25	U		mg/L	1.25	0.0%			0.025	-0.11	-0.11	1	1.25	-0.0022	05/17/05	16:05
262525d	Ti3349	0.250	U		mg/L	0.25	0.0%			0.005	-0.0005	-0.0005	1	0.25	-0.00001	05/17/05	16:05
262525d	Tl1908	0.500	U		mg/L	0.5	0.0%			0.01	0.0155	0.0155	1	0.5	0.00031	05/17/05	16:05
262525d	U_4090	5.00	U		mg/L	5	0.0%			0.1	-3.0855	-3.09	1	5	-0.06171	05/17/05	16:05
262525d	V_2924	0.250	U		mg/L	0.25	0.0%			0.005	-0.0115	-0.0115	1	0.25	-0.00023	05/17/05	16:05
262525d	W_2079	0.500	U		mg/L	0.5	0.0%			0.01	0.028	0.028	1	0.5	0.00056	05/17/05	16:05
262525d	Y_3710	0.250	U		mg/L	0.25	0.0%			0.005	-0.005	-0.005	1	0.25	-0.0001	05/17/05	16:05
262525d	Zn2062	0.250	U		mg/L	0.25	0.0%			0.005	0.022	0.022	1	0.25	0.00044	05/17/05	16:05
262525d	Zr3496	0.250	U		mg/L	0.25	0.0%			0.005	-0.0385	-0.0385	1	0.25	-0.00077	05/17/05	16:05
262525s	Ag3280	2.51			mg/L	0.25		100.4%	2.5	0.005	2.509	2.51	1	0.25	0.05018	05/17/05	16:15
262525s	Al3082	99.2			mg/L	2.5		99.2%	100	0.05	99.2475	99.2	1	2.5	1.98495	05/17/05	16:15
262525s	As1890	102			mg/L	0.25		102.0%	100	0.005	102.1055	102	1	0.25	2.04211	05/17/05	16:15
262525s	B_2496	1.00	U	#DIV/0!	mg/L	1		#DIV/0!	0	0.02	-0.003	-0.003	1	1	-0.00006	05/17/05	16:15
262525s	Ba4934	101			mg/L	0.25		101.0%	100	0.005	100.64	101	1	0.25	2.0128	05/17/05	16:15
262525s	Be3130	2.53			mg/L	0.25		101.2%	2.5	0.005	2.5305	2.53	1	0.25	0.05061	05/17/05	16:15
262525s	Bi2230	0.500	U	#DIV/0!	mg/L	0.5		#DIV/0!	0	0.01	-0.102	-0.102	1	0.5	-0.00204	05/17/05	16:15
262525s	Ca3179	1060			mg/L	2.5		104.8%	1000	0.05	1063.496	1060	1	2.5	21.26992	05/17/05	16:15
262525s	Cd2265	2.59			mg/L	0.25		103.6%	2.5	0.005	2.5875	2.59	1	0.25	0.05175	05/17/05	16:15
262525s	Co2286	25.7			mg/L	0.25		102.8%	25	0.005	25.736	25.7	1	0.25	0.51472	05/17/05	16:15
262525s	Cr2677	10.2			mg/L	0.25		102.0%	10	0.005	10.1575	10.2	1	0.25	0.20315	05/17/05	16:15
262525s	Cu3247	12.8			mg/L	0.25		102.4%	12.5	0.005	12.751	12.8	1	0.25	0.25502	05/17/05	16:15
262525s	Fe2714	56.3			mg/L	2.5		112.6%	50	0.05	56.2895	56.3	1	2.5	1.12579	05/17/05	16:15
262525s	La3988	0.250	U	#DIV/0!	mg/L	0.25		#DIV/0!	0	0.005	-0.031	-0.031	1	0.25	-0.00062	05/17/05	16:15
262525s	Li6707	207			mg/L	0.25		103.5%	200	0.005	207.298	207	1	0.25	4.14596	05/17/05	16:15
262525s	Mg2790	1050			mg/L	2.5		105.0%	1000	0.05	1047.34	1050	1	2.5	20.9468	05/17/05	16:15

010133

Div 20
to#050502-4
06002.01.222

Sample ID	Element	Result	Qual (C)	Qual (Q)	Units	RL	%RPD	%Recovery	TV	rl	mg/L	sigwt	Dilution	Calc RL	ug/ml	Date	Time
262525s	Mn2576	26.1			mg/L	0.25		104.4%	25	0.005	26.128	26.1	1	0.25	0.52256	05/17/05	16:15
262525s	Mo2020	0.250	U	#DIV/0!	mg/L	0.25		#DIV/0!	0	0.005	-0.079	-0.079	1	0.25	-0.00158	05/17/05	16:15
262525s	Ni2316	24.9			mg/L	0.25		99.6%	25	0.005	24.9015	24.9	1	0.25	0.49803	05/17/05	16:15
262525s	P_1782	1.00	U	#DIV/0!	mg/L	1		#DIV/0!	0	0.02	0.3195	0.32	1	1	0.00639	05/17/05	16:15
262525s	Pd3404	0.250	U	#DIV/0!	mg/L	0.25		#DIV/0!	0	0.005	-0.181	-0.181	1	0.25	-0.00362	05/17/05	16:15
262525s	S_1820	6.49		#DIV/0!	mg/L	1		#DIV/0!	0	0.02	6.4905	6.49	1	1	0.12981	05/17/05	16:15
262525s	Sb2068	24.7			mg/L	0.5		98.8%	25	0.01	24.6945	24.7	1	0.5	0.49389	05/17/05	16:15
262525s	Si2881	1.00	U	#DIV/0!	mg/L	1		#DIV/0!	0	0.02	0.4225	0.423	1	1	0.00845	05/17/05	16:15
262525s	Pb220	24.8			mg/L	0.25		99.2%	25	0.005	24.8455	24.8	1	0.25	0.49691	05/17/05	16:15
262525s	Se196	105			mg/L	0.25		105.0%	100	0.005	105.376	105	1	0.25	2.10752	05/17/05	16:15
262525s	Sn1899	0.250	U	#DIV/0!	mg/L	0.25		#DIV/0!	0	0.005	-0.0135	-0.0135	1	0.25	-0.00027	05/17/05	16:15
262525s	Sr4215	0.250	U	#DIV/0!	mg/L	0.25		#DIV/0!	0	0.005	0.0405	0.0405	1	0.25	0.00081	05/17/05	16:15
262525s	Th2837	1.25	U	#DIV/0!	mg/L	1.25		#DIV/0!	0	0.025	-1.1165	-1.12	1	1.25	-0.02233	05/17/05	16:15
262525s	Ti3349	0.250	U	#DIV/0!	mg/L	0.25		#DIV/0!	0	0.005	-0.01	-0.01	1	0.25	-0.0002	05/17/05	16:15
262525s	Tl1908	103			mg/L	0.5		103.0%	100	0.01	103.1	103	1	0.5	2.062	05/17/05	16:15
262525s	U_4090	5.00	U	#DIV/0!	mg/L	5		#DIV/0!	0	0.1	-1.98	-1.98	1	5	-0.0396	05/17/05	16:15
262525s	V_2924	25.5			mg/L	0.25		102.0%	25	0.005	25.5425	25.5	1	0.25	0.51085	05/17/05	16:15
262525s	W_2079	0.500	U	#DIV/0!	mg/L	0.5		#DIV/0!	0	0.01	-0.0885	-0.0885	1	0.5	-0.00177	05/17/05	16:15
262525s	Y_3710	0.250	U	#DIV/0!	mg/L	0.25		#DIV/0!	0	0.005	-0.0155	-0.0155	1	0.25	-0.00031	05/17/05	16:15
262525s	Zn2062	25.8			mg/L	0.25		103.2%	25	0.005	25.816	25.8	1	0.25	0.51632	05/17/05	16:15
262525s	Zr3496	0.250	U	#DIV/0!	mg/L	0.25		#DIV/0!	0	0.005	-0.0165	-0.0165	1	0.25	-0.00033	05/17/05	16:15

010134

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

☑ 6010B TAP No. 01-0406-130 Rev3/Mar05

☐ Other_____

QC STD. ID's	
CCV	05E02
CRI	
ICSA	
ICSAB	05E02

ICP CAL.STD. ID's	
Std0	05E02
Std1	
Std2	
Std3	
Std4	
Std5	
Std6	05E02

010135

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
06002.01.222	Div 20	0505024	5-17-05	Liquid	60-013

INSTRUMENT: TRACE FILENAME: B 5050024

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 61 013

CLIENT(S): Div 20 ~~010136~~
TASK ORDER(S): 050502-4 SDG(S): 262525
PROJECT NO(S): 06002.01.222
METHOD: 3005A___3050B___3050B-7.5___3010A___3020A___7760A___7740A___HClO___$HClO_4/H_2SO_4$___
Microwave___Fusion___Teflon___Rock___OTHER___ dilutions
MATRIX: Water___Soil___Biota___Solid___Liquid ✓ TCLP Ext___OTHER___
INSTRUMENT: GFAA___ICP ✓ ICP-MS___IC___FLAA___HYDRIDE___OTHER___
ACID INORG #: HNO_3# 5219 HCl# 5090 H_2SO_4#___ $HClO_4$#___ HF#___ H_2O_2#___
INTERNAL STD: Sc @ 10 PPM ✓ Be @ 10 PPM___ SOURCE: IV INORG# ~~4161~~ 4961 DH 5-17-05 EXP: ~~10/05~~ 02/06 AMT: 100ul
Oven/Hotplate/ Block ID:___ Temperature (°C):___

Sample Identification		df	WT(g)	I.V.(ml)	F.V.(ml)
PBW-E17H1		1		10	10
LCSW-E17H1*		1		10	10
262525		50		0.2	10
262525d		50		0.2	10
262525s*		50		0.2	10

* 40uL ICAL-1 Spex#4837 exp. 10/05 and 100ul Spike-1 #5197 exp. 3/06
*40ul Li IV #4628 exp. 8/05
PBW&LCSW are prepared as 10mls 1%HNO_3 / 5% HCL

5-17-05

Note: Contacted Charlie Butcher

LOCATION: N/A

PREPARED BY: [signature] DATE: 5-17-05
REVIEWED BY: John Walker DATE: 5-17-05
DISPOSAL INT/DATE/LOC: ___

FRM-191 (Rev 4/Jan 05)

Method: DAILY2 Standard: blk
Run Time: 05/17/05 14:35:09

010137

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Avge	-.0000	.0004	-.0000	.0001	-.0000	-.0001	-.0000
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	111.7	.2976	164.1	7.175	117.5	2.675	52.66
#1	-.0000	.0004	.0000	.0001	-.0000	-.0001	-.0000
#2	-.0000	.0004	-.0001	.0001	-.0000	-.0001	-.0000

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Avge	.0000	.0000	-.0000	-.0000	.0003	.0000	.0004
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0001
%RSD	29.38	15.31	159.4	69.85	.7898	129.0	25.11
#1	.0000	.0000	.0000	-.0000	.0003	.0001	.0005
#2	.0000	.0000	-.0000	-.0000	.0003	.0000	.0003

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Avge	.0000	.0000	.0000	.0000	-.0000	-.0001	-.0170
SDev	.0001	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	184.6	167.9	203.0	46.12	1063.	32.95	.1669
#1	.0001	.0000	.0000	.0000	-.0000	-.0001	-.0171
#2	-.0000	-.0000	-.0000	.0000	.0000	-.0002	-.0170

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Avge	-.0000	.0000	.0001	.0000	.0001	.0001	-.0010
SDev	.0000	.0000	.0001	.0000	.0001	.0000	.0001
%RSD	233.7	8.587	133.6	74.60	89.08	1.861	5.208
#1	-.0000	.0000	.0001	.0000	.0002	.0001	-.0009
#2	.0000	.0000	.0000	.0000	.0001	.0001	-.0010

Elem	Sc3613	1960/1	1960/2	Si2881	Sn1899	Sr4215	Th2837
Avge	70.64	-.0000	-.0000	.0012	.0000	.0000	.0000
SDev	.81	.0000	.0000	.0000	.0001	.0000	.0000
%RSD	1.146	63.91	334.1	1.148	1333.	220.6	42.39
#1	70.07	-.0000	-.0000	.0012	.0000	.0000	.0001
#2	71.21	-.0000	.0000	.0012	-.0000	-.0000	.0000

Elem	Ti3349	Tl1908	U_4090	V_2924	W_2079	Y_3710	Zn2062
Avge	-.0001	-.0002	-.0001	-.0000	.0002	.0000	-.0000
SDev	.0001	.0001	.0002	.0000	.0001	.0000	.0000
%RSD	67.47	65.19	160.7	23.48	38.74	34.28	141.4
#1	-.0000	-.0002	.0000	-.0000	.0002	.0000	.0000
#2	-.0001	-.0001	-.0003	-.0000	.0001	.0000	-.0000

Elem	Zr3496
Avge	.0001
SDev	.0000
%RSD	28.74
#1	.0001
#2	.0001

5-17-05

5/20/05

010138

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	706363	10000	--	--	--	--	--
SDev	8107.686	.0000000	--	--	--	--	--
%RSD	1.147807	.0000000	--	--	--	--	--
#1	700630	10000	--	--	--	--	--
#2	712096	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std4
Run Time: 05/17/05 14:39:55

010139

Elem	Ag3280	As1890	2203/1	2203/2	Sb2068	1960/1	1960/2
Avge	.0771	.0949	.2743	.2390	.1377	.1870	.1990
SDev	.0000	.0000	.0014	.0009	.0005	.0019	.0012
%RSD	.0548	.0028	.5084	.3674	.3688	.9919	.6166
#1	.0771	.0949	.2733	.2384	.1373	.1857	.1981
#2	.0772	.0949	.2753	.2396	.1380	.1883	.1998

Elem	Tl1908
Avge	.1771
SDev	.0002
%RSD	.1233
#1	.1770
#2	.1773

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	722378	10000	--	--	--	--	--
SDev	2482.652	.0000000	--	--	--	--	--
%RSD	.3436774	.0000000	--	--	--	--	--
#1	720623	10000	--	--	--	--	--
#2	724134	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std1
Run Time: 05/17/05 14:44:22

010140

Elem	Al3082	Ca3179	Fe2714	K_7664	Li6707	Mg2790	Na3302
Avge	.0940	.2146	.0844	.2327	3.525	.0811	.0078
SDev	.0001	.0001	.0001	.0006	.002	.0000	.0000
%RSD	.1114	.0670	.0549	.2499	.0646	.0377	.0618
#1	.0939	.2145	.0844	.2323	3.523	.0811	.0078
#2	.0941	.2147	.0845	.2331	3.526	.0811	.0078

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	703228	10000	--	--	--	--	--
SDev	2438.104	.0000000	--	--	--	--	--
%RSD	.3467018	.0000000	--	--	--	--	--
#1	704952	10000	--	--	--	--	--
#2	701504	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std5
Run Time: 05/17/05 14:48:02

010141

Elem	B_2496	Bi2230	Mo2020	P_1782	Si2881	Sn1899	Sr4215
Avge	.1389	.0248	.2467	.0255	.1428	.1279	2.681
SDev	.0002	.0000	.0008	.0001	.0004	.0002	.001
%RSD	.1127	.0299	.3100	.5160	.2556	.1234	.0390
#1	.1388	.0248	.2462	.0256	.1431	.1277	2.680
#2	.1390	.0249	.2473	.0254	.1426	.1280	2.681

Elem	Ti3349
Avge	2.641
SDev	.003
%RSD	.0980
#1	2.639
#2	2.643

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	738896	10000	--	--	--	--	--
SDev	2155.968	.0000000	--	--	--	--	--
%RSD	.2917826	.0000000	--	--	--	--	--
#1	740420	10000	--	--	--	--	--
#2	737371	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std2
Run Time: 05/17/05 14:51:42

010142

Elem	Ba4934	Be3130	Cr2677	Cu3247	Ni2316
Avge	1.183	1.354	.3748	.2864	.2857
SDev	.001	.000	.0001	.0002	.0002
%RSD	.0637	.0344	.0128	.0642	.0665
#1	1.184	1.354	.3748	.2865	.2855
#2	1.183	1.354	.3748	.2863	.2858

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	719370	10000	--	--	--	--	--
SDev	1671.601	.0000000	--	--	--	--	--
%RSD	.2323700	.0000000	--	--	--	--	--
#1	720552	10000	--	--	--	--	--
#2	718188	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std3
Run Time: 05/17/05 14:55:04

010143

Elem	Cd2265	Co2286	Mn2576	V_2924	Zn2062
Avge	.8293	.1753	.7778	.1797	.2472
SDev	.0015	.0003	.0008	.0001	.0008
%RSD	.1829	.1479	.1072	.0722	.3154
#1	.8303	.1755	.7784	.1796	.2477
#2	.8282	.1752	.7772	.1798	.2466

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	741304	10000	--	--	--	--	--
SDev	3233.599	.0000000	--	--	--	--	--
%RSD	.4362039	.0000000	--	--	--	--	--
#1	739018	10000	--	--	--	--	--
#2	743591	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std6
Run Time: 05/17/05 14:58:44

010144

Elem	La3988	Na5889	Pd3404	S_1820	Th2837	U_4090	W_2079
Avge	.5171	.0473	.1995	.0270	.0968	.0705	.1611
SDev	.0003	.0003	.0001	.0000	.0002	.0002	.0001
%RSD	.0529	.6814	.0464	.1027	.2307	.2974	.0772
#1	.5173	.0475	.1995	.0270	.0969	.0707	.1612
#2	.5169	.0470	.1994	.0270	.0966	.0704	.1610

Elem	Y_3710	Zr3496
Avge	.7778	1.992
SDev	.0000	.001
%RSD	.0046	.0515
#1	.7777	1.993
#2	.7778	1.992

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	713918	10000	--	--	--	--	--
SDev	5996.973	.0000000	--	--	--	--	--
%RSD	.8400092	.0000000	--	--	--	--	--
#1	718158	10000	--	--	--	--	--
#2	709677	10000	--	--	--	--	--

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Method: DAILY2 Slope = Conc(SIR)/IR

010145

Element	Wavelen	High std	Low std	Slope	Y-intercept	Date Standardized
Ag3280	328.068	clp_std4	blk	25.9230	.000529	05/17/05 02:58:44
Al3082	308.215	clp_std1	blk	533.810	-.188554	05/17/05 02:58:44
As1890	189.042	clp_std4	blk	105.310	.002806	05/17/05 02:58:44
B_2496	249.678	clp_std5	blk	72.0339	-.006932	05/17/05 02:58:44
Ba4934	493.409	clp_std2	blk	8.45145	.000071	05/17/05 02:58:44
Be3130	313.042	clp_std2	blk	3.69229	.000290	05/17/05 02:58:44
Bi2230	223.061	clp_std5	blk	199.358	.004080	05/17/05 02:58:44
Ca3179	317.933	clp_std1	blk	233.031	-.004131	05/17/05 02:58:44
Cd2265	226.502	clp_std3	blk	12.0559	-.000367	05/17/05 02:58:44
Co2286	228.616	clp_std3	blk	57.0268	.000640	05/17/05 02:58:44
Cr2677	267.716	clp_std2	blk	26.6809	.000075	05/17/05 02:58:44
Cu3247	324.753	clp_std2	blk	34.9519	-.009773	05/17/05 02:58:44
Fe2714	271.441	clp_std1	blk	592.696	-.019020	05/17/05 02:58:44
K_7664	766.491	clp_std1	blk	215.259	-.084536	05/17/05 02:58:44
La3988	398.853	clp_std6	blk	19.3560	-.000623	05/17/05 02:58:44
Li6707	670.784	clp_std1	blk	2.83710	-.000043	05/17/05 02:58:44
Mg2790	279.078	clp_std1	blk	308.260	-.001987	05/17/05 02:58:44
Mn2576	257.610	clp_std3	blk	12.8576	-.000136	05/17/05 02:58:44
Mo2020	202.030	clp_std5	blk	40.5374	.000061	05/17/05 02:58:44
Na3302	330.232	clp_std1	blk	6325.83	.835759	05/17/05 02:58:44
Na5889	588.991	clp_std6	blk	15.6322	.266421	05/17/05 02:58:44
Ni2316	231.604	clp_std2	blk	35.0032	.000301	05/17/05 02:58:44
P_1782	178.287	clp_std5	blk	392.812	-.005286	05/17/05 02:58:44
2203/1	220.351	clp_std4	blk	36.4595	-.001847	05/17/05 02:58:44
2203/2	220.352	clp_std4	blk	41.8463	-.000885	05/17/05 02:58:44
Pd3404	340.458	clp_std6	blk	51.5120	-.007037	05/17/05 02:58:44
S_1820	182.040	clp_std6	blk	371.843	-.049478	05/17/05 02:58:44
Sb2068	206.838	clp_std4	blk	72.1291	.070437	05/17/05 02:58:44
Sc3613	361.384	blk	dark	1.41566	.000000	05/17/05 02:58:44
1960/1	196.021	clp_std4	blk	53.4638	.001810	05/17/05 02:58:44
1960/2	196.022	clp_std4	blk	50.2578	.000363	05/17/05 02:58:44
Si2881	288.158	clp_std5	blk	70.3466	-.086350	05/17/05 02:58:44
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	78.2636	-.000300	05/17/05 02:58:44
Sr4215	421.552	clp_std5	blk	3.73041	-.000019	05/17/05 02:58:44
Th2837	283.730	clp_std6	blk	107.929	-.004978	05/17/05 02:58:44
Ti3349	334.941	clp_std5	blk	3.78642	.000320	05/17/05 02:58:44
Tl1908	190.864	clp_std4	blk	56.4003	.009257	05/17/05 02:58:44
U_4090	409.014	clp_std6	blk	149.664	.018790	05/17/05 02:58:44
V_2924	292.402	clp_std3	blk	55.6293	.001809	05/17/05 02:58:44
W_2079	207.914	clp_std6	blk	31.0581	-.005707	05/17/05 02:58:44
Y_3710	371.030	clp_std6	blk	12.8551	-.000145	05/17/05 02:58:44
Zn2062	206.200	clp_std3	blk	40.4561	.000028	05/17/05 02:58:44
Zr3496	349.621	clp_std6	blk	5.48653	-.000677	05/17/05 02:58:44

Analysis Report QC Standard 05/17/05 03:09:12 PM page 1

Method: DAILY2 Sample Name: ICV/CCV Operator:
Run Time: 05/17/05 15:04:38
Comment:
Mode: CONC Corr. Factor: 1

010146

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9851	9.867	5.104	4.901	10.01	.9897	5.070
SDev	.0030	.014	.005	.005	.02	.0010	.016
%RSD	.3062	.1447	.0953	.1119	.1665	.0997	.3248
#1	.9872	9.877	5.101	4.898	10.02	.9890	5.082
#2	.9829	9.857	5.108	4.905	9.994	.9904	5.059
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.11	1.034	5.191	1.984	2.027	10.55	18.75
SDev	.02	.005	.003	.003	.008	.05	.08
%RSD	.0751	.4537	.0571	.1639	.3849	.4593	.4099
#1	20.10	1.030	5.189	1.982	2.033	10.59	18.81
#2	20.12	1.037	5.193	1.987	2.022	10.52	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	4.921	5.202	20.07	1.044	5.170	28.44	Q41.19
SDev	.000	.008	.01	.000	.001	.08	.08
%RSD	.0066	.1600	.0251	.0036	.0238	.2836	.1988
#1	4.922	5.208	20.07	1.044	5.169	28.38	Q41.25
#2	4.921	5.197	20.07	1.044	5.170	28.49	Q41.14
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	4.975	5.143	4.955	4.970	.9956	.9884	1.009
SDev	.006	.018	.016	.034	.0025	.0041	.001
%RSD	.1121	.3480	.3321	.6827	.2521	.4182	.0820
#1	4.979	5.130	4.943	4.994	.9939	.9913	1.010
#2	4.971	5.156	4.966	4.946	.9974	.9854	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

010147

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.02	5.209	5.232	5.139	4.965	5.224	4.949
SDev	.76	.007	.059	.005	.017	.042	.006
%RSD	.7656	.1338	1.136	.1068	.3452	.8028	.1299
#1	99.56	5.214	5.274	5.143	4.977	5.254	4.944
#2	98.48	5.204	5.190	5.135	4.953	5.194	4.953
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	5.200	.9832	4.968	5.161	Q.8712	5.069	1.066
SDev	.001	.0030	.002	.014	.0375	.003	.005
%RSD	.0168	.3043	.0345	.2729	4.302	.0598	.4433
#1	5.200	.9853	4.969	5.152	Q.8977	5.071	1.063
#2	5.201	.9811	4.967	5.171	Q.8447	5.067	1.070
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail	QC Pass	QC Pass
Value	5.000	1.000	5.000	5.000	1.000	5.000	1.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.991	1.049	4.856
SDev	.007	.002	.000
%RSD	.1365	.1444	.0079
#1	4.995	1.048	4.857
#2	4.986	1.050	4.856
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

010148

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	699388	10000	--	--	--	--	--
SDev	5338.656	.0000000	--	--	--	--	--
%RSD	.7633325	.0000000	--	--	--	--	--
#1	703163	10000	--	--	--	--	--
#2	695613	10000	--	--	--	--	--

Analysis Report Blank Sample 05/17/05 03:15:48 PM page 1

Method: DAILY2 Sample Name: ICB/CCB Operator: 010149
Run Time: 05/17/05 15:11:14
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	-.0020	.0010	.0059	.0000	.0001	.0029
SDev	.0005	.0028	.0011	.0025	.0000	.0000	.0032
%RSD	1636.	142.0	108.6	41.94	70.44	49.29	109.6
#1	-.0004	-.0039	.0002	.0077	.0001	.0001	.0007
#2	.0003	.0000	.0018	.0042	.0000	.0000	.0052
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0013	-.0003	-.0001	.0001	.0001	-.0039	-.0139
SDev	.0005	.0004	.0003	.0006	.0003	.0112	.0139
%RSD	36.35	144.5	242.8	426.7	538.8	284.4	100.2
#1	-.0010	-.0005	-.0003	-.0003	-.0001	.0040	-.0040
#2	-.0016	.0000	.0001	.0006	.0002	-.0118	-.0237
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	-.0010	.0000	-.0038	-.0000	.0014	L-.1282	-.0014
SDev	.0001	.0000	.0010	.0001	.0013	.1752	.0023
%RSD	13.27	46.82	27.03	1625.	99.36	136.6	164.8
#1	-.0009	.0000	-.0045	.0000	.0023	-.0044	-.0030
#2	-.0010	.0000	-.0031	-.0000	.0004	L-.2521	.0002
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	.0001	H.0130	-.0017	-.0024	-.0046	-.0002	-.0023
SDev	.0020	.0045	.0043	.0007	.0006	.0078	.0011
%RSD	2010.	34.96	253.7	30.92	13.91	3334.	48.88
#1	-.0013	.0098	.0013	-.0030	-.0042	.0053	-.0031
#2	.0015	H.0162	-.0047	-.0019	L-.0051	-.0058	-.0015
Errors	LC Pass	LC High	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

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

010150

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.6	.0034	.0017	.0044	-.0022	.0023	.0009
SDev	.9	.0011	.0023	.0040	.0009	.0012	.0015
%RSD	.8507	32.27	137.2	90.90	43.10	51.27	170.7
#1	99.96	.0042	.0000	.0072	-.0015	.0014	-.0002
#2	101.2	.0026	.0033	.0016	-.0028	.0031	.0019
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	-.0009	.0002	-.0001	-.0361	.0003	.0038
SDev	.0000	.0019	.0000	.0041	.0075	.0003	.0026
%RSD	14.71	205.3	3.203	6118.	20.69	100.3	66.66
#1	-.0000	.0004	.0002	-.0030	-.0414	.0001	.0056
#2	-.0000	-.0022	.0002	.0028	-.0309	.0005	.0020
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	-.0000	.0000
SDev	.0001	.0000	.0005
%RSD	62.80	2847.	1939.
#1	.0002	.0000	.0004
#2	.0001	-.0000	-.0004
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010151

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	710290	10000	--	--	--	--	--
SDev	6078.997	.0000000	--	--	--	--	--
%RSD	.8558478	.0000000	--	--	--	--	--
#1	705991	10000	--	--	--	--	--
#2	714588	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: CRI Operator:
Run Time: 05/17/05 15:16:04 010152
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0192	.0959	.0218	.1052	.0206	.0099	.0059
SDev	.0006	.0008	.0041	.0006	.0001	.0000	.0031
%RSD	2.894	.8523	18.83	.5672	.4041	.3801	52.58
#1	.0196	.0953	.0247	.1056	.0207	.0099	.0037
#2	.0188	.0965	.0189	.1048	.0205	.0099	.0081
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value	.0200	.1000	.0200	.1000	.0200	.0100	
Range	50.00	50.00	50.00	50.00	50.00	50.00	

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0104	.1020	.0201	.0488	.0779	-.0189
SDev	.0000	.0002	.0012	.0005	.0004	.0125	.0014
%RSD	7.067	1.997	1.212	2.661	.8725	16.09	7.287
#1	.0003	.0105	.1029	.0205	.0491	.0867	-.0199
#2	.0002	.0102	.1011	.0198	.0485	.0690	-.0179
Errors	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value		.0100	.1000	.0200	.0500	.1000	
Range		50.00	50.00	50.00	50.00	50.00	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0784	-.0074	.0312	.0206	-.2751	.0016
SDev	.0001	.0000	.0022	.0001	.0001	.1448	.0016
%RSD	10.39	.0297	29.68	.1960	.7443	52.63	99.62
#1	-.0007	.0784	-.0058	.0312	.0205	-.1727	.0005
#2	-.0006	.0784	-.0089	.0311	.0207	-.3774	.0027
Errors	NOCHECK	QC Pass	NOCHECK	QC Pass	QC Pass	NOCHECK	NOCHECK
Value		.1000		.0300	.0200		
Range		50.00		50.00	50.00		

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0805	.1086	.0025	.0064	-.0036	-.0082	.1242
SDev	.0001	.0052	.0022	.0002	.0009	.0168	.0025
%RSD	.1388	4.808	87.66	2.782	24.25	204.3	1.997
#1	.0806	.1049	.0041	.0065	-.0030	.0037	.1260
#2	.0805	.1123	.0010	.0063	-.0042	-.0201	.1225
Errors	QC Pass	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	QC Pass
Value	.0800	.1000					.1200
Range	50.00	50.00					50.00

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

010153

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.7	.0106	.0104	.1073	.0051	.0104	.1021
SDev	.2	.0034	.0021	.0003	.0009	.0003	.0016
%RSD	.1627	31.84	20.29	.3159	16.68	2.641	1.525
#1	101.8	.0082	.0118	.1071	.0057	.0106	.1010
#2	101.6	.0130	.0089	.1076	.0045	.0103	.1032
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				.1000	.0060	.0100	.1000
Range				50.00	50.00	50.00	50.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0216	-.0020	.0201	.0233	.1445	.1014	-.0001
SDev	.0000	.0009	.0001	.0036	.0136	.0013	.0022
%RSD	.0398	45.73	.5677	15.58	9.434	1.246	1491.
#1	.0216	-.0014	.0202	.0207	.1541	.1023	.0014
#2	.0216	-.0027	.0200	.0258	.1349	.1006	-.0017
Errors	QC Pass	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value	.0200		.0200	.0200	.2000	.1000	
Range	50.00		50.00	50.00	50.00	50.00	

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0419	.0935
SDev	.0003	.0002	.0004
%RSD	1233.	.4059	.4534
#1	.0002	.0420	.0938
#2	-.0002	.0418	.0932
Errors	NOCHECK	QC Pass	QC Pass
Value		.0400	.1000
Range		50.00	50.00

010154

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	718260	10000	--	--	--	--	--
SDev	1167.433	.0000000	--	--	--	--	--
%RSD	.1625362	.0000000	--	--	--	--	--
#1	719086	10000	--	--	--	--	--
#2	717435	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: ICSA Operator: 010155
Run Time: 05/17/05 15:20:49
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0015	514.6	.0024	-.0165	.0023	.0001	.0153
SDev	.0004	.0	.0022	.0002	.0000	.0000	.0044
%RSD	25.35	.0032	89.20	1.084	1.555	36.27	28.87
#1	-.0017	514.6	.0009	-.0163	.0023	.0000	.0184
#2	-.0012	514.6	.0039	-.0166	.0023	.0001	.0121
Errors	NOCHECK	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value		500.0					
Range		20.00					

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	466.4	.0000	.0004	.0002	.0008	191.8	-.0221
SDev	1.1	.0003	.0001	.0007	.0006	.3	.0145
%RSD	.2271	8899.	15.29	282.0	79.92	.1774	65.72
#1	465.6	.0002	.0005	-.0002	.0012	192.0	-.0323
#2	467.1	-.0002	.0004	.0007	.0003	191.5	-.0118
Errors	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	QC Pass	NOCHECK
Value	500.0					200.0	
Range	20.00					20.00	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0042	.0003	542.5	-.0032	-.0006	.2437	-.0255
SDev	.0007	.0000	.2	.0001	.0015	.1936	.0020
%RSD	16.49	12.73	.0323	4.189	261.5	79.46	7.914
#1	.0037	.0002	542.3	-.0033	-.0017	.1067	-.0270
#2	.0047	.0003	542.6	-.0031	.0005	.3806	-.0241
Errors	NOCHECK	NOCHECK	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value			500.0				
Range			20.00				

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	-.0217	.0363	-.0360	.0120	.0126	.0034
SDev	.0003	.0034	.0130	.0072	.0032	.0158	.0056
%RSD	32.07	15.89	35.90	20.00	26.77	125.1	164.8
#1	.0012	-.0241	.0456	-.0411	.0097	.0238	-.0006
#2	.0007	-.0192	.0271	-.0309	.0142	.0015	.0074
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value							
Range							

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

010156

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	93.21	-.0019	-.0035	-.0073	-.0119	-.0030	-.0049
SDev	.25	.0044	.0020	.0019	.0005	.0001	.0012
%RSD	.2712	236.0	56.67	26.51	3.857	4.013	23.80
#1	93.39	.0012	-.0050	-.0086	-.0122	-.0029	-.0057
#2	93.03	-.0049	-.0021	-.0059	-.0116	-.0031	-.0041
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value							
Range							

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0168	.0151	-.0013	.0070	-.0216	.0001	.0038
SDev	.0001	.0002	.0001	.0006	.0211	.0003	.0013
%RSD	.2899	1.451	5.372	8.460	97.54	270.4	35.32
#1	.0168	.0150	-.0013	.0074	-.0365	-.0001	.0028
#2	.0168	.0153	-.0012	.0066	-.0067	.0003	.0047
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
Value							
Range							

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0005	.0080	-.0003
SDev	.0000	.0001	.0005
%RSD	6.228	1.393	142.6
#1	-.0004	.0080	-.0007
#2	-.0005	.0081	.0000
Errors	NOCHECK	NOCHECK	NOCHECK
Value			
Range			

010157

IntStd	1	2	3	4	5	6	
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	658363	10000	--	--	--	--	--
SDev	1770.595	.0000000	--	--	--	--	--
%RSD	.2689391	.0000000	--	--	--	--	--
#1	659615	10000	--	--	--	--	--
#2	657111	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: ICSAB Operator:
Run Time: 05/17/05 15:25:34
Comment:
Mode: CONC Corr. Factor: 1

010158

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.094	517.0	1.042	1.053	.5282	.4863	.0142
SDev	.003	.4	.007	.000	.0009	.0006	.0056
%RSD	.2528	.0719	.6789	.0084	.1740	.1213	39.48
#1	1.096	517.3	1.037	1.053	.5288	.4859	.0102
#2	1.092	516.8	1.047	1.053	.5275	.4868	.0181
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value	1.000	500.0	1.000	1.000	.5000	.5000	
Range	20.00	20.00	20.00	20.00	20.00	20.00	

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	467.2	.9898	.4990	.4843	.5476	192.7	-.0232
SDev	1.3	.0008	.0019	.0011	.0019	.0	.0254
%RSD	.2701	.0755	.3706	.2294	.3541	.0257	109.7
#1	466.3	.9893	.4977	.4836	.5490	192.6	-.0411
#2	468.1	.9904	.5003	.4851	.5463	192.7	-.0052
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	NOCHECK
Value	500.0	1.000	.5000	.5000	.5000	200.0	
Range	20.00	20.00	20.00	20.00	20.00	20.00	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0041	1.300	546.9	.5080	1.049	.3526	-.0188
SDev	.0011	.007	.8	.0006	.005	.2302	.0019
%RSD	26.18	.5549	.1521	.1288	.4835	65.29	10.09
#1	.0034	1.305	546.3	.5075	1.045	.1898	-.0202
#2	.0049	1.295	547.5	.5085	1.053	.5154	-.0175
Errors	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	NOCHECK	NOCHECK
Value			500.0	.5000	1.000		
Range			20.00	20.00	20.00		

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9406	1.035	1.015	.9485	.0073	-.0005	1.064
SDev	.0040	.021	.002	.0001	.0040	.0171	.002
%RSD	.4296	2.043	.2223	.0142	55.66	3314.	.1940
#1	.9434	1.050	1.013	.9484	.0044	.0116	1.065
#2	.9377	1.020	1.016	.9486	.0101	-.0126	1.062
Errors	QC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	QC Pass
Value	1.000						1.000
Range	20.00						20.00

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

010159

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	94.38	1.025	1.029	1.076	.9706	1.027	1.024
SDev	.45	.007	.009	.005	.0008	.004	.001
%RSD	.4752	.7302	.9049	.4785	.0867	.3611	.1400
#1	94.69	1.030	1.022	1.072	.9700	1.025	1.025
#2	94.06	1.020	1.035	1.079	.9712	1.030	1.023
Errors	NOCHECK	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	QC Pass
Value				1.000	1.000	1.000	1.000
Range				20.00	20.00	20.00	20.00

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.090	.0111	1.000	.9933	1.043	.5108	.0009
SDev	.001	.0007	.000	.0010	.036	.0014	.0009
%RSD	.0776	6.190	.0043	.0998	3.419	.2790	99.84
#1	1.090	.0115	1.000	.9940	1.018	.5118	.0003
#2	1.089	.0106	1.000	.9926	1.069	.5098	.0015
Errors	QC Pass	NOCHECK	NOCHECK	QC Pass	QC Pass	QC Pass	NOCHECK
Value	1.000			1.000	1.000	.5000	
Range	20.00			20.00	20.00	20.00	

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0004	1.007	.9471
SDev	.0001	.004	.0007
%RSD	16.58	.3909	.0745
#1	-.0005	1.004	.9466
#2	-.0004	1.010	.9476
Errors	NOCHECK	QC Pass	QC Pass
Value		1.000	1.000
Range		20.00	20.00

010160

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	666618	10000	--	--	--	--	--
SDev	3114.098	.0000000	--	--	--	--	--
%RSD	.4671488	.0000000	--	--	--	--	--
#1	668820	10000	--	--	--	--	--
#2	664416	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: ICV/CCV Operator:
Run Time: 05/17/05 15:34:01
Comment: 010161
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9826	9.824	5.080	4.892	9.986	.9882	5.063
SDev	.0004	.000	.015	.026	.023	.0018	.025
%RSD	.0438	.0035	.2883	.5274	.2269	.1786	.4872
#1	.9829	9.824	5.090	4.873	9.970	.9894	5.045
#2	.9823	9.823	5.070	4.910	10.00	.9869	5.080
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	1.000	10.00	5.000	5.000	10.00	1.000	5.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.05	1.032	5.184	1.983	2.028	10.54	18.73
SDev	.07	.002	.015	.005	.001	.08	.07
%RSD	.3588	.1575	.2933	.2330	.0539	.7404	.3989
#1	20.10	1.033	5.194	1.986	2.027	10.60	18.68
#2	20.00	1.031	5.173	1.979	2.029	10.49	18.78
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	4.915	5.199	20.06	1.044	5.153	28.24	Q41.12
SDev	.006	.006	.05	.002	.003	.33	.04
%RSD	.1127	.1112	.2610	.2275	.0650	1.168	.0910
#1	4.911	5.195	20.09	1.045	5.150	28.47	Q41.10
#2	4.918	5.203	20.02	1.042	5.155	28.00	Q41.15
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	4.959	5.137	4.949	4.904	.9979	.9908	1.012
SDev	.009	.036	.046	.016	.0025	.0084	.004
%RSD	.1810	.7068	.9204	.3233	.2481	.8502	.4045
#1	4.965	5.163	4.981	4.915	.9962	.9849	1.009
#2	4.952	5.111	4.916	4.893	.9997	.9968	1.015
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

010162

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	98.83	5.209	5.162	5.143	4.919	5.178	4.936
SDev	1.00	.038	.021	.002	.026	.001	.018
%RSD	1.015	.7318	.4054	.0369	.5235	.0241	.3633
#1	98.12	5.236	5.147	5.144	4.937	5.177	4.948
#2	99.54	5.182	5.177	5.141	4.901	5.178	4.923
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	5.206	.9855	4.969	5.147	Q.8274	5.062	1.056
SDev	.005	.0002	.001	.006	.0263	.011	.006
%RSD	.0936	.0218	.0255	.1206	3.175	.2153	.5636
#1	5.203	.9854	4.970	5.151	Q.8459	5.070	1.052
#2	5.209	.9857	4.968	5.142	Q.8088	5.055	1.060
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Fail	QC Pass	QC Pass
Value	5.000	1.000	5.000	5.000	1.000	5.000	1.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.990	1.044	4.856
SDev	.001	.005	.007
%RSD	.0130	.4755	.1462
#1	4.989	1.048	4.851
#2	4.990	1.041	4.861
Errors	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000
Range	10.00	10.00	10.00

010163

IntStd	1	2	3	4	5	6	
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	698051	10000	--	--	--	--	--
SDev	7032.884	.0000000	--	--	--	--	--
%RSD	1.007503	.0000000	--	--	--	--	--
#1	693078	10000	--	--	--	--	--
#2	703024	10000	--	--	--	--	--

Analysis Report Blank Sample 05/17/05 03:45:12 PM page 1

Method: DAILY2 Sample Name: ICB/CCB Operator:
Run Time: 05/17/05 15:40:38
Comment:
Mode: CONC Corr. Factor: 1

010164

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	-.0098	-.0001	.0056	-.0000	.0001	.0018
SDev	.0013	.0029	.0015	.0005	.0002	.0000	.0047
%RSD	186.1	29.55	1307.	9.529	919.8	44.90	259.9
#1	.0002	-.0077	.0009	.0060	-.0001	.0000	-.0015
#2	-.0016	-.0118	-.0012	.0052	.0001	.0001	.0051
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0012	-.0005	-.0001	.0006	-.0002	-.0145	-.0137
SDev	.0017	.0001	.0003	.0005	.0004	.0214	.0096
%RSD	139.4	13.04	227.3	86.85	183.7	148.0	69.76
#1	-.0000	-.0005	-.0004	.0002	-.0005	.0007	-.0069
#2	-.0024	-.0006	.0001	.0009	.0001	L-.0296	-.0205
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	-.0010	.0001	-.0065	-.0000	.0012	L-.1776	.0069
SDev	.0003	.0001	.0024	.0001	.0008	.1019	.0057
%RSD	30.94	108.3	36.08	494.3	65.49	57.36	83.04
#1	-.0008	.0001	-.0049	-.0001	.0006	L-.1056	.0110
#2	-.0012	.0000	-.0082	.0000	.0017	L-.2497	.0029
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	.0007	.0033	-.0010	-.0000	-.0033	-.0077	-.0048
SDev	.0015	.0128	.0041	.0009	.0030	.0100	.0004
%RSD	233.9	394.1	402.2	13240.	90.42	129.7	7.951
#1	-.0004	-.0058	.0019	-.0007	-.0012	L-.0148	-.0045
#2	.0017	H.0123	-.0039	.0007	L-.0054	-.0006	-.0051
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

010165

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.5	-.0039	-.0001	-.0012	-.0003	-.0013	-.0011
SDev	.3	.0077	.0018	.0030	.0007	.0038	.0015
%RSD	.2838	201.0	2656.	263.3	226.5	286.7	146.5
#1	101.7	.0016	.0012	.0010	.0002	.0014	.0000
#2	101.3	-.0093	-.0013	-.0033	-.0008	-.0040	-.0021
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	-.0036	.0001	.0033	-.0436	.0001	.0011
SDev	.0000	.0009	.0003	.0008	.0149	.0006	.0001
%RSD	41.97	24.41	260.5	24.60	34.23	417.8	12.93
#1	-.0000	-.0043	-.0001	.0038	-.0331	-.0003	.0012
#2	-.0000	-.0030	.0003	.0027	-.0542	.0006	.0010
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0000	-.0003
SDev	.0002	.0001	.0009
%RSD	1716.	282.6	334.9
#1	-.0001	-.0000	-.0009
#2	.0001	.0001	.0004
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010166

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	717155	10000	--	--	--	--	--
SDev	2002.526	.0000000	--	--	--	--	--
%RSD	.2792320	.0000000	--	--	--	--	--
#1	718571	10000	--	--	--	--	--
#2	715739	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: pbw-E17H1 Operator:
Run Time: 05/17/05 15:45:23
Comment:
Mode: CONC Corr. Factor: 1

010167

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	.0041	-.0025	.0050	-.0000	.0000	.0013
SDev	.0001	.0009	.0056	.0008	.0002	.0000	.0031
%RSD	38.79	21.15	220.9	15.99	2862.	96.89	236.3
#1	-.0004	.0035	L-.0064	.0056	.0002	.0001	.0035
#2	-.0002	.0047	.0014	.0044	-.0002	.0000	-.0009
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0028	-.0003	-.0003	-.0001	.0005	L-.0303	-.0140
SDev	.0005	.0003	.0007	.0015	.0008	.0156	.0112
%RSD	17.66	76.48	266.6	1247.	165.2	51.30	79.62
#1	.0032	-.0005	-.0008	.0010	.0011	L-.0413	-.0061
#2	.0025	-.0002	.0002	-.0012	-.0001	-.0193	-.0219
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	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	-.0013	.0000	-.0043	-.0000	.0006	L-.1945	-.0080
SDev	.0000	.0000	.0011	.0001	.0014	.0547	.0000
%RSD	.6561	8.676	25.53	2619.	238.4	28.10	.0367
#1	-.0012	.0000	-.0050	.0001	.0016	L-.1559	-.0080
#2	-.0013	.0000	-.0035	-.0001	-.0004	L-.2332	-.0080
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	.0009	.0033	.0010	-.0013	-.0044	-.0039	-.0008
SDev	.0005	.0040	.0083	.0041	.0006	.0062	.0022
%RSD	49.80	121.4	868.9	310.3	14.15	161.6	285.1
#1	.0013	.0005	-.0049	.0016	-.0040	-.0083	-.0023
#2	.0006	.0061	.0068	-.0042	-.0048	.0006	.0008
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

010168

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.52	.0023	.0012	.0044	-.0005	.0016	.0023
SDev	.48	.0019	.0001	.0022	.0000	.0007	.0008
%RSD	.4873	86.63	8.779	49.70	7.780	45.76	34.02
#1	97.18	.0009	.0011	.0029	-.0006	.0011	.0018
#2	97.85	.0036	.0013	.0060	-.0005	.0021	.0029
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0017	.0001	-.0022	-.0494	-.0003	.0024
SDev	.0000	.0037	.0006	.0013	.0079	.0015	.0009
%RSD	18.06	223.5	847.8	61.57	15.93	488.3	38.09
#1	-.0000	.0043	.0005	-.0031	-.0549	.0007	.0031
#2	-.0000	-.0010	-.0003	-.0012	-.0438	-.0013	.0018
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0002	-.0001
SDev	.0002	.0000	.0008
%RSD	244.0	17.24	1228.
#1	.0003	.0002	.0005
#2	-.0001	.0003	-.0006
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010169

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	688788	10000	--	--	--	--	--
SDev	3381.385	.0000000	--	--	--	--	--
%RSD	.4909180	.0000000	--	--	--	--	--
#1	686397	10000	--	--	--	--	--
#2	691179	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: pbw-E17H1 Operator:
Run Time: 05/17/05 15:51:14
Comment:
Mode: CONC Corr. Factor: 1

010170

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	-.0084	-.0024	.0034	-.0000	.0001	.0011
SDev	.0011	.0093	.0012	.0002	.0001	.0000	.0010
%RSD	186.4	109.9	48.97	4.822	187.3	7.623	90.74
#1	-.0014	-.0150	-.0016	.0035	-.0001	.0001	.0004
#2	.0002	-.0019	-.0032	.0033	.0000	.0001	.0018
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0015	-.0002	-.0003	-.0002	-.0006	.0020	-.0130
SDev	.0041	.0004	.0009	.0000	.0002	.0179	.0194
%RSD	269.3	145.7	350.2	21.93	38.29	881.1	149.6
#1	-.0014	-.0005	-.0009	-.0001	-.0007	-.0106	-.0267
#2	.0044	.0000	.0004	-.0002	-.0004	.0147	.0008
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	-.0008	.0000	-.0081	-.0002	.0003	-.0486	.0044
SDev	.0016	.0001	.0098	.0002	.0008	.4127	.0045
%RSD	210.4	879.6	120.5	88.18	269.6	849.3	101.6
#1	-.0019	-.0001	-.0150	-.0001	.0009	L-.3404	.0012
#2	.0004	.0001	-.0012	-.0003	-.0003	H.2432	.0076
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	.0011	.0000	-.0040	-.0012	.0006	-.0072
SDev	.0006	.0028	.0001	.0007	.0071	.0006	.0007
%RSD	140.1	253.5	368.0	18.07	588.0	88.53	10.13
#1	.0008	-.0009	-.0001	-.0045	L-.0062	.0002	-.0077
#2	.0000	.0031	.0001	-.0035	.0038	.0010	-.0067
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

010171

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.9	-.0042	.0039	-.0007	-.0026	.0012	.0013
SDev	1.2	.0043	.0036	.0074	.0005	.0010	.0005
%RSD	1.148	101.2	91.98	1019.	20.19	80.18	41.44
#1	101.7	-.0072	.0064	-.0059	L-.0030	.0019	.0017
#2	100.1	-.0012	.0014	.0045	-.0023	.0005	.0009
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	-.0018	-.0000	.0033	-.0345	-.0003	-.0009
SDev	.0001	.0049	.0001	.0027	.0543	.0002	.0031
%RSD	268.6	268.3	117.1	82.93	157.6	49.01	356.7
#1	-.0001	.0016	-.0001	.0014	-.0729	-.0002	-.0030
#2	.0000	-.0053	-.0000	.0053	.0040	-.0005	.0013
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0007	-.0003
SDev	.0001	.0007	.0000
%RSD	105.4	110.9	12.09
#1	-.0001	.0001	-.0003
#2	-.0000	.0012	-.0003
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010172

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	712538	10000	--	--	--	--	--
SDev	8249.815	.0000000	--	--	--	--	--
%RSD	1.157806	.0000000	--	--	--	--	--
#1	718372	10000	--	--	--	--	--
#2	706705	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: lcsw-E17H1 Operator:
Run Time: 05/17/05 15:55:59
Comment:
Mode: CONC Corr. Factor: 1

010173

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0509	1.980	2.035	.0035	2.002	.0504	.0051
SDev	.0008	.005	.004	.0016	.001	.0001	.0022
%RSD	1.491	.2635	.2026	45.52	.0552	.1691	42.09
#1	.0515	1.984	2.038	.0047	2.001	.0505	.0066
#2	.0504	1.976	2.032	.0024	2.002	.0503	.0036

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.83	.0517	.5138	.2017	.2532	1.125	18.39
SDev	.05	.0004	.0001	.0003	.0003	.010	.05
%RSD	.2411	.7899	.0289	.1711	.1335	.8878	.2736
#1	20.87	.0520	.5137	.2019	.2535	1.132	18.36
#2	20.80	.0514	.5139	.2014	.2530	1.118	18.43

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0006	4.165	20.71	.5205	-.0000	18.76	27.39
SDev	.0013	.009	.03	.0001	.0003	.27	.10
%RSD	220.2	.2232	.1664	.0241	1312.	1.433	.3545
#1	.0015	4.159	20.73	.5206	.0002	18.95	27.32
#2	-.0003	4.172	20.69	.5204	-.0002	18.57	27.46

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4989	.0078	.5023	.4938	.0021	.0065	.4900
SDev	.0041	.0091	.0022	.0014	.0050	.0085	.0019
%RSD	.8291	117.3	.4467	.2796	236.1	130.0	.3876
#1	.5019	.0142	.5007	.4948	.0057	.0005	.4887
#2	.4960	.0013	.5039	.4928	-.0014	.0126	.4914

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	95.69	2.117	2.110	.0123	.4967	2.112	.0017
SDev	.77	.005	.007	.0039	.0002	.003	.0023
%RSD	.8037	.2197	.3278	31.65	.0347	.1449	137.2
#1	95.15	2.120	2.105	.0150	.4968	2.110	.0001
#2	96.24	2.114	2.115	.0095	.4965	2.114	.0033

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	-.0213	.0002	2.058	-.0059	.5093	-.0017
SDev	.0000	.0001	.0001	.019	.0663	.0011	.0011
%RSD	5.352	.3010	51.44	.9118	1126.	.2260	66.68
#1	.0008	-.0213	.0003	2.071	.0410	.5085	-.0025
#2	.0007	-.0213	.0001	2.045	-.0528	.5101	-.0009

010174

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.5158	.0007
SDev	.0001	.0013	.0007
%RSD	326.5	.2532	94.54
#1	.0000	.5167	.0012
#2	-.0001	.5148	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	675892	10000	--	--	--	--	--
SDev	5482.199	.0000000	--	--	--	--	--
%RSD	.8111051	.0000000	--	--	--	--	--
#1	672016	10000	--	--	--	--	--
#2	679769	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 262525 Operator:
Run Time: 05/17/05 16:00:45
Comment:
Mode: CONC Corr. Factor: 1

010175

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0055	-.0012	.0019	-.0001	.0001	.0056
SDev	.0001	.0003	.0019	.0003	.0001	.0000	.0035
%RSD	32.60	4.931	153.8	14.08	98.23	4.969	61.85
#1	-.0005	.0057	-.0026	.0021	-.0000	.0001	.0081
#2	-.0003	.0053	.0001	.0017	-.0002	.0001	.0032

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.2401	-.0003	-.0002	.0003	.0006	-.0094	.0477
SDev	.0008	.0005	.0010	.0007	.0004	.0080	.0011
%RSD	.3203	159.7	440.5	214.5	63.68	84.67	2.411
#1	.2407	-.0006	-.0009	.0008	.0009	-.0150	.0469
#2	.2396	.0000	.0005	-.0002	.0003	-.0038	.0485

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0010	.0001	.0299	-.0001	.0002	.7406	.8759
SDev	.0003	.0000	.0029	.0001	.0002	.1620	.0004
%RSD	31.99	16.46	9.734	65.64	93.65	21.87	.0504
#1	-.0008	.0001	.0320	-.0001	.0003	.6261	.8763
#2	-.0013	.0001	.0279	-.0002	.0001	.8552	.8756

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0025	-.0001	.0014	-.0033	.1253	-.0001
SDev	.0002	.0004	.0033	.0024	.0020	.0033	.0006
%RSD	14770.	17.46	3297.	176.6	59.32	2.649	1212.
#1	.0002	.0022	.0022	-.0003	-.0047	.1230	-.0005
#2	-.0002	.0028	-.0024	.0031	-.0019	.1277	.0004

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.13	.0001	.0022	.0086	.0009	.0015	.0026
SDev	.36	.0003	.0024	.0040	.0005	.0015	.0011
%RSD	.3663	415.8	105.2	46.62	57.41	95.05	40.34
#1	97.39	-.0002	.0039	.0058	.0005	.0026	.0019
#2	96.88	.0003	.0006	.0115	.0013	.0005	.0034

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0016	.0001	.0049	-.0336	.0004	.0023
SDev	.0000	.0020	.0002	.0029	.0072	.0001	.0019
%RSD	9.423	126.9	127.3	59.89	21.50	27.24	83.83
#1	.0001	-.0002	.0003	.0069	-.0387	.0005	.0036
#2	.0001	-.0030	.0000	.0028	-.0285	.0003	.0009

010176

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0000	-.0002	-.0004
SDev	.0001	.0001	.0002
%RSD	317.7	40.48	66.27
#1	.0001	-.0001	-.0005
#2	-.0001	-.0003	-.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	686058	10000	--	--	--	--	--
SDev	2514.472	.0000000	--	--	--	--	--
%RSD	.3665101	.0000000	--	--	--	--	--
#1	687836	10000	--	--	--	--	--
#2	684280	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 262525d Operator:
Run Time: 05/17/05 16:05:31
Comment:
Mode: CONC Corr. Factor: 1

010177

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0021	-.0003	.0012	-.0000	.0000	.0013
SDev	.0006	.0015	.0008	.0009	.0001	.0000	.0010
%RSD	165.6	73.20	239.2	73.30	454.9	2.142	83.55
#1	-.0008	.0032	-.0008	.0006	.0000	.0000	.0020
#2	.0001	.0010	.0002	.0019	-.0001	.0000	.0005

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.2412	-.0003	.0011	-.0004	.0000	.0002	.0584
SDev	.0004	.0001	.0004	.0001	.0003	.0037	.0167
%RSD	.1803	42.22	36.78	39.10	1632.	2076.	28.62
#1	.2415	-.0002	.0014	-.0003	.0002	.0028	.0703
#2	.2409	-.0004	.0008	-.0005	-.0002	-.0025	.0466

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0010	.0001	.0337	-.0001	-.0003	.4928	.8761
SDev	.0003	.0001	.0028	.0001	.0000	.0321	.0042
%RSD	29.43	78.74	8.324	193.2	15.93	6.508	.4787
#1	-.0012	.0001	.0317	.0000	-.0002	.5155	.8790
#2	-.0008	.0000	.0357	-.0001	-.0003	.4701	.8731

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0011	.0045	.0036	-.0055	.0002	.1210	-.0036
SDev	.0004	.0016	.0059	.0026	.0005	.0034	.0004
%RSD	32.36	36.91	164.0	46.89	258.0	2.833	12.52
#1	.0009	.0033	.0078	-.0073	.0005	.1234	-.0032
#2	.0014	.0056	-.0006	-.0036	-.0002	.1186	-.0039

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.28	.0045	.0019	.0109	-.0024	.0027	.0010
SDev	.23	.0002	.0001	.0004	.0003	.0000	.0008
%RSD	.2352	4.123	8.255	4.006	11.23	1.501	83.73
#1	97.45	.0046	.0018	.0112	-.0022	.0027	.0004
#2	97.12	.0043	.0020	.0106	-.0026	.0028	.0015

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0022	-.0000	.0003	-.0617	-.0002	.0006
SDev	.0000	.0017	.0000	.0028	.0213	.0000	.0010
%RSD	11.58	75.57	368.5	876.9	34.48	7.061	184.1
#1	.0001	-.0034	-.0000	.0023	-.0467	-.0002	-.0002
#2	.0002	-.0010	.0000	-.0016	-.0768	-.0003	.0013

010178

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0004	-.0008
SDev	.0002	.0002	.0004
%RSD	146.1	37.72	57.54
#1	.0000	.0006	-.0005
#2	-.0002	.0003	-.0011

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	687163	10000	--	--	--	--	--
SDev	1578.262	.0000000	--	--	--	--	--
%RSD	.2296780	.0000000	--	--	--	--	--
#1	688279	10000	--	--	--	--	--
#2	686047	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 252525L df250 Operator:
Run Time: 05/17/05 16:10:16
Comment:
Mode: CONC Corr. Factor: 1

010179

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	-.0019	-.0013	.0015	.0000	.0001	.0030
SDev	.0015	.0067	.0031	.0010	.0001	.0000	.0175
%RSD	834.8	348.3	240.6	64.00	1116.	17.38	586.0
#1	-.0012	-.0066	-.0034	.0022	.0001	.0001	-.0094
#2	.0009	.0028	.0009	.0008	-.0001	.0001	.0154

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0502	-.0004	.0003	.0007	.0008	-.0076	.0028
SDev	.0029	.0003	.0006	.0009	.0002	.0325	.0296
%RSD	5.826	74.83	233.4	143.4	27.35	425.8	1060.
#1	.0481	-.0007	-.0002	-.0000	.0010	-.0306	-.0181
#2	.0522	-.0002	.0007	.0013	.0007	.0154	.0237

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0014	.0000	.0044	.0000	-.0002	-.0341	.1680
SDev	.0019	.0001	.0036	.0000	.0002	.2910	.0110
%RSD	135.5	405.6	82.93	985.2	72.00	852.3	6.537
#1	-.0028	-.0001	.0018	-.0000	-.0001	-.2399	.1602
#2	-.0001	.0001	.0069	.0000	-.0004	.1716	.1758

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0031	.0006	.0004	-.0021	.0186	-.0000
SDev	.0001	.0021	.0020	.0021	.0080	.0064	.0068
%RSD	507.6	67.88	307.8	485.3	387.0	34.18	36250.
#1	.0001	.0045	-.0008	.0019	-.0077	.0141	.0048
#2	-.0001	.0016	.0020	-.0011	.0036	.0232	-.0048

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	96.99	-.0013	.0012	.0056	.0005	.0004	-.0023
SDev	.19	.0031	.0007	.0039	.0008	.0006	.0004
%RSD	.1980	237.2	56.70	69.81	145.2	152.7	17.10
#1	96.85	.0009	.0007	.0029	.0011	.0008	-.0026
#2	97.12	-.0035	.0017	.0084	-.0000	-.0000	-.0020

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0017	-.0000	.0017	-.0526	.0007	-.0006
SDev	.0001	.0047	.0002	.0069	.0667	.0003	.0017
%RSD	759.2	281.6	663.6	418.1	126.8	36.75	262.9
#1	-.0001	.0050	.0001	-.0032	-.0998	.0009	.0005
#2	.0001	-.0017	-.0001	.0065	-.0054	.0005	-.0018

010180

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	-.0000	.0002
SDev	.0000	.0004	.0000
%RSD	869.3	1384.	8.650
#1	-.0000	-.0003	.0002
#2	.0000	.0003	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	685018	10000	--	--	--	--	--
SDev	1370.373	.0000000	--	--	--	--	--
%RSD	.2000492	.0000000	--	--	--	--	--
#1	684049	10000	--	--	--	--	--
#2	685987	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: 262525s Operator:
Run Time: 05/17/05 16:15:01
Comment:
Mode: CONC Corr. Factor: 1

010181

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0502	1.985	2.042	-.0001	2.013	.0506	-.0020
SDev	.0002	.004	.000	.0001	.002	.0000	.0006
%RSD	.3462	.1825	.0207	100.6	.0840	.0292	29.80
#1	.0501	1.988	2.042	-.0001	2.012	.0506	-.0025
#2	.0503	1.982	2.042	-.0000	2.014	.0506	-.0016

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	21.27	.0518	.5147	.2032	.2550	1.126	18.93
SDev	.01	.0002	.0001	.0003	.0014	.010	.02
%RSD	.0288	.3937	.0149	.1650	.5605	.9293	.0962
#1	21.27	.0516	.5148	.2029	.2540	1.118	18.92
#2	21.27	.0519	.5147	.2034	.2560	1.133	18.94

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0006	4.146	20.95	.5226	-.0016	19.65	29.13
SDev	.0005	.002	.00	.0004	.0006	.01	.04
%RSD	79.08	.0480	.0123	.0709	39.46	.0540	.1374
#1	-.0010	4.147	20.95	.5228	-.0011	19.65	29.16
#2	-.0003	4.145	20.94	.5223	-.0020	19.66	29.10

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4980	.0064	.4976	.4965	-.0036	.1298	.4939
SDev	.0018	.0089	.0061	.0050	.0012	.0090	.0056
%RSD	.3584	139.1	1.223	1.010	32.33	6.903	1.123
#1	.4968	.0001	.5019	.5001	-.0045	.1362	.4978
#2	.4993	.0127	.4933	.4930	-.0028	.1235	.4900

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	97.17	2.124	2.099	.0085	.4969	2.108	-.0003
SDev	.09	.005	.001	.0015	.0054	.003	.0003
%RSD	.0903	.2531	.0666	17.77	1.081	.1292	119.3
#1	97.11	2.128	2.100	.0095	.5007	2.109	-.0005
#2	97.23	2.120	2.098	.0074	.4931	2.106	-.0000

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	-.0223	-.0002	2.062	-.0396	.5109	-.0018
SDev	.0000	.0003	.0000	.005	.0117	.0008	.0008
%RSD	2.764	1.339	10.61	.2276	29.49	.1531	46.71
#1	.0008	-.0221	-.0002	2.065	-.0313	.5114	-.0024
#2	.0008	-.0225	-.0002	2.059	-.0479	.5103	-.0012

010182

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0003	.5163	-.0003
SDev	.0001	.0006	.0001
%RSD	33.51	.1242	31.11
#1	-.0004	.5168	-.0004
#2	-.0002	.5159	-.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	686327	10000	--	--	--	--	--
SDev	575.5849	.0000000	--	--	--	--	--
%RSD	.0838645	.0000000	--	--	--	--	--
#1	685920	10000	--	--	--	--	--
#2	686734	10000	--	--	--	--	--

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Method: DAILY2 Sample Name: cri Operator:
Run Time: 05/17/05 16:23:28
Comment:
Mode: CONC Corr. Factor: 1

010183

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0193	.0894	.0195	.1018	.0203	.0099	.0024
SDev	.0002	.0004	.0001	.0003	.0000	.0000	.0058
%RSD	1.200	.4889	.4419	.2826	.0373	.0527	238.8
#1	.0192	.0891	.0195	.1016	.0203	.0099	-.0017
#2	.0195	.0897	.0196	.1020	.0203	.0099	.0065
Errors	LC Pass	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass	NOCHECK
High	.0300		.0300	.1500	.0300	.0150	
Low	.0100		.0100	.0500	.0100	.0050	

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0016	.0101	.1018	.0200	.0491	.0931	-.0284
SDev	.0003	.0001	.0003	.0002	.0002	.0175	.0048
%RSD	16.10	1.078	.2426	.9086	.4610	18.76	17.03
#1	.0014	.0102	.1016	.0198	.0489	.0808	-.0319
#2	.0017	.0101	.1020	.0201	.0492	.1055	-.0250
Errors	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	NOCHECK
High		.0150	.1500	.0300	.0750	.1500	
Low		.0050	.0500	.0100	.0250	.0500	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0010	.0781	-.0043	.0311	.0197	-.3141	.0000
SDev	.0000	.0000	.0027	.0000	.0013	.0357	.0019
%RSD	.5228	.0174	61.43	.0841	6.355	11.38	30370.
#1	-.0010	.0781	-.0025	.0311	.0188	-.3393	-.0014
#2	-.0010	.0781	-.0062	.0312	.0206	-.2888	.0014
Errors	NOCHECK	LC Pass	NOCHECK	LC Pass	LC Pass	NOCHECK	NOCHECK
High		.1500		.0450	.0300		
Low		.0500		.0150	.0100		

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0813	.1084	.0054	.0046	-.0065	.0039	.1189
SDev	.0015	.0089	.0042	.0028	.0019	.0014	.0019
%RSD	1.820	8.257	76.10	60.23	29.65	36.80	1.611
#1	.0803	.1148	.0025	.0066	-.0078	.0049	.1175
#2	.0824	.1021	.0084	.0027	-.0051	.0029	.1202
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	LC Pass
High	.1200	.1500					.1800
Low	.0400	.0500					.0600

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

010184

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.40	.0108	.0150	.1114	.0049	.0136	.1066
SDev	.13	.0037	.0006	.0011	.0005	.0008	.0002
%RSD	.1305	34.11	3.792	1.016	9.667	6.219	.1653
#1	99.49	.0082	.0154	.1106	.0052	.0130	.1067
#2	99.30	.0134	.0146	.1122	.0046	.0142	.1065
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.1500	.0090	.0150	.1500
Low				.0500	.0030	.0050	.0500

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0216	-.0019	.0197	.0198	.1624	.1018	-.0014
SDev	.0000	.0028	.0000	.0010	.0049	.0001	.0027
%RSD	.0607	147.5	.0547	4.947	2.990	.0726	185.0
#1	.0216	.0001	.0197	.0191	.1590	.1018	.0004
#2	.0216	-.0038	.0197	.0205	.1659	.1017	-.0033
Errors	LC Pass	NOCHECK	LC Pass	LC Pass	NOCHECK	LC Pass	NOCHECK
High	.0300		.0300	.0300		.1500	
Low	.0100		.0100	.0100		.0500	

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0410	.0943
SDev	.0001	.0003	.0004
%RSD	297.5	.7281	.4152
#1	.0000	.0408	.0940
#2	-.0001	.0413	.0945
Errors	NOCHECK	LC Pass	NOCHECK
High		.0600	
Low		.0200	

010185

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	702058	10000	--	--	--	--	--
SDev	917.8246	.0000000	--	--	--	--	--
%RSD	.1307335	.0000000	--	--	--	--	--
#1	702707	10000	--	--	--	--	--
#2	701409	10000	--	--	--	--	--

Method: DAILY2 Sample Name: icsa Operator:
Run Time: 05/17/05 16:28:14
Comment:
Mode: CONC Corr. Factor: 1

010186

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	514.7	-.0033	-.0197	.0023	.0001	.0112
SDev	.0015	.0	.0009	.0004	.0001	.0000	.0004
%RSD	789700.	.0054	27.95	1.983	2.325	12.32	3.351
#1	-.0011	514.6	-.0026	-.0199	.0023	.0001	.0115
#2	.0011	514.7	-.0039	-.0194	.0024	.0001	.0109
Errors	NOCHECK	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High		600.0					
Low		400.0					

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	467.5	.0005	.0007	-.0001	.0012	191.9	.0087
SDev	3.7	.0002	.0001	.0002	.0003	.7	.0309
%RSD	.7980	37.57	17.90	141.8	25.48	.3550	354.0
#1	464.8	.0007	.0008	-.0002	.0010	191.4	-.0131
#2	470.1	.0004	.0006	.0000	.0014	192.3	.0306
Errors	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	LC Pass	NOCHECK
High	600.0					240.0	
Low	400.0					160.0	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0047	.0004	542.3	-.0037	-.0022	.2982	-.0191
SDev	.0009	.0001	2.7	.0001	.0035	.0455	.0026
%RSD	19.68	17.63	.5051	2.933	161.5	15.26	13.86
#1	.0041	.0004	540.4	-.0037	.0003	.2660	-.0172
#2	.0054	.0005	544.2	-.0036	-.0047	.3303	-.0209
Errors	NOCHECK	NOCHECK	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High			600.0				
Low			400.0				

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0024	-.0151	.0409	-.0333	.0126	.0086	.0034
SDev	.0034	.0111	.0035	.0006	.0060	.0055	.0023
%RSD	139.4	73.57	8.592	1.830	47.80	63.27	66.34
#1	.0000	-.0230	.0384	-.0329	.0084	.0125	.0018
#2	.0048	-.0073	.0434	-.0337	.0169	.0048	.0050
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High							
Low							

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

010187

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	90.48	.0029	.0010	.0024	-.0086	.0016	-.0075
SDev	1.79	.0051	.0066	.0042	.0008	.0027	.0014
%RSD	1.984	176.2	678.5	177.8	8.943	166.3	18.83
#1	91.75	-.0007	.0057	-.0006	-.0091	.0035	-.0065
#2	89.21	.0065	-.0037	.0053	-.0080	-.0003	-.0085
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High							
Low							

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0169	.0148	-.0012	.0043	.0068	.0002	.0029
SDev	.0000	.0081	.0001	.0019	.0396	.0001	.0027
%RSD	.2389	54.51	5.352	43.15	584.3	36.27	91.58
#1	.0168	.0206	-.0012	.0056	-.0212	.0002	.0048
#2	.0169	.0091	-.0013	.0030	.0348	.0001	.0010
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK	NOCHECK
High							
Low							

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0004	.0077	-.0002
SDev	.0001	.0006	.0002
%RSD	13.34	7.679	100.2
#1	-.0004	.0081	-.0001
#2	-.0003	.0073	-.0004
Errors	NOCHECK	NOCHECK	NOCHECK
High			
Low			

010188

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	639108	10000	--	--	--	--	--
SDev	12658.63	.0000000	--	--	--	--	--
%RSD	1.980671	.0000000	--	--	--	--	--
#1	648059	10000	--	--	--	--	--
#2	630157	10000	--	--	--	--	--

Analysis Report 05/17/05 04:37:33 PM page 1

Method: DAILY2 Sample Name: icsab Operator:
Run Time: 05/17/05 16:32:59
Comment:
Mode: CONC Corr. Factor: 1

010189

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.091	517.8	1.038	1.044	.5242	.4869	.0066
SDev	.002	.7	.000	.004	.0007	.0001	.0054
%RSD	.2231	.1369	.0266	.3480	.1394	.0295	82.85
#1	1.092	518.3	1.037	1.042	.5247	.4870	.0104
#2	1.089	517.3	1.038	1.047	.5237	.4868	.0027
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	NOCHECK
High	1.200	600.0	1.200	1.200	.6000	.6000	
Low	.8000	400.0	.8000	.8000	.4000	.4000	

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	471.4	.9892	.5001	.4857	.5486	193.2	-.0169
SDev	.6	.0032	.0000	.0003	.0000	.1	.0131
%RSD	.1224	.3249	.0005	.0672	.0035	.0382	77.44
#1	471.0	.9869	.5001	.4855	.5485	193.1	-.0262
#2	471.8	.9914	.5001	.4860	.5486	193.2	-.0076
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	NOCHECK
High	600.0	1.200	.6000	.6000	.6000	240.0	
Low	400.0	.8000	.4000	.4000	.4000	160.0	

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0038	H1.294	547.5	.5086	1.047	.4059	-.0243
SDev	.0002	.005	.0	.0002	.003	.3599	.0024
%RSD	4.479	.3494	.0077	.0312	.3315	88.68	9.867
#1	.0037	H1.297	547.4	.5085	1.044	.1514	-.0260
#2	.0039	H1.291	547.5	.5088	1.049	.6604	-.0226
Errors	NOCHECK	LC High	LC Pass	LC Pass	LC Pass	NOCHECK	NOCHECK
High		1.200	600.0	.6000	1.200		
Low		.8000	400.0	.4000	.8000		

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9326	1.046	1.034	.9427	.0074	.0172	1.062
SDev	.0036	.009	.005	.0091	.0041	.0001	.002
%RSD	.3881	.8836	.4856	.9598	55.28	.5718	.1576
#1	.9351	1.053	1.030	.9363	.0045	.0173	1.063
#2	.9300	1.040	1.037	.9490	.0103	.0172	1.061
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	NOCHECK	NOCHECK	LC Pass
High	1.200	1.200					1.200
Low	.8000	.8000					.8000

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

010190

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	91.01	1.041	1.020	1.078	.9730	1.027	1.027
SDev	.41	.002	.012	.001	.0077	.007	.001
%RSD	.4553	.1476	1.155	.0505	.7919	.7147	.0595
#1	91.30	1.042	1.012	1.078	.9676	1.022	1.027
#2	90.71	1.040	1.029	1.078	.9785	1.032	1.026
Errors	NOCHECK	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High					1.200	1.200	1.200
Low					.8000	.8000	.8000

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	1.092	.0135	1.000	1.008	.9890	.5135	.0007
SDev	.001	.0008	.000	.010	.0112	.0004	.0009
%RSD	.0938	5.978	.0418	.9857	1.134	.0795	124.9
#1	1.091	.0129	1.000	1.001	.9811	.5132	.0001
#2	1.093	.0141	.9998	1.015	.9969	.5138	.0013
Errors	LC Pass	NOCHECK	LC Pass	LC Pass	NOCHECK	LC Pass	NOCHECK
High	1.200		1.200	1.200		.6000	
Low	.8000		.8000	.8000		.4000	

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0003	1.009	.9584
SDev	.0000	.001	.0017
%RSD	5.346	.1336	.1728
#1	-.0003	1.008	.9573
#2	-.0003	1.010	.9596
Errors	NOCHECK	LC Pass	NOCHECK
High		1.200	
Low		.8000	

010191

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	642832	10000	--	--	--	--	--
SDev	2897.724	.0000000	--	--	--	--	--
%RSD	.4507746	.0000000	--	--	--	--	--
#1	644881	10000	--	--	--	--	--
#2	640783	10000	--	--	--	--	--

Analysis Report 05/17/05 04:45:59 PM page 1

Method: DAILY2 Sample Name: ccv2 Operator:
Run Time: 05/17/05 16:41:25
Comment:
Mode: CONC Corr. Factor: 1

010192

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.9828	9.841	5.071	4.898	9.949	.9872	5.045
SDev	.0009	.015	.017	.029	.042	.0014	.015
%RSD	.0933	.1535	.3267	.5934	.4187	.1460	.2923
#1	.9834	9.831	5.059	4.877	9.919	.9882	5.035
#2	.9821	9.852	5.083	4.919	9.978	.9862	5.056
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	1.100	11.00	5.500	5.500	11.00	1.100	5.500
Low	.9000	9.000	4.500	4.500	9.000	.9000	4.500

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	20.11	1.026	5.177	1.982	2.031	10.50	18.78
SDev	.06	.001	.007	.007	.006	.05	.08
%RSD	.3084	.0572	.1445	.3306	.2877	.4895	.4489
#1	20.15	1.026	5.183	1.986	2.027	10.53	18.72
#2	20.07	1.025	5.172	1.977	2.035	10.46	18.84
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	22.00	1.100	5.500	2.200	2.200	11.00	22.00
Low	18.00	.9000	4.500	1.800	1.800	9.000	18.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.921	5.212	20.07	1.043	5.145	28.26	H41.20
SDev	.005	.015	.02	.002	.008	.03	.10
%RSD	.0938	.2869	.0897	.1480	.1631	.1232	.2452
#1	4.917	5.201	20.09	1.044	5.151	28.29	H41.13
#2	4.924	5.222	20.06	1.042	5.139	28.24	H41.27
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High
High	5.500	5.500	22.00	1.100	5.500	33.00	33.00
Low	4.500	4.500	18.00	.9000	4.500	27.00	27.00

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	4.893	5.116	4.905	4.866	.9987	.9867	1.016
SDev	.004	.032	.010	.026	.0019	.0164	.003
%RSD	.0825	.6251	.2099	.5264	.1944	1.662	.2659
#1	4.890	5.139	4.897	4.884	1.000	.9751	1.014
#2	4.896	5.093	4.912	4.848	.9973	.9983	1.017
Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass
High	5.500	5.500			1.100	1.100	1.100
Low	4.500	4.500			.9000	.9000	.9000

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

010193

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.17	5.176	5.136	5.147	4.879	5.149	4.926
SDev	1.39	.030	.016	.006	.014	.001	.011
%RSD	1.398	.5760	.3151	.1158	.2797	.0165	.2310
#1	98.19	5.155	5.147	5.151	4.888	5.150	4.934
#2	100.1	5.198	5.125	5.143	4.869	5.149	4.918
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				5.500	5.500	5.500	5.500
Low				4.500	4.500	4.500	4.500

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	5.217	.9777	4.964	5.146	L.8355	5.062	1.063
SDev	.006	.0027	.001	.021	.0015	.003	.000
%RSD	.1145	.2774	.0103	.4138	.1795	.0554	.0143
#1	5.213	.9758	4.964	5.131	L.8344	5.060	1.063
#2	5.221	.9796	4.965	5.161	L.8365	5.064	1.063
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Low	LC Pass	LC Pass
High	5.500	1.100	5.500	5.500	1.100	5.500	1.100
Low	4.500	.9000	4.500	4.500	.9000	4.500	.9000

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	4.986	1.042	4.895
SDev	.003	.004	.005
%RSD	.0519	.3960	.1016
#1	4.984	1.045	4.892
#2	4.988	1.039	4.899
Errors	LC Pass	LC Pass	LC Pass
High	5.500	1.100	5.500
Low	4.500	.9000	4.500

010194

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	700436	10000	--	--	--	--	--
SDev	9736.860	.0000000	--	--	--	--	--
%RSD	1.390114	.0000000	--	--	--	--	--
#1	693551	10000	--	--	--	--	--
#2	707321	10000	--	--	--	--	--

Analysis Report 05/17/05 04:52:35 PM page 1

Method: DAILY2 Sample Name: ccb2 Operator: 010195
Run Time: 05/17/05 16:48:01
Comment:
Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0004	-.0082	.0001	.0043	-.0000	.0001	.0090
SDev	.0002	.0039	.0029	.0009	.0000	.0000	.0036
%RSD	56.05	47.68	2120.	20.96	144.1	19.98	39.27
#1	.0002	-.0109	-.0019	.0050	-.0001	.0001	.0065
#2	.0005	-.0054	.0022	.0037	.0000	.0001	H.0115
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0500	.0050	.0500	.0050	.0050	.0100
Low	-.0050	-.0500	-.0050	-.0500	-.0050	-.0050	-.0100

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0034	-.0004	.0010	-.0005	-.0005	.0012	-.0001
SDev	.0007	.0001	.0005	.0005	.0008	.0081	.0141
%RSD	21.82	26.66	50.49	95.64	168.7	688.9	10260.
#1	.0029	-.0003	.0006	-.0008	-.0010	.0069	-.0101
#2	.0039	-.0004	.0014	-.0002	.0001	-.0045	.0098
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0500	.0050	.0050	.0050	.0050	.0250	.1000
Low	-.0500	-.0050	-.0050	-.0050	-.0050	-.0250	-.1000

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0001	.0011	-.0001	.0008	-.0428	.0209
SDev	.0002	.0000	.0036	.0001	.0001	.1732	.0010
%RSD	25.26	9.755	323.9	71.13	8.717	404.9	5.015
#1	-.0008	.0001	-.0014	-.0001	.0009	L-.1653	.0217
#2	-.0006	.0001	.0037	-.0002	.0008	H.0797	.0202
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0083	-.0022	.0008	-.0001	-.0083	.0008
SDev	.0005	.0068	.0023	.0036	.0026	.0003	.0038
%RSD	597.5	82.19	104.3	422.0	2915.	3.681	468.2
#1	-.0004	H.0131	-.0006	.0034	-.0019	-.0085	.0035
#2	.0003	.0035	-.0038	-.0017	.0017	-.0081	-.0019
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

010196

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.3	-.0030	.0047	.0046	-.0001	.0022	.0036
SDev	.7	.0056	.0024	.0006	.0031	.0002	.0022
%RSD	.7200	183.1	51.17	14.10	2199.	10.93	60.11
#1	102.8	-.0070	.0065	.0042	.0021	.0020	.0021
#2	101.7	.0009	.0030	.0051	-.0023	.0023	H.0052
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	-.0006	.0001	.0047	-.0248	-.0002	-.0003
SDev	.0000	.0001	.0001	.0004	.0010	.0001	.0005
%RSD	10.56	24.00	140.8	9.038	4.214	48.57	150.5
#1	.0000	-.0005	.0001	.0050	-.0241	-.0003	.0000
#2	.0000	-.0007	.0000	.0044	-.0256	-.0001	-.0007
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0002	-.0003
SDev	.0000	.0002	.0003
%RSD	125.7	81.38	95.92
#1	-.0000	.0001	-.0004
#2	-.0000	.0003	-.0001
Errors	LC Pass	LC Pass	LC Pass
High	.0050	.0050	.0050
Low	-.0050	-.0050	-.0050

010197

IntStd	1	2	3	4	5	6	
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	722232	10000	--	--	--	--	--
SDev	5205.013	.0000000	--	--	--	--	--
%RSD	.7206839	.0000000	--	--	--	--	--
#1	725913	10000	--	--	--	--	--
#2	718552	10000	--	--	--	--	--

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SOUTHWEST RESEARCH INSTITUTE®
6220 Culebra Rd
San Antonio, Texas 78228

010198

SPECTRO ICP DAILY LOG

ANALYST [illegible]

DATE 5-17-05

POWER: 1200

FLOWS:
Aux 40
Coolant 60
Mass Flow Controller 886

CURRENT	PROPOSED	
5078	5062	Na
4777	4762	Fe
4935	4920	Sr

QC PREP DATE:	
CCV/ICV	05E02
CRI	
ICSA	
ICSAB	05E02

CLP_STD1_SC	05E02
CLP_STD2_SC	
CLP_STD3_SC	
CLP_STD4_SC	
CLP_STD5_SC	
BLK_SC	05E02

FILE	CLIENT	TO#	PROJECT NO.	METHOD	PREP PAGE
050517	DIV 20	050426-3	06002.01.242	SW6J	60-208
050517A DIA	DIV 20	050502-4	06002.01.222	6010B	61-013

5-17-05

COMMENTS:

MAINTENANCE:

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

OTHER:

REVIEWED BY: [illegible]

DATE: 5-24-05

BOOK/ PAGE 09 214

SOUTHWEST RESEARCH INSTITUTE®

6220 Culebra Rd
San Antonio, Texas 78228

010199

TJA_2 TRACE ICP DAILY LOG

ANALYST [signature]

DATE 5-17-05

As 189.042 Profile Line

As Intensity: 395.891

PEAK POSITION -.00909

VERNIER POSITION 753

STDs PREP DATE:	
CLP_STD1_SC	050502
CLP_STD2_SC	
CLP_STD3_SC	
CLP_STD4_SC	
CLP_STD5_SC	
CLP_STD6_SC	
BLK_SC	050502

QC PREP DATE:	
CCV/ICV	050502
CRI	
ICSA	
ICSAB	050502

COMMENTS	FILE	CLIENT	TO#	PROJECT NO.	METHOD
B505024A	Y05MAY	DIV 20	050502-4	06002.01.222	SW6010B/6020 60-014
B505024	Y05MAY	DIV 20	050502-4	06002.01.222	6010B 60-013

5-17-05

COMMENTS:

MAINTENANCE:
Changed pump tubing

REVIEWED BY: [signature]

DATE: 5-24-05

ICP ICV/CCV SOLUTION

13 019

010200

CCV- 05E02

Date Prepared: 5-2-05 Prepared By: DL

HNO3 INORG #: 5217 HCl INORG #: 5088

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

Element	Std Conc (ppm)	Amt added	Check	Source	Inorg #	Stock Conc (ppm)	Exp Date
Sc	10	1ml	✓	INORGVENT	5175	10000	5-1-06
B	5	5ml	✓	SPEX	4966	1000	1-15-06
Li	5	5ml	✓	SPEX	4846	1000	10-30-05
Mo	5	5ml	✓	SPEX	4847	1000	10-30-05
P	5	5ml	✓	SPEX	4758	1000	8-30-05
Si	5	5ml	✓	SPEX	5035	1000	2-28-06
Ti	5	5ml	✓	SPEX	5040	1000	2-28-06
Sr	5	5ml	✓	SPEX	4759	1000	8-30-05
Sn	5	5ml	✓	SPEX	5037	1000	2-28-06
Bi	5	5ml	✓	SPEX	4912	1000	11-30-05
La	5	5ml	✓	SPEX	4845	1000	10-30-05
Y	5	5ml	✓	SPEX	4913	1000	11-30-05
Pd	1	1ml	✓	SPEX	4967	1000	1-15-06
S	1	1ml	✓	SPEX	4617	1000	6-30-05
Th	1	1ml	✓	SPEX	4760	1000	8-30-05
U	1	1ml	✓	SPEX	4619	1000	6-30-05
W	1	1ml	✓	SPEX	4661	1000	7-30-05
Zr	5	5ml	✓	SPEX	5039	1000	2-26-06
Na	10	1ml	✓	SPEX	4998	10000	1-30-06
ICV-2A	vary	10ml	✓	SPEX	4909	mix	11-30-05
ICV-2B	vary	1ml	✓	SPEX	4911	mix	11-30-05
ICV-2C	vary	10ml	✓	SPEX	4910	mix	11-30-05

Expiration Date: 6-30-05

13 004

ICP Calibration Blank/ICB/CCB Solution

010201

ID: BLK- 05B14

Date Prepared: 2-14-05 Prepared By: [signature]

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4983

Added ✓ 50 ml HCL INORG #: 4993

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: 10-1-05 INORG #: 4761

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 05C01

Date Prepared: 3-1-05 Prepared By: [signature]

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 4979

Added ✓ 50 ml HCL INORG #: 4996

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: ~~4-1-05~~ 10-1-05 INORG #: 4761

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 05D01

Date Prepared: 4-1-05 Prepared By: [signature]

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 5166

Added ✓ 50 ml HCL INORG #: 5059

Added ✓ 1000ul of 10000ppm Sc (INORG. VENT.) EXP. Date: 10-1-05 INORG #: 4761

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- 05E02

Date Prepared: 5-2-05 Prepared By: [signature]

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO3 INORG #: 5217

Added ✓ 50 ml HCL INORG #: 5088

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

ICP Calibration Standards

13 030

Date Prepared: 5-2-05 Prepared By: [illegible]

HNO3 INORG #: 5217 HCl INORG #: 5088

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

010202

Prepared	Standard Name	Element	Std Conc (ppm)	Added ml	Check	Source	INORG #	Stock Conc (ppm)	Exp Date
5-2-05	STD1- 05E02	Al	50	2.50	✓	INORVENT	4762	10000	10-1-05
		Ca	50	2.50	✓	INORVENT	4988	10000	2-1-06
		Fe	50	2.50	✓	INORVENT	5048	10000	3-1-06
		K	50	2.50	✓	INORVENT	4907	10000	12-1-05
		Mg	25	1.25	✓	INORVENT	4656	10000	8-1-05
		Na	50	2.50	✓	INORVENT	4657	10000	8-1-05
		Li	10	5.00	✓	INORVENT	462X	1000	8-1-05
		Sc	10	0.500	✓	INORVENT	5175	10000	5-1-06
	STD2- 05E02	Ba	10	5.00	✓	INORVENT	5027	1000	3-1-06
		Be	5	2.50	✓	INORVENT	4592	1000	6-1-05
		Cr	10	5.00	✓	INORVENT	4906	1000	12-1-05
		Cu	10	5.00	✓	INORVENT	5049	1000	3-1-06
		Ni	10	5.00	✓	INORVENT	5043	1000	3-1-06
		Sc	10	0.500	✓	INORVENT	5175	10000	5-1-06
	STD3- 05E02	Cd	10	5.00	✓	INORVENT	5041	1000	3-1-06
		Co	10	5.00	✓	INORVENT	5044	1000	3-1-06
		Mn	10	5.00	✓	INORVENT	4989	1000	2-1-06
		V	10	5.00	✓	INORVENT	4916	1000	1-1-06
		Zn	10	5.00	✓	INORVENT	4915	1000	1-1-06
		Sc	10	0.500	✓	INORVENT	5175	10000	5-1-06
	STD4- 05E02	Ag	2	1.00	✓	INORVENT	4764	1000	10-1-05
		As	10	5.00	✓	INORVENT	4983	1000	2-1-06
		Pb	10	5.00	✓	INORVENT	4774	1000	10-1-05
		Sb	10	5.00	✓	INORVENT	5042	1000	3-1-06
		Se	10	5.00	✓	INORVENT	4630	1000	8-1-05
		TL	10	5.00	✓	INORVENT	4990	1000	2-1-06
		Sc	10	0.500	✓	INORVENT	5175	10000	5-1-06
	STD5- 05E02	B	10	5.00	✓	INORVENT	5047	1000	3-1-06
		Mo	10	5.00	✓	INORVENT	5050	1000	3-1-06
		P	10	5.00	✓	INORVENT	4593	1000	6-1-05
		Si	10	5.00	✓	INORVENT	4999	1000	3-1-06
		Ti	10	5.00	✓	INORVENT	4908	1000	12-1-05
		Sr	10	5.00	✓	INORVENT	4635	1000	8-1-05
		Sn	10	5.00	✓	INORVENT	5174	1000	5-1-06
		Bi	5	2.50	✓	INORVENT	4658	1000	8-1-05
		Sc	10	0.500	✓	INORVENT	5175	10000	5-1-06
5-2-05	STD6- 05E02	La	10	5.00	✓	INORVENT	4763	1000	10-1-05
		Na	1	0.05	✓	INORVENT	4657	10000	8-1-05
		Pd	10	5.00	✓	INORVENT	5045	1000	3-1-06
		S	10	5.00		INORVENT	4917	1000	1-1-06
		Th	10	5.00	✓	INORVENT	4844	1000	12-1-05
		U	10	5.00	✓	INORVENT	4828	1000	11-1-05
		W	5	2.50	✓	INORVENT	4660	1000	8-1-05
		Y	10	5.00	✓	INORVENT	5000	1000	3-1-06
		Zr	10	5.00	✓	INORVENT	4992	1000	8-1-05
		SC	10	0.500	✓	INORVENT	5175	10000	5-1-06

Expiration Dates:

STD1: 8-1-05 **STD4:** 8-1-05

STD2: 6-1-05 **STD5:** 6-1-05

STD3: 8-1-05 **STD6:** 8-1-05

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050502-4
SRR: 27541
SDG: 262525
CASE: CNWRA
VTSR: May 02, 2005
PROJECT#: 06002.01.222

010203

Certificates of Analysis

010204

Fisher Scientific

TRACEMETAL GRADE NITRIC ACID
CERTIFICATE OF ANALYSIS

B. McKelvey

Dr. B. McKelvey
QA/QC Manager

CATALOG NUMBER: A509
LOT NUMBER: 1104120
RELEASE DATE: January, 2005
EXPIRY DATE: January, 2008

Tests	Maximum Specification	Actual Value	Units
ASSAY (HNO_3, w/w):	67 - 70%	70%	% by w/w
Color:	10	<10	APHA

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

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

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 4/30/05
DATE EXPIRED: 4/28/2005
DATE OPENED: 4/28/2005
INORG: 527-5222 PO: P50167

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010205

Fisher Scientific

TRACEMETAL GRADE HYDROCHLORIC ACID
CERTIFICATE OF ANALYSIS

B McKelvey

Dr. B. McKelvey
QA/QC Manager

CATALOG NUMBER: A508
LOT NUMBER: 4104090
RELEASE DATE: November, 2004
EXPIRY DATE: November, 2007

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 3/1/05
DATE EXPIRED: 3/1/2015
DATE OPENED: 3/23/05
INORG: 5085-25010 PO: E55147

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

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

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.

inorganic ventures / iv labs

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certificate of analysis

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

Catalog Number: CGSC1-1and CGSC1-5

010206

Lot Number: **W-SC02058**

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/05/05
DATE EXPIRED: 01/06
DATE OPENED: 01/06/05
INORG: 4961 PO: F55124

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

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: 1007 ± 3 μg/mL
Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 1005 ± 2 μg/mL
Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3148a.

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

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

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

O	Al	<0.070	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	<0.0030	M	Rh	<0.00010	M	Tl	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	M	Mn	<0.00040	M	Rb	<0.00010	M	Th	0.0028
M	Be	<0.000050	M	Ga	<0.00010	O	Hg	i	M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	0.0043	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
O	B	<0.020	M	Au	<0.00030	M	Nd	<0.00020	s	Sc		M	Ti	<0.0050
M	Cd	<0.00030	M	Hf	0.0030	O	Ni	<0.084	O	Se	<0.67	M	W	<0.0010
O	Ca	0.016	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.034	M	U	<0.00020
M	Ce	<0.00050	M	In	<0.00010	n	Os		M	Ag	0.0050	M	V	<0.00020
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.16	M	Yb	<0.00010
M	Cr	<0.00050	O	Fe	<0.16	O	P	i	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	0.0075
M	Cu	<0.00060	M	Pb	0.00050	O	K	<5.01	M	Ta	<0.00070	M	Zr	0.032

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

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.038 g/mL

QA:KL Rev.010604DN

Paul R. Haines

Quality Assurance Manager Expires: EXPIRES 01 2006

010207

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

   Members of IQ Net : 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)**

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

   Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

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.

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 428359B and 454678. 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 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

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.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

010208

SPEXertificate™

Certificate of Reference Material

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/15/04
DATE EXPIRED: 10/15/05 DK
DATE OPENED: 10/15/04
INORG: 4837 PO: F5476

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

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

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

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

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

Date of Certification: OCT - - 2004 Certifying Officer: N. Kocherlakota

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4837

Report of Certification

010209

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

Legal Notice:

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

ISO 9001
CERTIFIED

4837

SPEX CertiPrep

203 Norcross Avenue • Metuchen, NJ 08840 USA

010210

SPECertificate™

Certificate of Reference Material

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

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

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

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 4/18/05
DATE EXPIRED: 4/30/06
DATE OPENED: 4/18/05
INORG: 5197 FO: 55160

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

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

1 of 2
5197

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

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010211

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

Legal Notice:

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

ISO 9001
CERTIFIED

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5107

SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA
732 549 7144 • 1 800 LAB SPEX • Fax: 732 603 9647 • CRMSales@spexcerti.com • www.spexcerti.com

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inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Lithium in 0.1% (abs) HNO_3**

Catalog Number:	CGLI1-1 and CGLI1-5
Lot Number:	**W-LI02073**
Starting Material:	Li_2CO_3
Starting Material Purity (%):	99.997165
Starting Material Lot No	1123
Matrix:	0.1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 07/01/04
DATE EXPIRED: 08/01/2005 v03
DATE OPENED: 07/01/04
INORG: 4628 PO: F53496

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 995 ± 2 µg/mL

Certified Density: 1.004 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

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

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

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

4.1 **Assay Method #1** **995 ± 2 µg/mL**
ICP Assay NIST SRM 3129a Lot Number: 000505

Assay Method #2 **995 ± 6 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00120	M	Dy	< 0.01199	S	Li		M	Pr	< 0.00060	M	Te	< 0.05994
M	Sb	< 0.00100	M	Er	< 0.00999	M	Lu	< 0.00080	M	Re	< 0.00200	M	Tb	< 0.00060
M	As	< 0.01998	M	Eu	< 0.00599	O	Mg	0.00650	M	Rh	< 0.00200	M	Tl	< 0.00200
M	Ba	< 0.01998	M	Gd	< 0.00200	O	Mn	0.00006	M	Rb	< 0.00200	M	Th	< 0.00200
O	Be	< 0.00020	M	Ga	< 0.00200	O	Hg	< 0.01500	M	Ru	< 0.00400	M	Tm	< 0.00080
M	Bi	< 0.00080	M	Ge	< 0.01199	M	Mo	< 0.00400	M	Sm	< 0.00200	O	Sn	< 0.00600
O	B	0.00020	M	Au	< 0.00599	M	Nd	< 0.00400	M	Sc	< 0.01998	O	Ti	< 0.00070
M	Cd	< 0.00599	M	Hf	< 0.00400	O	Ni	< 0.00230	M	Se	< 0.01598	O	W	< 0.00400
O	Ca	0.04050	M	Ho	< 0.00100	M	Nb	< 0.00100	O	Si	0.04650	M	U	< 0.00400
M	Ce	< 0.00999	O	In	< 0.00400	n	Os		M	Ag	< 0.00400	O	V	0.00009
M	Cs	< 0.00060	M	Ir	< 0.00999	M	Pd	< 0.00999	O	Na	0.03200	M	Yb	< 0.00200
M	Cr	< 0.00999	O	Fe	0.00200	O	P	< 0.00250	O	Sr	0.00026	M	Y	< 0.07992
M	Co	< 0.00599	M	La	< 0.00100	M	Pt	< 0.00400	O	S	0.01250	O	Zn	0.00145
O	Cu	0.00100	M	Pb	< 0.00599	O	K	0.00950	M	Ta	< 0.01399	M	Zr	< 0.00999

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do nd return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 6.941; +1; (6); $Li^+(aq)$ large effective radius due to hydration sphere (Coordination Number in parentheses is assumed, not certain.)

Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Li Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Sodium carbonate fusion in Pt° followed by HCl dissolution-blank levels of Li in sodium carbonate critical); Organic Matrices (Sulfuric / peroxide digestion or nitric / sulfuric / perchloric acid decomposition).

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤10ppm.)
ICP-OES 670.784 nm	0.002 / 0.00002 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES 460.286 nm	0.9 / 0.04 µg/mL	1	atom	Zr, Th
ICP-OES 323.261 nm	1.1 / 0.05 µg/mL	1	atom	Sb, Th, Ni
ICP-MS 7 amu	10 ppt		n/a	M'

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

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

10.0 QUALITY STANDARD DOCUMENTATION

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

Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

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

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

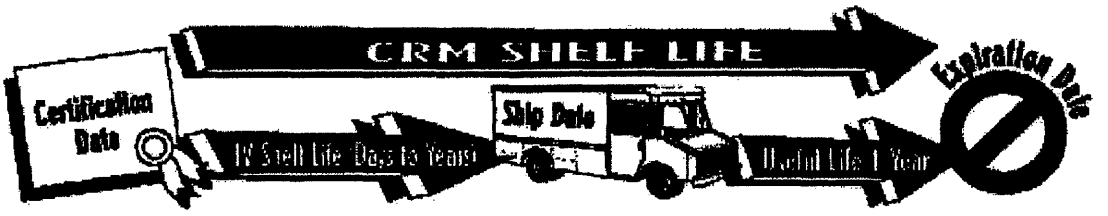
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

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

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/01/04
DATE EXPIRED: 08/01/2005 yes
DATE OPENED: 07/01/04
INORG: 4628 PO: F53406

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010215



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

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

Certification Date: August 12, 2003

Expiration Date: EXPIRES 01 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

010216

inorganic ventures / iv labs

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

certificate of analysis

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

2.0 DESCRIPTION OF CRM

Custom-Grade **10000 µg/mL Scandium in 5% (abs) HNO_3**

Catalog Number:	CGSC10-1, CGSC10-2, and CGSC10-5
Lot Number:	**X-SC02061**
Starting Material:	Sc_2O_3
Starting Material Purity (%):	99.996918
Starting Material Lot No	BSC-632-1-5736
Matrix:	5% (abs) HNO_3

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10,007 ± 21 µg/mL

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

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

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

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

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

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

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

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

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

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 3/31/05
DATE EXPIRED: 9/11/06
DATE OPENED: 3/31/05
INORG: 5175 PO: 9211606

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

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

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

010218

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 - 44.95591; +3; 6; $Sc(H_2O)_6^{+3}$

Chemical Compatibility - Soluble in HCl, H_2SO_4 and HNO_3. Avoid HF, H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride. Avoid mixing with elements / solutions containing moderate amounts of fluoride. The fluoride is soluble in excess HF forming ScF_6^{3-} (not recommended for standard preparations)

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

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

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at = concs.)
ICP-OES 335.373 nm	0.004 / 0.00002 µg/mL	1	ion	
ICP-OES 337.215 nm	0.004 / 0.00002 µg/mL	1	ion	Ti, U, Ni, Rh
ICP-OES 424.683 nm	0.003 / 0.00002 µg/mL	1	ion	Ce
ICP-MS 45 amu	2.3 ppt	n/a	M'	$^{16}O_2{}^{12}CH$, $^{29}Si^{16}O$, $^{90}Zr^{12}$

8.0 HAZARDOUS INFORMATION

- Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY

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

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)

3 of 4
5175

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: July 01, 2004

Expiration Date: EXPIRES 01/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Malda, QA Administrator	Nicholas Malda
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010220

SPEXertificate ™

Certificate of Reference Material

Catalog Number: PLB9-2X/2Y/2T **Lot No.** 10-119B

Description: 1000 mg/L Boron

Matrix: H2O

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

Certified Value: 1001 mg/L

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

Certified Value is Traceable to: NIST SRM 3107

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

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1001 mg/L

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

Instrumental Analysis by ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.001 @ 22.3 Degrees Celsius

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

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

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

Date of Certification: JAN '05 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/17/05
DATE EXPIRED: 01/15/2006 v03
DATE OPENED: 01/19/05
INORG: 4966 PO: F55130

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Report of Certification

010221

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U = ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

Legal Notice:

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

ISO 9001
CERTIFIED

010222

SPEXertificate ™

Certificate of Reference Material

Catalog Number: PLLI2-2X/2Y **Lot No.** 11-24LI

Description: 1000 mg/L Lithium

Matrix: 2% HNO3

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

Certified Value: 1000.5 mg/L

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

Certified Value is Traceable to: NIST SRM #3129a

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

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1001 mg/L

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

Instrumental Analysis by ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.015 @ 22.8 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
As	<0.002	Cu	<0.001	Pb	<0.001
Al	0.007	Fe	0.013	Re	<0.001
Ag	<0.001	Ga	<0.001	Rb	<0.001
Be	<0.001	In	<0.001	Sr	<0.001
Ba	<0.001	K	0.027	Sb	<0.001
Bi	<0.001	Mg	0.002	Si	0.014
B	<0.001	Mn	<0.001	Ti	<0.001
Co	<0.001	Mo	<0.001	Tl	<0.001
Ca	0.008	Ni	0.001	V	<0.001
Cr	<0.004	Na	0.01	Zn	3.0
Cd	<0.001			Zr	0.002

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

Date of Certification: OCT '04 Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/03/04
DATE EXPIRED: 10/30/2005
DATE OPENED: 11/09/04
INORG: 4846 PO: F54767

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Report of Certification

010223

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X = True value (Labeled Value), U= Expanded uncertainty
$U = ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

Legal Notice:

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

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SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA
732-549-7144 • 1-800-LAB-SPEX • Fax: 732-603-9647 • CRMSales@spexcsp.com • www.spexcsp.com

010224

SPEXertificate™

Certificate of Reference Material

Catalog Number: PLMO9-2X/2Y/2T **Lot No.** 11-51MO

Description: 1000 mg/L Molybdenum

Matrix: H2O

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

Certified Value: 1000 mg/L

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

Certified Value is Traceable to: NIST SRM #3134

The CRM is prepared gravimetrically using high purity (NH4)6(Mo)7(O)24-4H2OLot# 03011C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

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

Instrumental Analysis by ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 09989 @23.7 Degrees Celsius

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

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

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

Date of Certification: OCT '04 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/09/04
DATE EXPIRED: 10/30/2005 WS
DATE OPENED: 11/03/04
INORG: 4847 PO: 54767

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010225

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

Legal Notice:

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

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010226

SPEXertificate ™

Certificate of Reference Material

Catalog Number: PLP9-2X/2Y/2T **Lot No.** 10-125P

Description: 1000 mg/L Phosphorus

Matrix: H2O

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

Certified Value: 1001 mg/L

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

Certified Value is Traceable to: NIST SRM 3139a

The CRM is prepared gravimetrically using high purity (NH4)2(H)PO4 Lot# 07901A. 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 Magnesia Mixture. Filter, ignite and weigh as Mg2P2O7.

Instrumental Analysis by ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.000 @ 22.5 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.001	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.002	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.01	In	<0.001	Si	0.085
Ba	0.001	K	0.027	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	0.01
Bi	<0.001	Mg	<0.001	Ti	0.002
Ca	0.002	Mn	<0.001	Tl	<0.001
Cr	<0.001	Mo	<0.001	V	<0.001
Cd	<0.001	Na	0.008	Zr	<0.001
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: AUG 04 Certifying Officer: N. Kocherlakota

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DATE EXPIRED: 08/30/2005 VOC
DATE OPENED: 09/01/04
INORG: 4758 PO: F53434

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Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

010227

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U = ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

Legal Notice:

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

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Certificate of Reference Material

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DATE OPENED: 3/28/05
INORG: 5038 PO: F55148

Catalog Number: PLSI9-2X/2Y/2T **Lot No.** 11-33SI

Description: 1000 mg/L Silicon

Matrix: H2O / 0.4% F-

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

Certified Value: 1001.5 mg/L

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

Certified Value is Traceable to: NIST SRM #3150

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

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1004 mg/L

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

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.001 @ 23.7 Degrees Celsius

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

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

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

Date of Certification: FEB '05 Certifying Officer: N. Kocherlakota

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Report of Certification

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Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
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ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

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Catalog Number: PLTI9-2X/2Y/2T **Lot No.** 10-172TI
Description: 1000 mg/L Titanium
Matrix: H2O/ 0.24% F-

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

Certified Value: 998 mg/L
Uncertainty Associated with Measurement: +/- 3.0 mg/L
Certified Value is Traceable to: NIST SRM #3162a

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

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 999 mg/L

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

Instrumental Analysis by ICP spectrometer: 997 mg/L

Uncertified Properties:

Density: 1.000 @ 23.7 Degrees Celsius

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

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

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

Date of Certification: FEB '05 Certifying Officer: N. Kocherlakota

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

Guide To The Expression Of Uncertainty In Measurement 1995
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ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

010231

Material Source:

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Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

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

X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty

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

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

Certification Traveler Report:

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

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Certificate of Reference Material

Catalog Number: PLSR2-2X/2Y/2T **Lot No.** 10-111SR

Description: 1000 mg/L Strontium in 2% HNO3

Matrix: 2% HNO3

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

Certified Value: 998 mg/ L

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

Certified Value is Traceable to: NIST SRM #3153a

The CRM is prepared gravimetrically using high purity Strontium Carbonate Lot# 09031B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

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

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.009 @ 24.1 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.001	Cu	<0.001	Pb	0.001
As	<0.001	Fe	0.001	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.004	In	<0.001	Si	0.002
Ba	0.02	K	0.015	Sb	<0.001
Be	<0.001	Li	<0.001	Ti	<0.001
Bi	<0.001	Mg	<0.001	Tl	<0.001
Ca	0.008	Mn	<0.001	V	<0.001
Cr	<0.004	Mo	<0.001	Zr	0.004
Cd	<0.001	Na	0.005	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: AUG '04 Certifying Officer: N. Kocherlakota

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ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

010233

Material Source:

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Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U = ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

Legal Notice:

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Certificate of Reference Material

Catalog Number: PLSN5-2X/2Y/2T **Lot No.** 11-45SN

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 relevant to the certified properties listed below.

Certified Value: 997.5 mg/L

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

Certified Value is Traceable to: NIST SRM #3161

The CRM is prepared gravimetrically using high purity Tin Metal Lot# 10951C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 999 mg/L

Method: Precipitation using Ammonium Hydroxide. Filter, ignite, and weigh as SnO2.

Instrumental Analysis by ICP spectrometer: 996 mg/L

Uncertified Properties:

Density: 1.041 @ 22.7 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
As	<0.10	Cu	<0.001	Pb	0.001
Ag	0.004	Fe	0.10	Re	<0.001
Al	0.007	Ga	<0.001	Rb	<0.001
B	<0.001	In	<0.01	Sb	0.002
Ba	<0.001	K	<0.20	Si	0.09
Be	<0.001	Li	<0.001	Sr	<0.001
Bi	<0.001	Mo	<0.001	Ti	<0.001
Co	0.007	Mn	<0.001	Tl	<0.001
Cd	<0.01	Mg	<0.001	V	<0.20
Ca	0.07	Na	0.045	Zn	0.70
Cr	0.007	Ni	0.045	Zr	<0.001

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

Date of Certification: FEB '05 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 2/28/2006 DK
DATE OPENED: 3/28/05
INORG: 5037 PO: F55148

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Report of Certification

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EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

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Instructions for Use:

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Method of Preparation:

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Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U = ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

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DATE RECEIVED: 12/03/04
DATE EXPIRED: 11/30/2005 v05
DATE OPENED: 12/03/04
INORG: 4912 PO: 55102

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Certificate of Reference Material

Catalog Number: PLBI4-2X/2Y **Lot No.** 10-173BI

Description: 1000 mg/L Bismuth

Matrix: 10% HNO3

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

Certified Value: 1002.5 mg/L

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

Certified Value is Traceable to: NIST SRM #3106

The CRM is prepared gravimetrically using high purity Bismuth Metal Lot# 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: 1003 mg/L

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

Instrumental Analysis by ICP spectrometer: 1002 mg/L

Uncertified Properties:

Density: 1.052 @ 24.0 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.02	Cu	<0.001	Pb	0.006
As	<0.001	Fe	0.001	Re	<0.001
Ag	0.002	Ga	<0.001	Rb	<0.001
B	<0.002	In	<0.001	Sr	<0.001
Ba	0.002	K	0.010	Sb	<0.001
Be	<0.002	Li	<0.001	Si	0.005
Cd	<0.001	Mn	<0.001	Ti	<0.002
Co	<0.001	Mo	<0.001	Tl	<0.001
Ca	0.125	Mg	<0.001	V	<0.001
Cr	<0.001	Na	0.006	Zr	<0.001
		Ni	0.002	Zn	0.08

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

Date of Certification: NOV '04 Certifying Officer: N. Kocherlakota

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Report of Certification 010237

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

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Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U = ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

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DATE OPENED: 11/02/04
INORG: 4845 PO: F54767

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Certificate of Reference Material

Catalog Number: PLLA2-2X/2Y **Lot No.** 11-12LA

Description: 1000 mg/L Lanthanum

Matrix: 2% HNO3

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

Certified Value: 1000 mg/L

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

Certified Value is Traceable to: NIST SRM #3127a

The CRM is prepared gravimetrically using high purity La(NO3)3-6H2O Lot# 03951B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

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

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.010 @ 22.3 Degrees Celsius

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

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

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

Date of Certification: OCT '04 Certifying Officer: N. Kocherlakota

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Report of Certification

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ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

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Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U = ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

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DATE EXPIRED: 11/30/2005 NS
DATE OPENED: 12/08/04
INORG: 4913 PO: F5109

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Certificate of Reference Material

Catalog Number: PLY2-2X/2Y/2T **Lot No.** 10-121Y

Description: 1,000 mg/L Yttrium

Matrix: 2% HNO3

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

Certified Value: 1000 mg/ L

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

Certified Value is Traceable to: NIST SRM 3167a

The CRM is prepared gravimetrically using high purity Yttrium Oxide Lot# 01031B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

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

Instrumental Analysis by ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.011 @ 21.8 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Ce	<0.001	La	<0.001	Tb	<0.001
Ca	0.007	Lu	<0.001	Tm	<0.001
Dy	<0.001	Mn	<0.001	Tl	<0.001
Er	<0.001	Mo	<0.001	Th	<0.001
Eu	<0.001	Nd	<0.001	Ta	<0.001
Fe	0.015	Ni	<0.001	Ti	<0.001
Gd	<0.001	Na	0.006	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.

Date of Certification: NOV '04 Certifying Officer: N. Kocherlakota

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Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

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Certificate of Reference Material

Catalog Number: PLPD3-2X/2Y **Lot No.** 9-99PD

Description: 1000 mg/L Palladium

Matrix: 10% HCl

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

Certified Value: 999 mg/L

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

Certified Value is Traceable to: NIST SRM #3138

The CRM is prepared gravimetrically using high purity Palladium Metal Lot# 06021C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 999 mg/L

Method: Precipitation using Dimethyl Glyoxime. Filter, dry, and weigh as Pd(C4H7O2N2)2.

Instrumental Analysis by ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.017 @ 24.2 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.002	Fe	0.033	Re	<0.001
Au	0.002	Ga	<0.001	Rh	<0.001
Ag	<0.001	Ir	<0.001	Rb	<0.001
B	<0.001	In	<0.001	Ru	<0.001
Be	<0.001	Mg	0.001	Sn	<0.001
Bi	<0.001	Mn	<0.001	Te	<0.001
Ca	0.006	Na	0.005	Ti	<0.001
Cd	<0.001	Ni	0.001	W	<0.001
Co	<0.001	Pb	0.002	Zr	<0.001
Cr	<0.002	Pt	0.008	Zn	0.06
Cu	0.002				

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

Date of Certification: JAN '05 Certifying Officer: N. Kochekakota

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DATE RECEIVED: 01/17/05
DATE EXPIRED: 01/15/2006 [illegible]
DATE OPENED: 01/19/05
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Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U = ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

Legal Notice:

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

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Certificate of Reference Material

Catalog Number: PLS9-2X/2Y/2T **Lot No.** 10-122S

Description: 1000 mg/L Sulfur

Matrix: H2O

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

Certified Value: 1001 mg/L

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

Certified Value is Traceable to: NIST SRM #3154

The CRM is prepared gravimetrically using high purity Ammonium Sulfate Lot# 05891M. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1002 mg/L

Method: Precipitation using Barium Chloride. Filter, ignite and weigh as BaSO4.

Instrumental Analysis by ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.001 @ 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	<0.001	Cu	<0.001	Pb	<0.001
As	0.003	Fe	0.014	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.001	In	<0.001	Si	0.003
Ba	<0.001	K	<0.10	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	0.005	Ti	<0.001
Ca	0.012	Mn	<0.002	Tl	<0.001
Cr	<0.001	Mo	<0.001	V	<0.001
Cd	<0.001	Na	0.01	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	<0.002

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

Date of Certification: JUN - - 2004 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/25/04
DATE EXPIRED: 06/30/2005 NS
DATE OPENED: 06/29/04
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EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i, and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

Legal Notice:

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Certificate of Reference Material

Catalog Number: PLTH2-2X/2Y **Lot No.** 11-15TH

Description: 1000 mg/L Thorium

Matrix: 2% HNO3

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

Certified Value: 999 mg/L

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

Certified Value is Traceable to: NIST SRM #3159

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

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

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

Instrumental Analysis by ICP spectrometer: 998 mg/L

Uncertified Properties:

Density: 1.010 @ 22.0 Degrees Celsius

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

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

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

Date of Certification: AUG '04 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/01/04
DATE EXPIRED: 08/30/2005 W3
DATE OPENED: 09/01/04
INORG: 4760 PO: F53435

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Report of Certification

010247

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U = ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

Legal Notice:

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

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SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA
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010248

Certificate of Reference Material

Catalog Number: PLU2-2X/2Y **Lot No.** 10-127U

Description: 1000 mg/L Uranium

Matrix: 2% HNO3

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

Certified Value: 1004 mg/L

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

Certified Value is Traceable to: NIST SRM #3164

The CRM is prepared gravimetrically using high purity Uranium(V,VI) 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: 1004 mg/L

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

Instrumental Analysis by ICP spectrometer: 1005 mg/L

Uncertified Properties:

Density: 1.010 @ 21.6 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.005	Cu	0.01	Pb	0.008
As	0.04	Fe	0.41	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.003	In	<0.001	Si	0.03
Ba	<0.001	K	0.022	Sr	0.003
Be	<0.001	Li	<0.001	Sb	0.003
Bi	<0.001	Mg	0.002	Ti	<0.001
Ca	0.09	Mn	0.003	Tl	<0.001
Cr	<0.002	Mo	0.004	V	0.004
Cd	<0.001	Na	0.08	Zr	0.002
Co	<0.001	Ni	<0.001	Zn	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.

Date of Certification: JUN - - 2004 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/25/04
DATE EXPIRED: 06/30/2005 VOJ
DATE OPENED: 06/29/04
INORG: 4619 PO: F53398

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Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

010249

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U = ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

Legal Notice:

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DATE EXPIRED: 07/30/2005 V03
DATE OPENED: 07/29/04
INORG: 4661 PO: F53417

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Certificate of Reference Material

010250

Catalog Number: PLW9-2X/2Y **Lot No.** 10-139W
Description: 1000 mg/L Tungsten
Matrix: H2O

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

Certified Value: 1003 mg/L
Uncertainty Associated with Measurement: +/-3.0 mg/L
Certified Value is Traceable to: NIST SRM #3163

The CRM is prepared gravimetrically using high purity Ammonium Tungstate Lot# 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: 1004 mg/L

Method: Fume with Sulfuric acid to dryness. Ignite and weigh as WO3.

Instrumental Analysis by ICP spectrometer: 1002 mg/L

Uncertified Properties:

Density: 0.9998 @ 21.7 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.003	Cu	<0.001	Pb	<0.001
As	0.004	Fe	<0.01	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	0.003
B	<0.002	In	<0.001	Si	0.60
Ba	<0.001	K	0.13	Sr	<0.001
Be	<0.01	Li	<0.001	Sb	0.001
Bi	<0.001	Mg	<0.001	Ti	<0.001
Ca	0.006	Mn	<0.001	Tl	<0.001
Cr	<0.003	Mo	0.004	V	<0.003
Cd	<0.001	Na	0.03	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	0.01

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

Date of Certification: JUL '04 Certifying Officer: N. Kocherlakota

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Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

010251

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

Legal Notice:

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Certificate of Reference Material

Catalog Number: PLZR2-2X/2Y/2T **Lot No.** 11-69ZR

Description: 1000 mg/L Zirconium

Matrix: 2% HNO3

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

Certified Value: 1004 mg/L

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

Certified Value is Traceable to: NIST SRM #3169

The CRM is prepared gravimetrically using high purity Zirconyl Nitrate Lot# 02041A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1004 mg/L

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

Instrumental Analysis by ICP spectrometer: 1004 mg/L

Uncertified Properties:

Density: 1.011 @ 22.6 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
As	<0.001	Cu	<0.001	Pb	<0.001
Ag	0.03	Fe	0.02	Re	<0.001
Al	0.004	Ga	<0.001	Rb	<0.001
Ba	<0.002	In	<0.001	Sb	<0.001
Be	<0.001	K	<0.20	Sr	<0.001
Bi	0.15	Li	<0.001	Si	<0.10
B	<0.004	Mn	<0.001	Tl	<0.001
Cr	<0.001	Mg	<0.001	Ti	<0.003
Cd	<0.001	Mo	<0.001	V	<0.001
Co	<0.002	Ni	<0.001	Zn	0.001
Ca	<0.001	Na	0.004		

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

Date of Certification: FEB '05 Certifying Officer: N. Kocherlakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 2/28/2006 DK
DATE OPENED: 2/28/05
INORG: S039 PO: F55148

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Report of Certification 010253

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s=s^2m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U=ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c=\sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

Legal Notice:

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

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Certificate of Reference Material

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/31/05
DATE EXPIRED: 1/31/2006
DATE OPENED: 1/31/05
INORG: 4998 PO: E55739

Catalog Number: PLNA2-3X/3Y **Lot No.** V9-56NA
Description: 10,000 mg/L Sodium
Matrix: 5% HNO3

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

Certified Value: 9984 mg/L
Uncertainty Associated with Measurement: +/- 30.0 mg/L
Certified Value is Traceable to: NIST SRM # 3152a

The CRM is prepared gravimetrically using high purity Sodium Carbonate Lot# 05031C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 9983 mg/L

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

Instrumental Analysis by ICP spectrometer: 9985 mg/L

Uncertified Properties:

Density: 1.048 @ 23.1 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	<0.001	Cu	0.01	Pb	0.009
As	<0.01	Fe	0.02	Re	<0.001
Ag	<0.02	Ga	<0.001	Rb	<0.001
B	<0.05	In	<0.001	Sr	<0.002
Ba	0.01	K	2.50	Sb	<0.001
Be	<0.009	Li	<0.002	Si	0.14
Bi	0.001	Mg	0.20	Ti	<0.02
Ca	0.75	Mn	0.001	Tl	<0.001
Cr	<0.02	Mo	<0.001	V	0.002
Cd	<0.001	Ni	<0.006	Zr	<0.01
Co	<0.001			Zn	0.02

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

Date of Certification: JAN -- 2005 Certifying Officer: N. Kocherlakota

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Report of Certification

010255

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U = ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

Legal Notice:

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

ISO 9001
CERTIFIED

SPEXertificate™

Certificate of Reference Material

010256

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 12/08/04
DATE EXPIRED: 11/30/2005 KS
DATE OPENED: 12/08/04
INORG: 4909 PO: F55102

Catalog Number: ICV-2A **Lot No.:** 6-114MS
Description: **Initial Calibration Verification Standard II**
Matrix: 5% Nitric Acid

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

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

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM	Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
Ca	2,000	1,995.81	3109a	Ni	500	499.54	3136
K	2,000	1,995.56	3141a	V	500	499.79	3165
Mg	2,000	1,995.61	3131a	Cr	200	199.97	3112a
Na	2,000	1,995.63	3152a	Cu	200	199.98	3114
Al	1,000	989.06	3101a	Ag	100	99.44	3151
Ba	1,000	999.68	3104a	Be	100	99.16	3105a
Fe	1,000	995.89	3126a	Mn	100	100.03	3132
Co	500	500.41	3113	Zn	100	100.06	3168a

Spex Reference Multi: Lot # 1-58GM, 15-37AS, 11-171AS REF

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

Date of Certification: NOV '04 Certifying Officer: N. Kocherlakota

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Report of Certification

010257

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:
Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.
The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size
s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)
m = the sub-sampling mass
k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as
X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty
$U = ku_c$ where k=2 is the coverage factor at the 95% confidence level
u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\Sigma u_i^2}$

Certification Traveler Report:

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

Legal Notice:

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

ISO 9001
CERTIFIED

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 12/09/04
DATE EXPIRED: 11/30/2005
DATE OPENED: 12/09/04
INORG: 4911 PO: E55103

SPEXertificate™ 010258

Certificate of Reference Material

Catalog Number: PLSB7-2X/2Y/2T **Lot No.** 10-43SB

Description: 1000 mg/L Antimony

Matrix: H2O/0.6Tart.Acid/tr.HNO3

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

Certified Value: 1004 mg/ L

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

Certified Value is Traceable to: NIST SRM 3102a

The CRM is prepared gravimetrically using high purity Antimony Metal Lot# 04021A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1005 mg/L

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

Instrumental Analysis by ICP spectrometer: 1002 mg/ L

Uncertified Properties:

Density: 1.046 @ 25.5 Degrees Celsius

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

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

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

Date of Certification: NOV '04 Certifying Officer: N. Kocherlakota

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Report of Certification

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

Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

010259

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

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

X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

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

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SPEX CertiPrep
203 Norcross Avenue • Metuchen, NJ 08840 USA
732-549-7144 • 1-800-LAB-SPEX • Fax: 732-603-9647 • CRMSales@spexcsp.com • www.spexcsp.com

010260

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 12/09/04
DATE EXPIRED: 11/30/2005
DATE OPENED: 12/09/04
INORG: 4910 PO: F55109

SPEXertificate™

Certificate of Reference Material

Catalog Number: ICV-2C **Lot No.:** 6-146MS
Description: **Initial Calibration Verification Standard II**
Matrix: 5% Nitric Acid

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
As	500	499.69	3103a
Pb	500	499.61	3128
Se	500	499.91	3149
TL	500	499.92	3158
Cd	100	99.90	3108

Spex Reference Multi: Lot #9-34AS, 11-173AS, 1-57GM, 15-39AS REF.

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

Date of Certification: NOV '04 Certifying Officer: N. Kocherlakota

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Report of Certification

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

010261

Guide To The Expression Of Uncertainty In Measurement 1995
EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition
ASTM Guide D6362-98
ISO Guide 34: Quality system guidelines for the production of reference materials.
ISO Guide 17025: Certification of reference materials, general and statistical principles
ISO Guide 31: Contents of certificates of reference materials
NIST Technical Note 1297
ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers
ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

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

X = x+/-U where X =True value (Labeled Value), U= Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

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

ISO 9001
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inorganic ventures / iv labs

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

010262

certificate of analysis

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

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

Catalog Number:	CGAL10-1 and CGAL10-5
Lot Number:	**X-AL04016**
Starting Material:	Al metal
Starting Material Purity (%):	99.996430
Starting Material Lot No	607116
Matrix:	5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS 1 of 2
DATE RECEIVED: 09/01/04
DATE EXPIRED: 10/01/2005 WOS
DATE OPENED: 09/01/04
INORG: 4762 PO: F53434

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,020 ± 40 µg/mL

Certified Density: 1.070 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

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

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

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

4.1 **Assay Method #1** **10,020 ± 40 µg/mL**
ICP Assay NIST SRM 3101a Lot Number: 010808

Assay Method #2 **10,043 ± 87 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

s	Al		M	Dy	<	0.02419	O	Li		0.00166	M	Pr	<	0.00121	M	Te	<	0.12095
M	Sb	<	0.00202	M	Er	<	0.02016	M	Lu	<	0.00161	M	Re	<	0.00403	M	Tb	<	0.00121
M	As	<	0.04032	M	Eu	<	0.01210	O	Mg		0.00685	M	Rh	<	0.00403	M	Tl	<	0.00403
M	Ba	<	0.04032	M	Gd	<	0.00403	M	Mn	<	0.01613	M	Rb	<	0.00403	M	Th	<	0.00403
O	Be	<	0.00017	M	Ga	<	0.00403	O	Hg	<	0.00700	M	Ru	<	0.00806	M	Tm	<	0.00161
M	Bi	<	0.00161	M	Ge	<	0.02419	M	Mo	<	0.00806	M	Sm	<	0.00403	M	Sn	<	0.02016
O	B		0.00975	M	Au	<	0.01210	M	Nd	<	0.00806	M	Sc	<	0.04032	O	Ti		0.00705
M	Cd	<	0.01210	M	Hf	<	0.00806	O	Ni	<	0.00600	M	Se	<	0.03225	M	W	<	0.04032
O	Ca		0.10166	M	Ho	<	0.00202	M	Nb	<	0.00202	O	Si		0.07884	M	U	<	0.00806
M	Ce	<	0.02016	O	In	<	0.03000	n	Os			M	Ag	<	0.00806	M	V	<	0.00806
M	Cs	<	0.00121	M	Ir	<	0.02016	M	Pd	<	0.02016	O	Na		0.06639	M	Yb	<	0.00403
O	Cr		0.00581	O	Fe		0.00954	O	P	<	0.03000	M	Sr	<	0.00202	M	Y	<	0.16126
M	Co	<	0.01210	M	La	<	0.00202	M	Pt	<	0.00806	O	S	<	0.10000	O	Zn		0.07676
M	Cu	<	0.02419	M	Pb	<	0.01210	O	K		0.01992	M	Ta	<	0.02822	M	Zr	<	0.02016

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 26.98154; +3; 6; $Al(H_2O)_6^{+3}$

Chemical Compatibility - Soluble in HCl, HNO_3, HF and H_2SO_4. Avoid neutral media. Soluble in strongly basic NaOH forming the $Al(OH)_4(H_2O)_2^-$ species. Stable with most metals and inorganic anions. The phosphate is insoluble in water and only slightly soluble in acid.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

Al Containing Samples (Preparation and Solution) - Metal (Best dissolved in HCl / HNO_3); α- Al_2O_3 (Na_2CO_3 fusion in Pt[a]); γ- Al_2O_3 (Soluble in acids such as HCl); Ores (Carbonate fusion in Pt[a] followed by HCl dissolution); Organic Matrices (sulfuric/peroxide digestion or nitric / sulfuric / perchloric acid decomposition, or dry ash and dissolution in dilute HCl.

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ppm conc.)
ICP-OES 394.401 nm	0.05 / 0.006 µg/mL	1	atom	U, Ce
ICP-OES 396.152 nm	0.03 / 0.006 µg/mL	1	atom	Mo, Zr, Ce
ICP-OES 167.078 nm	0.1 / 0.009 µg/mL	1	ion	Fe
ICP-MS 27 amu	30 ppt	n/a	M[+]	$^{12}C^{15}N$, $^{13}C^{14}N$, $^{1}H^{12}C^{14}N$, $^{11}B^{16}O$, $^{54}Cr^{2+}$, $^{54}Fe^{2+}$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

INORGANIC LABS/RADCHEM LABS 82 of 2
DATE RECEIVED: 09/01/04
DATE EXPIRED: 10/01/2005 VOS
DATE OPENED: 09/01/04
INORG: 4762 PO: E53434

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010265

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

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

Certification Date: January 23, 2004

Expiration Date:

EXPIRES
1 8 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

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inorganic ventures / iv labs

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

certificate of analysis

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

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

Catalog Number:	CGCA10-1, CGCA10-2, and CGCA10-5
Lot Number:	**X-CA03030**
Starting Material:	CaO
Starting Material Purity (%):	99.999155
Starting Material Lot No	C27L01
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/27/05
DATE EXPIRED: 2/1/06 DR
DATE OPENED: 11/28/05
INORG: 4988 PO: E55133

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,035 ± 24 µg/mL

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

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

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

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

$(\bar{x})$ = 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** **10,035 ± 24 µg/mL**
EDTA NIST SRM 928 Lot Number: 392110

Assay Method #2 **10,046 ± 65 µg/mL**
ICP Assay NIST SRM 3109a Lot Number: 000622

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	0.00069	M	Dy	< 0.04098	O	Li	< 0.00002	M	Pr	< 0.00205	M	Te	< 0.20492
M	Sb	< 0.00342	M	Er	< 0.03415	M	Lu	< 0.00273	M	Re	< 0.00683	M	Tb	< 0.00205
M	As	< 0.06831	M	Eu	< 0.02049	O	Mg	0.05295	M	Rh	< 0.00683	M	Tl	< 0.00683
O	Ba	0.00065	M	Gd	< 0.00683	O	Mn	0.00038	M	Rb	< 0.00683	M	Th	< 0.00683
O	Be	< 0.00009	M	Ga	< 0.00683	O	Hg	< 0.01100	M	Ru	< 0.01366	M	Tm	< 0.00273
M	Bi	< 0.00273	M	Ge	< 0.04098	M	Mo	< 0.01366	M	Sm	< 0.00683	M	Sn	< 0.03415
O	B	< 0.00054	M	Au	< 0.02049	M	Nd	< 0.01366	O	Sc	< 0.00002	M	Ti	< 0.34153
O	Cd	< 0.00450	M	Hf	< 0.01366	O	Ni	< 0.00230	O	Se	< 0.00620	M	W	< 0.06831
s	Ca		M	Ho	< 0.00342	M	Nb	< 0.00342	O	Si	0.00132	M	U	< 0.01366
M	Ce	< 0.03415	O	In	< 0.00200	n	Os		M	Ag	< 0.01366	O	V	< 0.00090
M	Cs	< 0.00205	M	Ir	< 0.03415	M	Pd	< 0.03415	O	Na	0.01000	M	Yb	< 0.00683
O	Cr	0.00103	O	Fe	< 0.00110	O	P	< 0.00480	O	Sr	0.03530	M	Y	< 0.27323
O	Co	< 0.00120	M	La	< 0.00342	M	Pt	< 0.01366	O	S	0.00412	O	Zn	0.02353
O	Cu	< 0.00400	M	Pb	< 0.02049	O	K	< 0.00170	M	Ta	< 0.04782	M	Zr	< 0.03415

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 40.078; +2; 6; $Ca(H_2O)_6^{+2}$

Chemical Compatibility - Soluble in HCl and HNO_3. Avoid H_2SO_4, HF, H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate and tungstate in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO_3 / LDPE container.

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

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

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	393.366 nm	0.0002 / 0.00004 µg/mL	1	ion	U, Ce
ICP-OES	396.847 nm	0.0005 / 0.00006 µg/mL	1	ion	Th
ICP-OES	422.673 nm	0.01 / 0.001 µg/mL	1	atom	Ge
ICP-MS	44 amu	1200 ppt	n/a	M⁺	$^{16}O_2$, ^{12}C, $^{28}Si^{16}O$, $^{44}Sr^{+2}$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

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

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

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

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

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

010269

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: September 20, 2004

Expiration Date: EXPIRES 1 FEB 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas Maida
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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4988

010270

inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Iron in 4.8% (abs) HNO_3**

Catalog Number:	CGFE10-1, CGFE10-2, and CGFE10-5
Lot Number:	**X-FE03041**
Starting Material:	Fe metal
Starting Material Purity (%):	99.998667
Starting Material Lot No	23387
Matrix:	4.8% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 3/1/2006 DR
DATE OPENED: 2/28/05
INORG: 5048 PO: F55148

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,041 ± 21 µg/mL

Certified Density: 1.061 g/mL (measured at 22° C)

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

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

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

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

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

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

4.1 **Assay Method #1** **10,041 ± 21 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **10,017 ± 40 µg/mL**
ICP Assay NIST SRM 3126a Lot Number: 000606

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1 of 4

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	< 0.02528	O	Li	< 0.00003	M	Pr	< 0.00126	M	Te	< 0.12640
M	Sb	< 0.00211	M	Er	< 0.02107	M	Lu	< 0.00169	M	Re	< 0.00421	M	Tb	< 0.00126
M	As	< 0.04213	M	Eu	< 0.01264	O	Mg	< 0.00006	M	Rh	< 0.00421	M	Tl	< 0.00421
M	Ba	< 0.04213	M	Gd	< 0.00421	O	Mn	< 0.05000	M	Rb	< 0.00421	M	Th	< 0.00421
O	Be	< 0.00005	M	Ga	< 0.00421	O	Hg	< 0.01100	M	Ru	< 0.00843	M	Tm	< 0.00169
M	Bi	< 0.00169	i	Ge		M	Mo	< 0.00843	M	Sm	< 0.00421	M	Sn	< 0.02107
O	B	< 0.00090	M	Au	< 0.01264	M	Nd	< 0.00843	M	Sc	< 0.04213	M	Ti	< 0.21066
M	Cd	< 0.01264	M	Hf	< 0.00843	O	Ni	< 0.00230	M	Se	< 0.03371	M	W	< 0.04213
O	Ca	0.03107	M	Ho	< 0.00211	M	Nb	< 0.00211	O	Si	0.01673	M	U	< 0.00843
M	Ce	< 0.02107	M	In	< 0.04213	n	Os		M	Ag	< 0.00843	M	V	< 0.00843
M	Cs	< 0.00126	M	Ir	< 0.02107	M	Pd	< 0.02107	O	Na	0.00956	M	Yb	< 0.00421
M	Cr	< 0.02107	s	Fe		I	P		M	Sr	< 0.00211	M	Y	< 0.16853
O	Co	0.01195	M	La	< 0.00211	M	Pt	< 0.00843	O	S	< 0.07200	M	Zn	0.08761
M	Cu	< 0.02528	M	Pb	< 0.01264	O	K	0.00239	M	Ta	< 0.02949	M	Zr	< 0.02107

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 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⁺	$^{40}Ar^{16}N^1H$, $^{40}Ar^{16}O$, $^{38}Ar^{17}O^1H$, $^{38}Ar^{18}O$, $^{37}Cl^{18}O^1H$, $^{40}Ca^{16}O$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

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

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

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

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

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

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: July 22, 2004

Expiration Date: EXPIRES 1 M 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Malda, QA Administrator	Nicholas Malda
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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2 of 4

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inorganic ventures / iv labs

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

certificate of analysis

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

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

Catalog Number:	CGK10-1, CGK10-2, and CGK10-5
Lot Number:	**X-K02116**
Starting Material:	KNO3
Starting Material Purity (%):	99.996753
Starting Material Lot No	K18J19
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 12/02/04
DATE EXPIRED: 12/01/2005 vos
DATE OPENED: 12/02/04
INORG: 4907 PO: F55102

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 9957 ± 28 µg/mL

Certified Density: 1.023 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

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

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

4.1 **Assay Method #1** **10,011 ± 16 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **9957 ± 28 µg/mL**
ICP Assay NIST SRM 3141a Lot Number: 891312

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00090	M	Dy	< 0.02426	O	Li	< 0.00003	M	Pr	< 0.00121	M	Te	< 0.12131
M	Sb	< 0.00202	M	Er	< 0.02022	M	Lu	< 0.00162	M	Re	< 0.00404	M	Tb	< 0.00121
M	As	< 0.04044	M	Eu	< 0.01213	O	Mg	0.00109	M	Rh	< 0.00404	M	Tl	< 0.00404
M	Ba	< 0.04044	M	Gd	< 0.00404	O	Mn	< 0.00003	M	Rb	0.63001	M	Th	< 0.00404
O	Be	< 0.00020	M	Ga	< 0.00404	O	Hg	< 0.01500	M	Ru	< 0.00809	M	Tm	< 0.00162
M	Bi	< 0.00162	O	Ge	< 0.00150	M	Mo	< 0.00809	M	Sm	< 0.00404	M	Sn	< 0.02022
O	B	< 0.00060	O	Au	< 0.00300	M	Nd	< 0.00809	O	Sc	< 0.00002	O	Ti	< 0.00070
M	Cd	< 0.01213	M	Hf	< 0.00809	O	Ni	< 0.00230	O	Se	< 0.05000	M	W	< 0.04044
O	Ca	0.01360	M	Ho	< 0.00202	M	Nb	< 0.00202	O	Si	< 0.00340	M	U	< 0.00809
M	Ce	< 0.02022	M	In	< 0.04044	n	Os		M	Ag	< 0.00809	O	V	< 0.00090
M	Cs	0.00050	M	Ir	< 0.02022	M	Pd	< 0.02022	O	Na	0.19537	M	Yb	< 0.00404
M	Cr	< 0.02022	O	Fe	0.00297	O	P	< 0.00250	M	Sr	< 0.00202	M	Y	< 0.16175
M	Co	< 0.01213	M	La	< 0.00202	M	Pt	< 0.00809	O	S	< 0.07200	O	Zn	< 0.00020
M	Cu	< 0.02426	M	Pb	< 0.01213	S	K		M	Ta	< 0.02831	M	Zr	< 0.02022

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 29.0983; +1; (6); $K^+(aq)$
(Coordination Number in parentheses is assumed, not certain.)

Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Avoid use of $HClO_4$ due to insolubility of the perchlorate. Stable with all metals and inorganic anions except ClO_4^-.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

K Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Sodium carbonate fusion in Pt[s] followed by HCl dissolution-blank levels of K in sodium carbonate critical); Organic Matrices (Sulfuric/peroxide digestion)

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at = concs.)
ICP-OES 766.490 nm	0.4 / 0.001 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES 771.531 nm	1.0 / 0.03 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES 404.721 nm	1.1 / 0.05 µg/mL	1	atom	U, Ce,
ICP-MS 39 amu	10 ppt	n/a	M[1]	^{37}ArH, $^{23}Na^{16}O$, $^{78}Se^{+2}$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

010276

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: March 30, 2004

Expiration Date:

EXPIRES
12 2005

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 12/02/04
DATE EXPIRED: 12/01/2005 VOS
DATE OPENED: 12/02/04
INORG: 4907 PO: F55102

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

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inorganic ventures / iv labs

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

certificate of analysis

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

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

Catalog Number:	CGMG10-1, CGMG10-2, and CGMG10-5
Lot Number:	**X-MG03018**
Starting Material:	Mg metal
Starting Material Purity (%):	99.994984
Starting Material Lot No	91191
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 v03
DATE OPENED: 07/29/04
INORG: 4656 PO: F53417

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,039 ± 31 µg/mL

Certified Density: 1.051 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum s$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

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

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

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

4.1 **Assay Method #1** **10,039 ± 31 µg/mL**
ICP Assay NIST SRM 3131a Lot Number: 991107

Assay Method #2 **10,079 ± 21 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

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	0.04714	M	Dy	< 0.03601	O	Li	0.00623	M	Pr	< 0.00180	M	Te	< 0.18002
M	Sb	< 0.00300	M	Er	< 0.03000	M	Lu	< 0.00240	M	Re	< 0.00600	M	Tb	< 0.00180
M	As	< 0.06001	M	Eu	< 0.01800	s	Mg		M	Rh	< 0.00600	M	Tl	< 0.00600
M	Ba	< 0.06001	M	Gd	< 0.00600	O	Mn	0.07408	M	Rb	< 0.00600	M	Th	< 0.00600
O	Be	< 0.00017	M	Ga	< 0.00600	O	Hg	< 0.00900	M	Ru	< 0.01200	M	Tm	< 0.00240
M	Bi	< 0.00240	M	Ge	< 0.03601	M	Mo	< 0.01200	M	Sm	< 0.00600	M	Sn	< 0.03000
O	B	0.00303	M	Au	< 0.01800	M	Nd	< 0.01200	M	Sc	< 0.06001	O	Ti	0.09765
M	Cd	< 0.01800	M	Hf	< 0.01200	O	Ni	0.01229	M	Se	< 0.04801	M	W	< 0.06001
O	Ca	0.14984	M	Ho	< 0.00300	M	Nb	< 0.00300	O	Si	0.02357	M	U	< 0.01200
M	Ce	< 0.03000	M	In	< 0.06001	n	Os		M	Ag	< 0.01200	M	V	< 0.01200
M	Cs	< 0.00180	M	Ir	< 0.03000	M	Pd	< 0.03000	O	Na	0.02189	M	Yb	< 0.00600
O	Cr	0.02189	O	Fe	0.03704	O	P	< 0.01600	M	Sr	< 0.00300	M	Y	0.02021
M	Co	< 0.01800	M	La	< 0.00300	M	Pt	< 0.01200	n	S		O	Zn	0.00572
O	Cu	0.00674	O	Pb	0.02694	O	K	< 0.05000	M	Ta	< 0.04201	M	Zr	< 0.03000

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 24.305; +2; 6; $Mg(H_2O)_6^{+2}$

Chemical Compatibility - Soluble in HCl, HNO_3, and H_2SO_4 avoid HF, H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicates, carbonates, hydroxides, oxides, and tungstates in neutral and slightly acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO_3 / LDPE container.

Mg Containing Samples (Preparation and Solution) - Metal (Best dissolved in diluted HNO_3); Oxide (Readily soluble in above compatible aqueous acidic solutions); Ores (Carbonate fusion in Pt° followed by HCl dissolution); Organic Matrices (Sulfuric / peroxide digestion or nitric / sulfuric / perchloric acid decomposition, or dry ash and dissolution in dilute HCl).

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

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	279.553 nm	0.0002 / 0.00003 µg/mL	1	ion	Th
ICP-OES	280.270 nm	0.0003 / 0.00005 µg/mL	1	ion	U, V
ICP-OES	285.213 nm	0.002 / 0.00003 µg/mL	1	atom	U, Hf, Cr, Zr
ICP-MS	24 amu	42 ppt	n/a	M'	$^{7}Li^{16}O$, $^{48}Ti^{+2}$, $^{48}Ca^{+2}$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

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

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

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

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

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

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 VPS
DATE OPENED: 07/29/04
INORG: 4656 PO: F53417

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: April 15, 2004

Expiration Date: EXPIRES 1 2 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

010282

inorganic ventures / iv labs

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

certificate of analysis

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

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

Catalog Number:	CGNA10-1, CGNA10-2, and CGNA10-5
Lot Number:	**W-NA03010**
Starting Material:	Na2CO3
Starting Material Purity (%):	99.999819
Starting Material Lot No	42063
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 WO
DATE OPENED: 07/29/04
INORG: 4657 PO: F53417

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,006 ± 6 µg/mL

Certified Density: 1.032 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

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

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

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

4.1 **Assay Method #1** **10,006 ± 6 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **10,019 ± 33 µg/mL**
ICP Assay NIST SRM 3152a Lot Number: 990907

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.00600	O Li < 0.00003	M Pr < 0.00030	M Te < 0.02998
M Sb < 0.00050	M Er < 0.00500	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
M As < 0.00999	M Eu < 0.00300	O Mg 0.00010	M Rh < 0.00100	M Tl < 0.00100
M Ba < 0.00999	M Gd < 0.00100	O Mn < 0.00003	M Rb < 0.00100	M Th < 0.00100
O Be < 0.00020	M Ga < 0.00100	O Hg < 0.01500	M Ru < 0.00200	M Tm < 0.00040
M Bi < 0.00040	O Ge < 0.00150	M Mo < 0.00200	M Sm < 0.00100	M Sn < 0.00500
O B < 0.00060	O Au < 0.00300	M Nd < 0.00200	O Sc < 0.00002	O Ti < 0.00070
M Cd < 0.00300	M Hf < 0.00200	O Ni < 0.00230	O Se < 0.05000	M W < 0.00999
O Ca 0.00050	M Ho < 0.00050	M Nb < 0.00050	O Si < 0.00340	M U < 0.00200
M Ce < 0.00500	M In < 0.00999	n Os	M Ag < 0.00200	O V < 0.00090
M Cs < 0.00030	M Ir < 0.00500	M Pd < 0.00500	S Na	M Yb < 0.00100
M Cr < 0.00500	O Fe < 0.00110	O P < 0.04000	M Sr < 0.00050	M Y < 0.03997
M Co < 0.00300	M La < 0.00050	M Pt < 0.00200	O S < 0.07200	O Zn 0.00250
O Cu < 0.00140	M Pb < 0.00300	O K 0.04000	M Ta < 0.00700	M Zr < 0.00500

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 22.98977; +1; (6); Na^+(aq) largely ionic in nature (Coordination Number in parentheses is assumed, not certain.)

Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Na Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Lithium carbonate fusion in graphite crucible followed by HCl dissolution - blank levels of Na in lithium carbonate critical); Organic Matrices (Sulfuric / peroxide digestion or nitric/sulfuric/perchloric acid decomposition).

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

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ppm conc.)
ICP-OES	589.595 nm	0.07 / 0.00009 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	588.995 nm	0.03 / 0.006 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	330.237 nm	2.0 / 0.09 µg/mL	1	atom	Pd, Zn
ICP-MS	23 amu	310 ppt	n/a	M+	$^{46}Ti^{+2}$, $^{46}Ca^{+2}$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

010284

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: October 27, 2003

Expiration Date: EXPIRES 1 2005

INORGANIC LABS/RADCHEM LABS pg. 2 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 VOS
DATE OPENED: 07/29/04
INORG: 4657 PO: E53417

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

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inorganic ventures / iv labs

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

certificate of analysis

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

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Barium in 0.1% (abs) HNO_3**

Catalog Number:	CGBA1-1, CGBA1-2, and CGBA1-5
Lot Number:	**X-BA02027**
Starting Material:	Ba(NO3)2
Starting Material Purity (%):	99.999730
Starting Material Lot No	21879
Matrix:	0.1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/18/05
DATE EXPIRED: 3/1/2006 DR
DATE OPENED: 2/18/05
INORG: 5027 PO: F55142

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1002 ± 3 µg/mL

Certified Density: 0.999 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = 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** **1002 ± 3 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **996 ± 4 µg/mL**
ICP Assay NIST SRM 3104a Lot Number: 992907

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4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00011	M	Dy	< 0.01269	O	Li	< 0.00400	M	Pr	< 0.00063	M	Te	< 0.06343
M	Sb	< 0.00106	M	Er	< 0.01057	M	Lu	< 0.00085	M	Re	< 0.00211	O	Tb	< 0.00390
M	As	< 0.02114	O	Eu	< 0.00040	O	Mg	0.00009	M	Rh	< 0.00211	M	Tl	< 0.00211
s	Ba		O	Gd	< 0.00052	M	Mn	< 0.00846	M	Rb	< 0.00211	M	Th	< 0.00211
M	Be	< 0.00106	M	Ga	< 0.00211	O	Hg	< 0.01200	M	Ru	< 0.00423	M	Tm	< 0.00085
M	Bi	< 0.00085	M	Ge	< 0.01269	M	Mo	< 0.00423	O	Sm	< 0.00071	M	Sn	< 0.01057
M	B	< 0.14800	M	Au	< 0.00634	O	Nd	< 0.00330	M	Sc	< 0.02114	M	Ti	< 0.10571
M	Cd	< 0.00634	M	Hf	< 0.00423	M	Ni	< 0.01691	M	Se	< 0.01691	M	W	< 0.02114
O	Ca	0.00072	M	Ho	< 0.00106	M	Nb	< 0.00106	O	Si	< 0.00340	M	U	< 0.00423
M	Ce	< 0.01057	M	In	< 0.02114	n	Os		M	Ag	< 0.00423	M	V	< 0.00423
M	Cs	< 0.00063	M	Ir	< 0.01057	M	Pd	< 0.01057	M	Na	< 0.21142	M	Yb	< 0.00211
M	Cr	< 0.01057	O	Fe	0.00062	O	P	< 0.00260	O	Sr	0.00379	O	Y	0.00040
M	Co	< 0.00634	M	La	< 0.00106	M	Pt	< 0.00423	O	S	< 0.02500	O	Zn	< 0.00039
M	Cu	< 0.01269	M	Pb	0.00020	O	K	< 0.00180	O	Ta	< 0.00690	M	Zr	< 0.01057

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

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5027

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 137.33; +2; 6; $Ba(H_2O)_6^{+2}$

Chemical Compatibility - Soluble in HCl, and HNO_3. Avoid H_2SO_4, HF and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate, iodate, molybdate, sulfite and tungstate in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1 -10,000 ppm solutions chemically stable for years in 1-3.5% HNO_3 / LDPE container.

Ba Containing Samples (Preparation and Solution) - Metal(is best dissolved in diluted HNO_3); Ores(Carbonate fusion in Pt° followed by HCl dissolution. If sulfate is present dissolve the fuseate using HCl /tartaric acid to prevent $BaSO_4$ precipitate); Organic Matrices (dry ash and dissolve in dilute HCl.)

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES 455.403 nm	0.002 / 0.0001 µg/mL	1	ion	Zr, U
ICP-OES 233.527 nm	0.004 / 0.0003 µg/mL	1	ion	
ICP-OES 230.424 nm	0.004 / 0.0005 µg/mL	1	ion	Mo, Ir, Co
ICP-MS 138 amu	1 ppt	n/a	M'	$^{122}Sn^{16}O$, $^{122}Te^{16}O$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010289

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

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

Certification Date: May 05, 2004

Expiration Date:

EXPIRES
1 MAR 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

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5007

010290

inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Beryllium in 2% (abs) HNO_3**

Catalog Number:	CGBE1-1, CGBE1-2, and CGBE1-5
Lot Number:	**W-BE01104**
Starting Material:	Be(OOCCH3)2
Starting Material Purity (%):	99.999897
Starting Material Lot No	01-10-01
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS P3-1 of 2
DATE RECEIVED: 06/01/04
DATE EXPIRED: 06/01/2005 VOS
DATE OPENED: 06/01/04
INORG: 4592 PO: F53393

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1007 ± 4 µg/mL

Certified Density: 1.023 g/mL (measured at 22° C)

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

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

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

(□) = mean
x_i = individual results
n = number of measurements
■S = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

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

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

4.1 **Assay Method #1** **1007 ± 4 µg/mL**
ICP Assay NIST SRM 3105a Lot Number: 892707

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00800	M	Dy	< 0.01305	O	Li	< 0.00002	M	Pr	< 0.00065	M	Te	< 0.06525
M	Sb	< 0.00109	M	Er	< 0.01087	M	Lu	< 0.00087	M	Re	< 0.00218	M	Tb	< 0.00065
M	As	< 0.02175	M	Eu	< 0.00652	O	Mg	< 0.00003	M	Rh	< 0.00218	M	Tl	< 0.00218
M	Ba	< 0.02175	M	Gd	< 0.00218	O	Mn	< 0.00002	M	Rb	< 0.00218	M	Th	< 0.00218
s	Be		M	Ga	< 0.00218	O	Hg	< 0.01500	M	Ru	< 0.00435	M	Tm	< 0.00087
M	Bi	< 0.00087	M	Ge	< 0.01305	M	Mo	< 0.00435	M	Sm	< 0.00218	M	Sn	< 0.01087
O	B	< 0.01200	M	Au	< 0.00652	M	Nd	< 0.00435	O	Sc	< 0.00009	M	Ti	< 0.10874
M	Cd	< 0.00652	M	Hf	< 0.00435	M	Ni	< 0.65245	M	Se	< 0.01740	M	W	< 0.02175
O	Ca	0.00164	M	Ho	< 0.00109	M	Nb	< 0.00109	O	Si	0.00649	M	U	< 0.00435
M	Ce	< 0.01087	M	In	< 0.02175	n	Os		M	Ag	< 0.00435	M	V	< 0.00435
M	Cs	< 0.00065	M	Ir	< 0.01087	M	Pd	< 0.01087	O	Na	0.00368	M	Yb	< 0.00218
O	Cr	< 0.00900	O	Fe	0.00268	n	P		M	Sr	< 0.00109	M	Y	< 0.08699
M	Co	< 0.00652	M	La	< 0.00109	M	Pt	< 0.00435	i	S		M	Zn	< 0.04350
M	Cu	< 0.01305	M	Pb	< 0.00652	O	K	< 0.10000	M	Ta	< 0.01522	M	Zr	< 0.01087

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 9.01218; +2; 4; $Be^{+2}(H_2O)_4^{+2}$
Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.
Stability - 2-100 ppb levels stable for months in 1 % HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 5-10 % HNO_3 / LDPE container.
Be Containing Samples (Preparation and Solution) - Metal (is best dissolved in diluted H_2SO_4); BeO (boiling nitric, hydrochloric, or sulfuric acids or $KHSO_4$ fusion); Ores (H_2SO_4/HF digestion or carbonate fusion in Pt*); Organic Matrices (sulfuric/peroxide digestion or nitric/sulfuric/perchloric acid decomposition, or dry ash and dissolution according to the BeO procedure above).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ppm conc.)
ICP-OES 313.042 nm	0.0003 / 0.00009 µg/mL	1	ion	V, Ce, U
ICP-OES 234.861 nm	0.0003 / 0.00016 µg/mL	1	atom	Fe, Ta, Mo
ICP-OES 313.107 nm	0.0007 / 0.0005 µg/mL	1	ion	Ce, Th, Tm
ICP-MS 9 amu	4 ppt	n/a	M'	

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

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

10.0 QUALITY STANDARD DOCUMENTATION

010292

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: January 08, 2004

Expiration Date: EXPIRES 1/8/2005

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 06/01/04
DATE EXPIRED: 06/01/2005 VOS
DATE OPENED: 06/01/04
INORG: 4592 PO: F53393

010293

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
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certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Chromium (+3) in 1.4% (abs) HNO_3**

Catalog Number:	CGCR(3)1-1, CGCR(3)1-2, and CGCR(3)1-5
Lot Number:	**X-CR02137**
Starting Material:	Cr pieces
Starting Material Purity (%):	99.997404
Starting Material Lot No	F02N38
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 12/02/04
DATE EXPIRED: 12/01/2005 VOI
DATE OPENED: 12/02/04
INORG: 4906 PO: F55102

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 2 µg/mL

Certified Density: 1.011 g/mL (measured at 22° C)

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

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S_i$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

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

4.1 **Assay Method #1** **1002 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3112a Lot Number: 990607

Assay Method #2 **1004 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00120	M	Dy	< 0.02432	O	Li	< 0.00002	M	Pr	< 0.00122	M	Te	< 0.12159
M	Sb	< 0.00203	M	Er	< 0.02027	M	Lu	< 0.00162	M	Re	< 0.00405	M	Tb	< 0.00122
M	As	< 0.04053	M	Eu	< 0.01216	O	Mg	< 0.00030	M	Rh	< 0.00405	M	Tl	< 0.00405
M	Ba	< 0.04053	M	Gd	< 0.00405	M	Mn	< 0.01621	M	Rb	< 0.00405	M	Th	< 0.00405
M	Be	< 0.00203	M	Ga	< 0.00405	O	Hg	< 0.01500	M	Ru	< 0.00811	M	Tm	< 0.00162
M	Bi	< 0.00162	M	Ge	< 0.02432	M	Mo	< 0.00811	M	Sm	< 0.00405	M	Sn	< 0.02027
O	B	< 0.01000	M	Au	< 0.01216	M	Nd	< 0.00811	M	Sc	< 0.04053	O	Ti	< 0.00100
M	Cd	< 0.01216	M	Hf	< 0.00811	O	Ni	< 0.02000	M	Se	< 0.03242	M	W	< 0.04053
O	Ca	0.01818	M	Ho	< 0.00203	M	Nb	< 0.00203	O	Si	< 0.20000	M	U	< 0.00811
M	Ce	< 0.02027	M	In	< 0.04053	n	Os		M	Ag	< 0.00811	O	V	< 0.02000
M	Cs	< 0.00122	M	Ir	< 0.02027	M	Pd	< 0.02027	O	Na	0.00647	M	Yb	< 0.00405
s	Cr		O	Fe	< 0.01000	O	P	< 0.04000	M	Sr	< 0.00203	M	Y	< 0.16212
M	Co	< 0.01216	M	La	< 0.00203	M	Pt	< 0.00811	i	S		O	Zn	< 0.00400
M	Cu	< 0.02432	M	Pb	0.00089	O	K	< 0.00180	M	Ta	< 0.02837	M	Zr	< 0.02027

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 51.9961; +3; 6; $Cr(H_2O)_6^{3+}$

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Cr Containing Samples (Preparation and Solution) - Metal (soluble in HCl); Oxides/Ores (Chrome ore/oxides are very difficult to dissolve. The following procedures [A-D] are commonly used:

A. Fusion with $KHSO_4$ and extraction with hot KCl. The residue fused with Na_2CO_3 and $KClO_3$, 3:1.
B. Fusion with $NaKSO_4$ and NaF, 2:1.
C. Fusion with magnesia or lime and sodium or potassium carbonates, 4:1.
D. Fusion with Na_2O_2 or NaOH and KNO_3 or NaOH and Na_2O_2.
Nickel, iron, copper, or silver crucibles should be used for **D**. Platinum may be used for **A, B and C**.

Organic Matrices (Ash at 450°C followed by one of the fusion methods above or sulfuric/hydrogen peroxide acid digestions **may** be applicable to **non oxide** containing samples).

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

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	205.552 nm	0.006 / 0.0008 µg/mL	1	ion	Os
ICP-OES	284.325 nm	0.008 / 0.0007 µg/mL	1	ion	
ICP-OES	276.654 nm	0.01 / 0.001 µg/mL	1	ion	Cu, Ta, Y
ICP-MS	52 amu	40 ppt	n/a	M+	$^{35}S^{16}O$, $^{36}Ar^{16}O$ - The ^{52}Cr, ^{53}Cr, ^{54}Cr lines suffer from many more potential interferences from sulfur, chlorine and argon compounds of oxygen, nitrogen and carbon.

8.0 HAZARDOUS INFORMATION

- Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

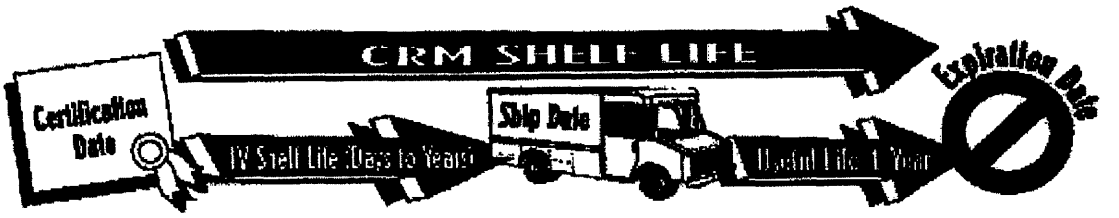
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

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

INORGANIC LABS/RADCHEM LABS 3 of 3
DATE RECEIVED: 12/02/04
DATE EXPIRED: 12/01/2005 v03
DATE OPENED: 12/02/04
INORG: 4906 PO: E55102

010297

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 16, 2004

Expiration Date: EXPIRES 12/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas Maida
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010298

inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Copper in 2% (abs) HNO_3**

Catalog Number:	CGCU1-1, CGCU1-2, and CGCU1-5
Lot Number:	**X-CU02067**
Starting Material:	Cu shot
Starting Material Purity (%):	99.999437
Starting Material Lot No	K09C13
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 3/1/2006
DATE OPENED: 2/28/05 DR
INORG: 5049 PO: F55148

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1003 ± 3 µg/mL

Certified Density: 1.015 g/mL (measured at 22° C)

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

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S$ = 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** **1003 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 392110

Assay Method #2 **1001 ± 2 µg/mL**
ICP Assay NIST SRM 3114 Lot Number: 891811

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010298-A

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00090	M	Dy	< 0.03027	O	Li	< 0.00002	M	Pr	< 0.00151	M	Te	< 0.15134
M	Sb	< 0.00252	M	Er	< 0.02522	M	Lu	< 0.00202	M	Re	< 0.00504	M	Tb	< 0.00151
M	As	< 0.05045	M	Eu	< 0.01513	O	Mg	0.00001	M	Rh	< 0.00504	M	Tl	< 0.00504
M	Ba	< 0.05045	M	Gd	< 0.00504	M	Mn	< 0.02018	M	Rb	< 0.00504	M	Th	< 0.00504
M	Be	< 0.00252	M	Ga	< 0.00504	O	Hg	< 0.01500	M	Ru	< 0.01009	M	Tm	< 0.00202
M	Bi	< 0.00202	M	Ge	< 0.03027	M	Mo	< 0.01009	M	Sm	< 0.00504	O	Sn	0.00439
M	B	< 0.35312	M	Au	< 0.01513	M	Nd	< 0.01009	M	Sc	< 0.05045	M	Ti	< 0.25223
M	Cd	< 0.01513	M	Hf	< 0.01009	M	Ni	< 0.04036	M	Se	< 0.04036	M	W	< 0.05045
O	Ca	0.00011	M	Ho	< 0.00252	M	Nb	< 0.00252	O	Si	< 0.00340	M	U	< 0.01009
M	Ce	< 0.02522	M	In	< 0.05045	n	Os		M	Ag	< 0.01009	O	V	< 0.00300
M	Cs	< 0.00151	M	Ir	< 0.02522	M	Pd	< 0.02522	O	Na	0.00044	M	Yb	< 0.00504
M	Cr	< 0.02522	O	Fe	0.00054	O	P	< 0.00260	M	Sr	< 0.00252	M	Y	< 0.20178
M	Co	< 0.01513	M	La	< 0.00252	M	Pt	< 0.01009	n	S		M	Zn	< 0.10089
s	Cu		M	Pb	0.00050	O	K	< 0.00180	M	Ta	< 0.03531	M	Zr	< 0.02522

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 63.546; +2; 6; $Cu(H_2O)_6^{2+}$

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Cu Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).

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

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	324.754 nm	0.06/.001 µg/mL	1	atom	Nb, U, Th, Mo, Hf
ICP-OES	224.700 nm	0.01/.001 µg/mL	1	ion	Pb, Ir, Ni, W
ICP-OES	219.958 nm	0.01/.002 µg/mL	1	atom	Th, Ta, Nb, U, Hf
ICP-MS	63 amu	10 ppt	n/a	M'	$^{40}Ar^{23}Na$ $^{47}Ti^{16}O$, $^{14}N^{12}C^{35}Cl$, $^{16}O^{12}C^{35}Cl$, $^{44}Ca^{16}O$, $^{23}Na^{40}Ca$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010300

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 16, 2004

Expiration Date: EXPIRES 1 MAR 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas Maida
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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010301

inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Nickel in 1.4% (abs) HNO_3**

Catalog Number:	CGNI1-1, CGNI1-2, and CGNI1-5
Lot Number:	**X-NI02032**
Starting Material:	Ni pieces
Starting Material Purity (%):	99.999371
Starting Material Lot No	L06L02
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 3/1/2006 DR
DATE OPENED: 3/28/05
INORG: 5043 PO: F55148

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 3 µg/mL

Certified Density: 1.011 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

$(\bar{x})$ = 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** **999 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **1002 ± 3 µg/mL**
ICP Assay NIST SRM 3136 Lot Number: 000612

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4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00938	M Dy < 0.06577	O Li < 0.00006	M Pr < 0.00329	M Te < 0.32886
M Sb < 0.00548	M Er < 0.05481	M Lu < 0.00439	M Re < 0.01096	M Tb < 0.00329
O As < 0.01689	M Eu < 0.03289	O Mg 0.00002	M Rh < 0.01096	M Tl < 0.01096
M Ba < 0.10962	M Gd < 0.01096	M Mn < 0.04385	M Rb < 0.01096	M Th < 0.01096
O Be < 0.00626	M Ga < 0.01096	O Hg < 0.03441	M Ru < 0.02192	M Tm < 0.00439
M Bi < 0.00439	M Ge < 0.06577	M Mo < 0.02192	M Sm < 0.01096	M Sn < 0.05481
O B < 0.03097	M Au < 0.03289	M Nd < 0.02192	M Sc < 0.10962	M Ti < 0.54811
M Cd < 0.03289	M Hf < 0.02192	S Ni	O Se < 0.01877	M W < 0.10962
O Ca < 0.01157	M Ho < 0.00548	M Nb < 0.00548	O Si 0.00188	M U < 0.02192
M Ce < 0.05481	M In < 0.10962	n Os	M Ag < 0.02192	M V < 0.02192
M Cs < 0.00329	M Ir < 0.05481	M Pd < 0.05481	O Na 0.00102	M Yb < 0.01096
M Cr < 0.05481	O Fe 0.00156	O P < 0.31280	M Sr < 0.00548	M Y < 0.43849
O Co 0.00182	M La < 0.00548	M Pt < 0.02192	O S < 0.07820	M Zn 0.00189
M Cu < 0.06577	M Pb < 0.03289	O K 0.00043	M Ta < 0.07674	M Zr < 0.05481

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.69; +2; 6; $Ni(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Ni Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	221.647 nm	0.01 / 0.0009 µg/mL	1	ion	Si
ICP-OES	232.003 nm	0.02 / 0.006 µg/mL	1	atom	Cr, Re, Os, Nb, Ag, Pt, Fe
ICP-OES	231.604 nm	0.02 / 0.002 µg/mL	1	ion	Sb, Ta, Co
ICP-MS	60 amu	100 ppt	n/a	M+	$^{40}Ca^{16}O^{1}H$, $^{44}Ca^{16}O$, $^{23}Na^{37}Cl$

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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

010303

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: April 27, 2004

Expiration Date: EXPIRES 1 APR 2006

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3 of 4

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010304

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

010305

inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Cadmium in 2% (abs) HNO_3**

Catalog Number:	CGCD1-1, CGCD1-2, and CGCD1-5
Lot Number:	**Y-QCD01109**
Starting Material:	Cd shot
Starting Material Purity (%):	99.998904
Starting Material Lot No	C14M30
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05 DR
DATE EXPIRED: 3/1/2005
DATE OPENED: 2/28/05
INORG: 5041 PO: F55147

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1000 ± 3 µg/mL

Certified Density: 1.013 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

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

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

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

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

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

4.1 **Assay Method #1** **1002 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **1000 ± 3 µg/mL**
ICP Assay NIST SRM 3108 Lot Number: 890312

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4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00090	M	Dy	< 0.01191	O	Li	< 0.00002	M	Pr	< 0.00060	O	Te	< 0.00700
M	Sb	0.00039	M	Er	< 0.00993	M	Lu	< 0.00079	M	Re	< 0.00199	M	Tb	< 0.00060
M	As	< 0.01985	M	Eu	< 0.00596	O	Mg	0.00002	M	Rh	< 0.00199	M	Tl	< 0.00199
M	Ba	< 0.01985	M	Gd	< 0.00199	M	Mn	< 0.00794	M	Rb	< 0.00199	M	Th	< 0.00199
M	Be	< 0.00099	M	Ga	< 0.00199	O	Hg	< 0.01200	M	Ru	< 0.00397	M	Tm	< 0.00079
M	Bi	< 0.00079	M	Ge	< 0.01191	M	Mo	< 0.00397	M	Sm	< 0.00199	M	Sn	< 0.00993
O	B	< 0.00900	M	Au	< 0.00596	M	Nd	< 0.00397	M	Sc	< 0.01985	M	Ti	< 0.09925
s	Cd		M	Hf	< 0.00397	O	Ni	< 0.00300	M	Se	< 0.01588	M	W	< 0.01985
O	Ca	0.00378	M	Ho	< 0.00099	M	Nb	< 0.00099	O	Si	< 0.00340	M	U	< 0.00397
M	Ce	< 0.00993	O	In	< 0.00200	n	Os		M	Ag	< 0.00397	M	V	< 0.00397
M	Cs	< 0.00060	M	Ir	< 0.00993	M	Pd	0.00691	M	Na	< 0.19849	M	Yb	< 0.00199
M	Cr	< 0.00993	O	Fe	< 0.00110	O	P	< 0.00300	M	Sr	< 0.00099	M	Y	< 0.07940
M	Co	< 0.00596	M	La	< 0.00099	M	Pt	< 0.00397	O	S	< 0.03000	O	Zn	0.00040
M	Cu	< 0.01191	M	Pb	< 0.00596	O	K	0.00015	M	Ta	< 0.01389	M	Zr	< 0.00993

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do r removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Formin Solution - 112.41; +2; 4 ; $Cd_2(OH)(aq)^{3+}$ and Cd(C
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, and HF. Avoid basic media forming insoluble carbonate and hyc most metals and inorganic anions in acidic media. The sulfide, carbonate, oxalate, phosphate, and cyanide are insoluble i in HCl, HNO_3 and NH_4OH. The chloride, bromide and iodide are soluble in water. CdI_2 is one of the fewiodides soluble i compounds of Cd are soluble in excess NaI, due to the formation of the complex ion, CdI_4^{2-}.
Stability - 2-100 ppb levels stable for months in 1% HNO_3/ LDPE container. 1-10,000 ppm solutions chemically stable fo HNO_3/LDPE container.
Cd Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HCl or HNO_3); Ores HNO_3 then take to fumes with H_2SO_4. The silica and lead sulfate are filtered off after addition of water.); Organic based ((and dissolve ash in HCl) (sulfuric/peroxide acid digestion).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES	214.438 nm	0.003 / 0.0003 µg/mL	1	ion	Pt, Ir
ICP-OES	228.802 nm	0.003 / 0.0003 µg/mL	1	atom	Co, Ir, As, Pt
ICP-OES	226.502 nm	0.003 / 0.0003 µg/mL	1	ion	Ir
ICP-MS	111 amu	11 ppt	n/a	M^+	$^{95}Mo^{16}O$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

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11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: January 19, 2005

Expiration Date: EXPIRES 1 MAR 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas Maida
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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inorganic ventures / iv labs

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

certificate of analysis

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

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Cobalt in 2% (abs) HNO_3**

Catalog Number:	CGCO1-1, CGCO1-2, and CGCO1-5
Lot Number:	**X-CO01123**
Starting Material:	Co powder
Starting Material Purity (%):	99.999403
Starting Material Lot No	23171
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 3/1/06 DR
DATE OPENED: 2/28/05
INORG: 5044 PO: F55148

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1003 ± 2 µg/mL

Certified Density: 1.016 g/mL (measured at 22° C)

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

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

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

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

4.1 **Assay Method #1** **1007 ± 5 µg/mL**
ICP Assay NIST SRM 3181 Lot Number: 000630

Assay Method #2 **1003 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

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4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al		0.00030	M	Dy	<	0.02394	O	Li		0.00001	M	Pr	<	0.00120	M	Te	<	0.11970
M	Sb	<	0.00200	M	Er	<	0.01995	M	Lu	<	0.00160	M	Re	<	0.00399	M	Tb	<	0.00120
O	As	<	0.10000	M	Eu	<	0.01197	O	Mg		0.00128	M	Rh	<	0.00399	M	Tl	<	0.00399
M	Ba	<	0.03990	M	Gd	<	0.00399	O	Mn	<	0.00400	M	Rb	<	0.00399	M	Th	<	0.00399
M	Be	<	0.00200	M	Ga	<	0.00399	O	Hg	<	0.05000	M	Ru	<	0.00798	M	Tm	<	0.00160
M	Bi		0.00020	M	Ge	<	0.02394	M	Mo	<	0.00798	M	Sm	<	0.00399	M	Sn	<	0.01995
O	B		0.00103	M	Au	<	0.01197	M	Nd	<	0.00798	M	Sc	<	0.03990	M	Ti	<	0.19949
M	Cd	<	0.01197	M	Hf	<	0.00798	O	Ni	<	0.02000	M	Se	<	0.03192	M	W	<	0.03990
O	Ca		0.00168	M	Ho	<	0.00200	M	Nb	<	0.00200	O	Si	<	0.00400	M	U	<	0.00798
M	Ce	<	0.01995	M	In	<	0.03990	n	Os			M	Ag	<	0.00798	M	V	<	0.00798
M	Cs	<	0.00120	M	Ir	<	0.01995	M	Pd	<	0.01995	O	Na		0.00095	M	Yb	<	0.00399
M	Cr		0.00080	O	Fe	<	0.00400	n	P			M	Sr	<	0.00200	M	Y	<	0.15960
s	Co			M	La	<	0.00200	M	Pt	<	0.00798	n	S			O	Zn		0.00020
M	Cu		0.00023	M	Pb		0.00150	O	K		0.00048	M	Ta	<	0.02793	M	Zr	<	0.01995

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.9332; +2; 6; $Co(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Co Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at = concs.)
ICP-OES	238.892 nm	0.01/.002 µg/mL	1	ion	Fe, W, Ta
ICP-OES	228.616 nm	0.01/.001µg/mL	1	ion	
ICP-OES	237.862 nm	0.01/.002 µg/mL	1	ion	W, Re, Al, Ta
ICP-MS	59 amu	2 ppt	n/a	M+	$^{43}Ca^{16}O^{1}H$, $^{40}Ar^{18}O^{1}H$, $^{40}Ar^{19}Na$, $^{43}Ca^{16}O$, $^{27}Mg^{32}Cl$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: March 30, 2004

Expiration Date: EXPIRES 1 2006

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12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

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inorganic ventures / iv labs

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

certificate of analysis

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

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Manganese in 2% (abs) HNO_3**

Catalog Number:	CGMN1-1, CGMN1-2, and CGMN1-5
Lot Number:	**X-MN02037**
Starting Material:	Mn pieces
Starting Material Purity (%):	99.995300
Starting Material Lot No	21563
Matrix:	2% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/27/05
DATE EXPIRED: 2/1/06 DR
DATE OPENED: 1/28/05
INORG: 4989 PO: F55133

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1006 ± 2 µg/mL

Certified Density: 1.014 g/mL (measured at 22° C)

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

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

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

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

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

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

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

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

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

4.1 **Assay Method #1** **1006 ± 2 µg/mL**
ICP Assay NIST SRM 3132 Lot Number: 890903

Assay Method #2 **1008 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00221	M	Dy	< 0.02471	O	Li	0.00020	M	Pr	< 0.00124	M	Te	< 0.12355
M	Sb	< 0.00206	M	Er	< 0.02059	M	Lu	< 0.00165	M	Re	< 0.00412	M	Tb	< 0.00124
M	As	< 0.04118	M	Eu	< 0.01236	O	Mg	0.03350	M	Rh	< 0.00412	M	Tl	< 0.00412
M	Ba	< 0.04118	M	Gd	< 0.00412	s	Mn		M	Rb	< 0.00412	M	Th	< 0.00412
M	Be	< 0.00206	O	Ga	< 0.05000	i	Hg		M	Ru	< 0.00824	M	Tm	< 0.00165
M	Bi	< 0.00165	O	Ge	< 0.00300	M	Mo	< 0.00824	M	Sm	< 0.00412	M	Sn	< 0.02059
O	B	0.00295	M	Au	< 0.01236	M	Nd	< 0.00824	M	Sc	< 0.04118	M	Ti	< 0.20592
M	Cd	< 0.01236	M	Hf	< 0.00824	M	Ni	< 0.03295	M	Se	< 0.03295	M	W	< 0.04118
O	Ca	0.00340	M	Ho	< 0.00206	M	Nb	< 0.00206	O	Si	0.00275	M	U	< 0.00824
M	Ce	< 0.02059	M	In	< 0.04118	n	Os		M	Ag	< 0.00824	M	V	< 0.00824
M	Cs	< 0.00124	M	Ir	< 0.02059	M	Pd	< 0.02059	O	Na	0.00225	M	Yb	< 0.00412
M	Cr	< 0.02059	O	Fe	< 0.01000	i	P		M	Sr	< 0.00206	M	Y	< 0.16474
M	Co	< 0.01236	M	La	< 0.00206	M	Pt	< 0.00824	i	S		O	Zn	0.00250
M	Cu	< 0.02471	M	Pb	< 0.01236	O	K	0.00105	M	Ta	< 0.02883	M	Zr	< 0.02059

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 54.9380; +2; 6; $Mn(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3/ LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO_3/LDPE container.
Mn Containing Samples (Preparation and Solution) - Metal (Soluble in dilute acids); Oxides (Soluble in dilute acids); Ores (Dissolve with HCl. If silica is present add HF and then fume off silica by adding H_2SO_4 and heat to SO_3 fumes - dense white fumes).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES	257.610nm	0.0014 / 0.00002 µg/mL	1	ion	Ce, W, Re
ICP-OES	259.373 nm	0.0016 / 0.00002 µg/mL	1	ion	U, Ta, Mo, Fe, Nb
ICP-OES	260.569 nm	0.0021 / 0.00002 µg/mL	1	ion	Co
ICP-MS	55 amu	10 ppt	n/a	M^+	$^{40}Ar^{14}N^{1}H$, $^{39}K^{16}O$, $^{37}Cl^{18}O$, $^{40}Ar^{15}N$, $^{38}Ar^{17}O$, $^{40}Ar^{16}O^{1}H$, $^{38}Ar^{16}O^{1}H$, $^{37}Cl^{17}O^{1}H$, $^{23}Na^{32}S$

8.0 HAZARDOUS INFORMATION

- Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

010316

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: April 13, 2004

Expiration Date: EXPIRES 1/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

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010317

inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Vanadium in 1.4% (abs) HNO_3**

Catalog Number:	CGV1-1, CGV1-2, and CGV1-5
Lot Number:	**X-QV01102**
Starting Material:	V2O5
Starting Material Purity (%):	99.986532
Starting Material Lot No	Stractor 46
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 12/9/2004
DATE EXPIRED: 01/01/2006
DATE OPENED: 12/9/04 KS
INORG: 4916 PO: F55102 VOS 12/1 SK

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 999 ± 3 µg/mL

Certified Density: 1.014 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

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

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

4.1 **Assay Method #1** **999 ± 3 µg/mL**
ICP Assay NIST SRM 3165 Lot Number: 992706

Assay Method #2 **1007 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00600	M	Dy	< 0.00597	O	Li	< 0.00002	M	Pr	< 0.00030	M	Te	< 0.02984
M	Sb	0.04543	M	Er	< 0.00497	M	Lu	< 0.00040	M	Re	< 0.00100	M	Tb	< 0.00030
M	As	< 0.00995	M	Eu	< 0.00298	O	Mg	< 0.10000	M	Rh	< 0.00100	M	Tl	< 0.00100
M	Ba	< 0.00995	M	Gd	< 0.00100	M	Mn	0.00069	M	Rb	< 0.00100	M	Th	< 0.00100
M	Be	< 0.00050	M	Ga	< 0.00100	O	Hg	< 0.01200	M	Ru	< 0.00199	M	Tm	< 0.00040
M	Bi	< 0.00040	M	Ge	< 0.00597	M	Mo	0.01481	M	Sm	< 0.00100	M	Sn	< 0.00497
O	B	< 0.04000	M	Au	< 0.00298	M	Nd	< 0.00199	M	Sc	< 0.00995	M	Ti	< 0.04973
M	Cd	< 0.00298	M	Hf	< 0.00199	M	Ni	< 0.07957	M	Se	< 0.00796	M	W	< 0.00995
O	Ca	0.00596	M	Ho	< 0.00050	M	Nb	< 0.00050	O	Si	0.04964	M	U	< 0.00199
M	Ce	< 0.00497	M	In	< 0.00995	n	Os		M	Ag	< 0.00199	s	V	
M	Cs	< 0.00030	M	Ir	< 0.00497	M	Pd	< 0.00497	O	Na	< 0.01000	M	Yb	< 0.00100
O	Cr	< 0.10000	O	Fe	0.08936	O	P	< 0.10000	M	Sr	< 0.00050	M	Y	< 0.03979
O	Co	< 0.00200	M	La	< 0.00050	M	Pt	< 0.00199	n	S		M	Zn	< 0.01989
M	Cu	< 0.00597	M	Pb	< 0.00298	O	K	0.03276	M	Ta	< 0.00696	M	Zr	< 0.00497

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 50.9415; +5; 6; $H_3V_{10}O_{28}^{3-}$

Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4, HF, H_3PO_4 and strong 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.

V Containing Samples (Preparation and Solution) - Metal (Fusion with NaOH or KOH in Ni* or Na_2CO_3 / KNO_3); Oxides (V_2O_3 - use HCl, V_2O_5 - use HCl or HNO_3, V_2O_5 - use concentrated acids); Ores (Na_2CO_3 / KNO_3 in Pt* ***caution - nitrates attack Pt*** followed by water extraction of fuseate); Organic Matrices (Ash at 450 °C followed by dissolving according to V_2O_5 above).

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES 309.311 nm	0.005 / 0.001 µg/mL	1	ion	Mg, U, Th
ICP-OES 292.402 nm	0.006 / 0.001 µg/mL	1	ion	Th
ICP-OES 290.882 nm	0.008 / 0.0008 µg/mL	1	atom	Hf, Nb
ICP-MS 51 amu	4 ppt	n/a	M⁺	$^{34}S^{16}O^{1}H$, $^{35}Cl^{16}O$, $^{40}Ar^{11}C$, $^{40}Ar^{14}N$, $^{36}Ar^{14}N^{1}H$, $^{37}Cl^{14}N$, $^{35}S^{16}N$, $^{34}S^{16}O$, $^{35}S^{16}O$, $^{96}Ru^{+2}$, $^{96}Pd^{+2}$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

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

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

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

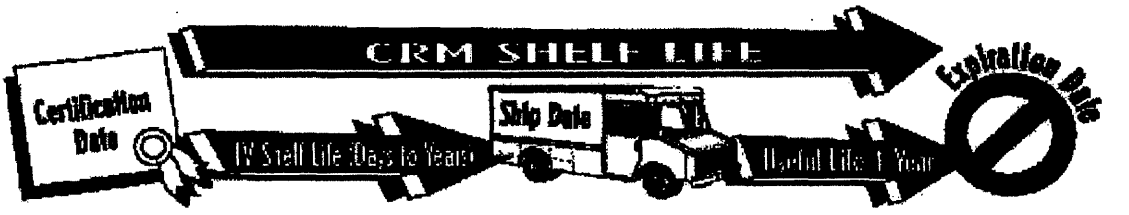
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

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

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 12/9/2004
DATE EXPIRED: 01/01/2006 was for KE
DATE OPENED: 12/9/04
INORG: 4916 PO: F55102

010320

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



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

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

Certification Date: July 26, 2004

Expiration Date: EXPIRES 01 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas Maida
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Zinc in 1.4% (abs) HNO_3**

Catalog Number:	CGZN1-1, CGZN1-2, and CGZN1-5
Lot Number:	**X-ZN02020**
Starting Material:	Zn shot
Starting Material Purity (%):	99.999889
Starting Material Lot No	J17L26
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 12/03/04
DATE EXPIRED: 01/01/2006 WDS
DATE OPENED: 12/07/04
INORG: 4915 PO: F55106

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 2 µg/mL

Certified Density: 1.010 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

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

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

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

4.1 **Assay Method #1** **1005 ± 4 µg/mL**
ICP Assay NIST SRM 3168a Lot Number: 001402

Assay Method #2 **1002 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00200	M	Dy	< 0.02440	O	Li	0.00001	M	Pr	< 0.00122	M	Te	< 0.12198
M	Sb	< 0.00203	M	Er	< 0.02033	M	Lu	< 0.00163	M	Re	< 0.00407	M	Tb	< 0.00122
M	As	< 0.04066	M	Eu	< 0.01220	O	Mg	0.00011	M	Rh	< 0.00407	M	Tl	< 0.00407
M	Ba	< 0.04066	M	Gd	< 0.00407	M	Mn	< 0.01626	M	Rb	< 0.00407	M	Th	< 0.00407
M	Be	< 0.00203	M	Ga	< 0.00407	O	Hg	< 0.01000	M	Ru	< 0.00813	M	Tm	< 0.00163
M	Bi	< 0.00163	M	Ge	< 0.02440	M	Mo	< 0.00813	M	Sm	< 0.00407	M	Sn	< 0.02033
O	B	0.00015	M	Au	< 0.01220	M	Nd	< 0.00813	M	Sc	< 0.04066	M	Ti	< 0.20331
M	Cd	< 0.01220	M	Hf	< 0.00813	O	Ni	0.00009	M	Se	< 0.03253	M	W	< 0.04066
O	Ca	0.00022	M	Ho	< 0.00203	M	Nb	< 0.00203	O	Si	< 0.00400	M	U	< 0.00813
M	Ce	< 0.02033	M	In	< 0.04066	n	Os		M	Ag	< 0.00813	M	V	< 0.00813
M	Cs	< 0.00122	M	Ir	< 0.02033	M	Pd	< 0.02033	O	Na	0.00055	M	Yb	< 0.00407
O	Cr	< 0.00100	O	Fe	0.00005	O	P	< 0.00300	M	Sr	< 0.00203	M	Y	< 0.16264
M	Co	< 0.01220	M	La	< 0.00203	M	Pt	< 0.00813	O	S	< 0.02000	s	Zn	
O	Cu	< 0.00050	M	Pb	< 0.01220	O	K	0.00018	M	Ta	< 0.02846	M	Zr	< 0.02033

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 65.39; +2; 4; $Zn(OH)_4^{2-}$

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media that promotes the formation of insoluble carbonate and hydroxide. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Zn Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Soluble in HCl); Ores (Dissolve in HCl /HNO_3); Organic based (Dry ash at 450°C and dissolve ash in HCl) (Sulfuric/peroxide acid digestion)

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

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ 5 ppm conc.)
ICP-OES	213.856 nm	0.002 / 0.0004 µg/mL	1	atom	Ni, Cu, V
ICP-OES	202.548 nm	0.004 / 0.0002 µg/mL	1	ion	Nb, Cu, Co, Hf
ICP-OES	206.200 nm	0.006 / 0.0006 µg/mL	1	ion	Sb, Ta, Bi, Os
ICP-MS	66 amu	7 ppt	n/a	M+	$^{48}Ti^{16}O$, $^{50}Cr^{16}O$, $^{50}V^{16}O$, $^{34}S^{16}O_2$, $^{32}S^{16}O^{18}O$, $^{32}S^{17}O_2$, $^{33}S^{16}O^{17}O$, $^{32}S^{34}S$, $^{34}S_2$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

INORGANIC LABS/RADCHEM LABS Page 2 of 2
DATE RECEIVED: 12/03/04
DATE EXPIRED: 01/01/2006 NPS
DATE OPENED: 12/07/04
INORG: 4915 PO: F55106

010324

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: February 19, 2004

Expiration Date:

EXPIRES
1 JAN 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

010325

inorganic ventures / iv labs

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

certificate of analysis

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

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

Lot Number: **W-AG02018**

Starting Material:	Silver Metal
Starting Material Purity:	99.999%
Starting Material Lot No:	G14K25

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/01/04
DATE EXPIRED: 10/01/2005 v03
DATE OPENED: 09/01/04
INORG: 4764 PO: F53434

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: 999 ± 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.

O	Al	<0.00010	M	Dy	<0.00060	O	Li	<0.000030	M	Pr	<0.000030	O	Te	<0.030			
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030			
O	As	<0.0050	M	Eu	<0.00030	O	Mg	<0.000040	M	Rh	<0.00010	M	Tl	<0.00010			
M	Ba	<0.0010	M	Gd	<0.00010	O	Mn	<0.00030	M	Rb	<0.00010	M	Th	<0.00010			
O	Be	<0.00050	M	Ga	<0.00010	O	Hg	0.00090	M	Ru	<0.00020	M	Tm	<0.000040			
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050			
O	B	<0.0020	O	Au	<0.012	M	Nd	<0.00020	M	Sc	<0.0010	O	Ti	<0.00070			
O	Cd	<0.0020	M	Hf	<0.00020	O	Ni	<0.0070	O	Se	<0.036	M	W	<0.0010			
O	Ca	<0.000050	M	Ho	<0.000050	M	Nb	<0.000050	O	Si	<0.0030	M	U	<0.00020			
M	Ce	<0.00050	O	In	<0.020	n	Os		s	Ag		M	V	<0.00020			
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	O	Na	<0.090	M	Yb	<0.00010			
O	Cr	<0.0020	O	Fe	<0.00070	O	P	<0.030	M	Sr	<0.000050	M	Y	<0.0040			
M	Co	<0.00030	M	La	<0.000050	M	Pt	<0.00020	O	S	<0.020	O	Zn	<0.0010			
M	Cu	<0.00060	M	Pb	<0.00030	O	K	<0.0060	M	Ta	<0.00070	M	Zr	<0.00050			

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

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.024 g/mL

QA:KL Rev.072103/T5

Paul R. Gaines

Quality Assurance Manager

Expires: EXPIRES 1?2005

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

   Members of IQ Net : 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)**

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

   Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of the standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

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.

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 428359B and 454678. 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 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

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.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

010327

inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Arsenic in 1.4% (abs) HNO_3**

Catalog Number:	CGAS1-1, CGAS1-2, and CGAS1-5
Lot Number:	**X-AS02026**
Starting Material:	As Polycrystaline lump
Starting Material Purity (%):	99.998994
Starting Material Lot No	23115
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/27/05
DATE EXPIRED: 3/11/06 DR
DATE OPENED: 1/28/05
INORG: 4987 PO: E55132

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 997 ± 3 µg/mL

Certified Density: 1.010 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

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

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

4.1 **Assay Method #1** **997 ± 3 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3103a Lot Number: 010713

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

1 of 4
4987

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	0.00038	M	Dy	< 0.01596	O	Li	0.00009	M	Pr	< 0.00080	M	Te	< 0.07978
O	Sb	< 0.01000	M	Er	< 0.01330	M	Lu	< 0.00106	O	Re	< 0.01000	M	Tb	< 0.00080
s	As		M	Eu	< 0.00798	O	Mg	0.00009	M	Rh	< 0.00266	M	Tl	< 0.00266
M	Ba	< 0.02660	M	Gd	< 0.00266	O	Mn	< 0.00003	M	Rb	< 0.00266	M	Th	< 0.00266
M	Be	< 0.00133	M	Ga	< 0.00266	O	Hg	< 0.01200	M	Ru	< 0.00532	M	Tm	< 0.00106
M	Bi	< 0.00106	M	Ge	< 0.01596	M	Mo	< 0.00532	M	Sm	< 0.00266	O	Sn	0.00049
O	B	< 0.01200	M	Au	< 0.00798	M	Nd	< 0.00532	M	Sc	< 0.02660	M	Ti	< 0.13297
M	Cd	< 0.00798	M	Hf	< 0.00532	M	Ni	< 0.02128	M	Se	< 0.02128	M	W	< 0.02660
O	Ca	0.00189	M	Ho	< 0.00133	O	Nb	< 0.00200	O	Si	0.00415	M	U	< 0.00532
M	Ce	< 0.01330	M	In	< 0.02660	n	Os		M	Ag	< 0.00532	M	V	< 0.00532
M	Cs	< 0.00080	M	Ir	< 0.01330	M	Pd	< 0.01330	O	Na	0.00159	M	Yb	< 0.00266
M	Cr	< 0.01330	O	Fe	< 0.00110	O	P	< 0.00260	M	Sr	< 0.00133	M	Y	< 0.10638
M	Co	< 0.00798	M	La	< 0.00133	M	Pt	< 0.00532	O	S	< 0.02500	O	Zn	0.00057
M	Cu	< 0.01596	M	Pb	< 0.00798	O	K	0.00132	M	Ta	< 0.01862	M	Zr	< 0.01330

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

2 of 4
4987

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 74.9216; mix of +3 and +5; 6; H_3AsO_4 and $HAsO_2$

Chemical Compatibility -Arsenic has no cationic chemistry. It is soluble in HCl, HNO_3, H_3PO_4, H_2SO_4 and HF aqueous matrices water and NH_4OH . It is stable with most inorganic anions (forms arsenate when boiled with chromate) but many cationic metals form the insoluble arsenates under pH neutral conditions. When fluorinated and / or under acidic conditions arsenate formation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

As Containing Samples (Preparation and Solution) - As^3 (soluble in 1:1 H_2O / HNO_3); Oxides (the oxide exists in crystalline and amorphous forms where the amorphoric form is more water soluble. The oxides typically dissolve in dilute acidic solutions when boiled); Minerals (One gram of powered sample is fused in a Ni^0 crucible with 10 grams of a 1:1 mix of K_2CO_3 and KNO_3 and the melt extracted with hot water); Organic Matrices (0.2 to 0.5 grams of the sample are fused with 15 grams of a 1:1 Na_2CO_3 / Na_2O_2 mix in a Ni^0 crucible. The fuseate is extracted with water and acidified with HNO_3)

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at = concs.)
ICP-OES 189.042 nm	0.05 / 0.005 µg/mL	1	atom	Cr
ICP-OES 193.696 nm	0.1 / 0.01 µg/mL	1	atom	V, Ge
ICP-OES 228.812 nm	0.1 / 0.01 µg/mL	1	atom	Cd, Pt, Ir, Co
ICP-MS 75 amu	20 ppt	n/a	M'	$^{40}Ar^{35}Cl$, $^{59}Co^{16}O$, $^{40}Ar^{36}Ar^{1}H$, $^{40}Ar^{35}Cl$, $^{40}Ar^{35}K$, $^{150}Nd^{2+}$, $^{150}Sm^{2+}$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

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

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

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

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

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

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010330

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 17, 2004

Expiration Date: EXPIRES 1 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas Maida
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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4987

010331

inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Lead in 0.35% (abs) HNO_3**

Catalog Number:	CGPB1-1, CGPB1-2, and CGPB1-5
Lot Number:	**W-PB02115**
Starting Material:	Pb(NO3)2
Starting Material Purity (%):	99.999974
Starting Material Lot No	22150
Matrix:	0.35% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 09/17/04
DATE EXPIRED: 10/01/2005 NOS
DATE OPENED: 09/17/04
INORG: 4774 PO: F54731

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 3 µg/mL

Certified Density: 1.002 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

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

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

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

4.1 **Assay Method #1** **1002 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **998 ± 3 µg/mL**
ICP Assay NIST SRM 3128 Lot Number: 991504

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	<	0.01193	O	Li	<	0.00002	M	Pr	<	0.00060	M	Te	<	0.05965
M	Sb	<	0.00099	M	Er	<	0.00994	M	Lu	<	0.00080	M	Re	<	0.00199	M	Tb	<	0.00060
M	As	<	0.01989	M	Eu	<	0.00597	O	Mg		0.00008	O	Rh	<	0.00900	O	Tl		0.00130
M	Ba	<	0.01989	M	Gd	<	0.00199	M	Mn	<	0.00795	M	Rb	<	0.00199	M	Th	<	0.00199
M	Be	<	0.00099	M	Ga	<	0.00199	O	Hg	<	0.01500	M	Ru	<	0.00398	M	Tm	<	0.00080
O	Bi	<	0.02000	M	Ge	<	0.01193	M	Mo	<	0.00398	M	Sm	<	0.00199	M	Sn	<	0.00994
O	B	<	0.04000	M	Au	<	0.00597	M	Nd	<	0.00398	M	Sc	<	0.01989	M	Ti	<	0.09942
M	Cd	<	0.00597	M	Hf	<	0.00398	M	Ni	<	0.01591	M	Se	<	0.01591	M	W	<	0.01989
O	Ca		0.00009	M	Ho	<	0.00099	M	Nb	<	0.00099	O	Si	<	0.00340	M	U	<	0.00398
M	Ce	<	0.00994	M	In	<	0.01989	n	Os			M	Ag	<	0.00398	M	V	<	0.00398
M	Cs	<	0.00060	M	Ir	<	0.00994	M	Pd	<	0.00994	O	Na	<	0.00600	M	Yb	<	0.00199
M	Cr	<	0.00994	O	Fe		0.00011	O	P	<	0.00500	M	Sr	<	0.00099	M	Y	<	0.07954
M	Co	<	0.00597	M	La	<	0.00099	M	Pt	<	0.00398	O	S	<	0.10000	M	Zn	<	0.03977
M	Cu	<	0.01193	s	Pb			O	K	<	0.00180	M	Ta	<	0.01392	M	Zr	<	0.00994

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 207.2; +2; 6; $Pb(H_2O)_6^{+2}$

Chemical Compatibility - Soluble in HCl, HF and HNO_3. Avoid H_2SO_4. Stable with most metals and inorganic anions forming insoluble carbonate, borate, sulfate, sulfite, sulfide, phosphate, oxalate, chromate, tannate, iodate, and cyanide in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

Pb Containing Samples (Preparation and Solution) - Metal (Best dissolved in 1:1 H_2O / HNO_3.) Oxides (The many different Pb oxides are soluble in HNO_3 with the exception of PbO_2 which is soluble in HCl or HF). Ores and Alloys (Best attacked using 1:1 H_2O / HNO_3.) Organic Matrices (Dry ash and dissolve in dilute HCl.).

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤10ppm.)
ICP-OES 168.215 nm	0.03 / 0.003 µg/mL	1	ion	Co
ICP-OES 220.353 nm	0.04 / 0.006 µg/mL	1	ion	Bi, Nb
ICP-OES 217.000 nm	0.09 / 0.03 µg/mL	1	atom	W, Ir, Hf, Sb, Th
ICP-MS 208 amu	5 ppt	n/a	M⁺	$^{192}Pt^{16}O$, $^{192}Os^{16}O$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

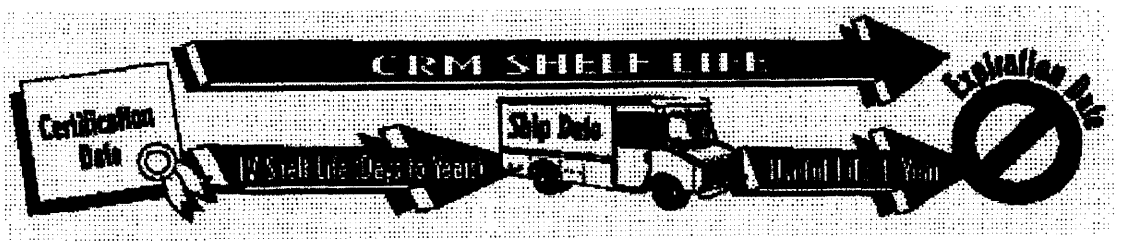
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

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

INORGANIC LABS/RADCHEM LABS P.2of2
DATE RECEIVED: 09/17/04
DATE EXPIRED: 10/01/2005 v03
DATE OPENED: 09/17/04
INORG: 4774 PO: F54731

010334

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



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

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

Certification Date: September 17, 2003

Expiration Date:

EXPIRES
01/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

010335

inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Antimony in 0.7% (abs) HNO_3 / 3% Tartaric Acid**

Catalog Number:	CGSB1-1, CGSB1-2 and CGSB1-5
Lot Number:	**X-SB02083**
Starting Material:	Sb shot
Starting Material Purity (%):	99.993665
Starting Material Lot No	D29N32
Matrix:	0.7% (abs) HNO_3 / 3% Tartaric Acid

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 3/1/2006
DATE OPENED: 2/28/05
INORG: 5042 PO: F55147

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 999 ± 3 µg/mL

Certified Density: 1.020 g/mL (measured at 22° C)

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

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

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

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

4.1 **Assay Method #1** **999 ± 3 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3102a Lot Number: 990707

Assay Method #2 **1001 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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1 of 4

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		0.02186	M	Dy	<	0.00598	O	Li	<	0.00002	M	Pr	<	0.00030	M	Te	<	0.02988
s	Sb			M	Er	<	0.00498	M	Lu	<	0.00040	M	Re	<	0.00100	M	Tb	<	0.00030
M	As	<	0.00996	M	Eu	<	0.00299	O	Mg		0.00074	M	Rh	<	0.00100	M	Tl		0.00015
O	Ba		0.00011	M	Gd	<	0.00100	O	Mn		0.00139	M	Rb	<	0.00100	M	Th	<	0.00100
O	Be	<	0.00001	M	Ga	<	0.00100	O	Hg	<	0.01500	M	Ru	<	0.00199	M	Tm	<	0.00040
M	Bi		0.00386	M	Ge	<	0.00598	M	Mo	<	0.00199	M	Sm	<	0.00100	M	Sn	<	0.00498
O	B		0.00045	M	Au	<	0.00299	M	Nd	<	0.00199	O	Sc	<	0.00016	O	Ti		0.00056
M	Cd	<	0.00299	M	Hf	<	0.00199	O	Ni		0.00219	M	Se	<	0.00797	M	W	<	0.00996
O	Ca		0.00521	M	Ho	<	0.00050	M	Nb	<	0.00050	O	Si		0.00388	M	U	<	0.00199
O	Ce	<	0.00300	M	In	<	0.00996	n	Os			M	Ag	<	0.00199	M	V	<	0.00199
M	Cs	<	0.00030	M	Ir	<	0.00498	M	Pd	<	0.00498	O	Na		0.00298	M	Yb	<	0.00100
O	Cr		0.00696	O	Fe		0.00715	O	P	<	0.04000	M	Sr	<	0.00050	M	Y	<	0.03984
M	Co		0.00052	O	La	<	0.00120	M	Pt	<	0.00199	n	S			M	Zn	<	0.01992
O	Cu		0.00239	M	Pb		0.00040	O	K		0.00497	M	Ta	<	0.00697	M	Zr	<	0.00498

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 121.75; +3 ; 6; $Sb(OH)C_4H_4O_6^{-1}$
Chemical Compatibility - Stable in concentrated HCl, dilute or concentrated HF. Stable in dilute HNO_3 as the fluoride or tartrate complex. Avoid basic media. Stable with most metals and inorganic anions in acidic media as the tartrate provided the acidity is not too high or the acid is oxidizing causing loss of the stabilizing tartrate ion. The fluoride complex of antimony is stable in strong acid but you should only mix with other metals that are fluorinated.
Stability - 2-100 ppb levels stable for months in 1% HNO_3/ LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-2% HNO_3/ LDPE container.
Sb Containing Samples (Preparation and Solution) - Metal and alloys (Soluble in H_2O / HF / HNO_3 mixture); Oxides (Soluble in HCl and tartaric acid or H_2O / HF / HNO_3 mixtures); Ores (Fusion with Na_2CO_3 in Pt followed by dissolving the fuseate in a H_2O / HF / HNO_3 mixture); Organic based (Sulfuric acid / hydrogen peroxide digestion)
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES 206.833 nm	0.03 / 0.003 µg/mL	1	atom	Ta, Cr, Ge, Hf
ICP-OES 217.581 nm	0.05 / 0.005 µg/mL	1	atom	Nb, W, Re, Fe,
ICP-OES 231.147 nm	0.06 / 0.006 µg/mL	1	atom	Ni, Co, Pt
ICP-MS 121 amu	5 ppt	n/a	M^+	$^{105}Pd^{16}O$, $^{89}Y^{16}O_2$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

5042
3084

010338

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: April 22, 2004

Expiration Date:

EXPIRES
1 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

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inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Selenium in 1.4% (abs) HNO_3**

Catalog Number:	CGSE1-1, CGSE1-2, and CGSE1-5
Lot Number:	**X-QSE01091**
Starting Material:	Se shot
Starting Material Purity (%):	99.997834
Starting Material Lot No	I20L45
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS 83-1 of 2
DATE RECEIVED: 07/01/04
DATE EXPIRED: 08/01/2005 1005
DATE OPENED: 07/01/04
INORG: 4630 PO: F53406

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1005 ± 2 µg/mL

Certified Density: 1.009 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

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

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

4.1 **Assay Method #1** **1005 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3149 Lot Number: 992106

Assay Method #2 **1004 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00030	M	Dy	< 0.01196	O	Li	< 0.00003	M	Pr	< 0.00060	M	Te	< 0.05982
M	Sb	< 0.00100	M	Er	< 0.00997	M	Lu	< 0.00080	O	Re	< 0.00900	M	Tb	< 0.00060
O	As	< 0.00500	M	Eu	< 0.00598	O	Mg	0.00021	M	Rh	< 0.00199	M	Tl	< 0.00199
M	Ba	< 0.01994	M	Gd	< 0.00199	M	Mn	< 0.00798	M	Rb	< 0.00199	M	Th	< 0.00199
O	Be	< 0.00009	M	Ga	< 0.00199	O	Hg	0.01054	O	Ru	< 0.00700	M	Tm	< 0.00080
M	Bi	< 0.00080	M	Ge	< 0.01196	O	Mo	< 0.00400	M	Sm	< 0.00199	M	Sn	< 0.00997
O	B	< 0.00006	M	Au	< 0.00598	M	Nd	< 0.00399	M	Sc	< 0.01994	M	Ti	< 0.09969
M	Cd	0.00060	M	Hf	< 0.00399	O	Ni	0.00028	S	Se		M	W	< 0.01994
O	Ca	0.00100	M	Ho	< 0.00100	O	Nb	< 0.00400	O	Si	< 0.00300	M	U	< 0.00399
M	Ce	< 0.00997	M	In	< 0.01994	n	Os		M	Ag	< 0.00399	M	V	< 0.00399
M	Cs	< 0.00060	M	Ir	< 0.00997	M	Pd	< 0.00997	O	Na	0.00402	M	Yb	< 0.00199
M	Cr	0.00080	O	Fe	0.00271	O	P	< 0.00300	M	Sr	< 0.00100	M	Y	< 0.07976
M	Co	< 0.00598	M	La	< 0.00100	M	Pt	< 0.00399	O	S	< 0.04000	M	Zn	0.00400
M	Cu	0.00130	M	Pb	< 0.00598	O	K	0.00060	M	Ta	< 0.01396	O	Zr	0.00005

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 78.96; +4; 6; H_2SeO_3

Chemical Compatibility - Soluble in HCl, HNO_3, H_3PO_4, H_2SO_4 and HF aqueous matrices and water. It is stable with most inorganic anions but many cationic metals form the insoluble selenites under pH neutral conditions. When fluorinated and/or under acidic conditions precipitation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels - stable for months alone or mixed with other elements at equivalent levels - in 1 % HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Se Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3); Oxides (Readily soluble in water); Minerals and alloys (Acid digestion with HNO_3 or HNO_3 / HF); Organic Matrices (Acid digestion with hot concentrated H_2SO_4 accompanied by the careful dropwise addition of H_2O_2 until clear)

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤5ppm conc.)
ICP-OES 196.026 nm	0.08 / 0.006 µg/mL	1	atom	Fe
ICP-OES 203.985 nm	0.2 / 0.05 µg/mL	1	atom	Sb, Ir, Cr, Ta
ICP-OES 206.279 nm	0.3 / 0.16 µg/mL	1	atom	Cr, Pt
ICP-MS 82 amu	200 ppt	n/a	M⁺	$^{12}C^{35}Cl_2$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 07/01/04
DATE EXPIRED: 08/01/2005 NOS
DATE OPENED: 07/01/04
INORG: 4630 PO: F53406

010342

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: February 23, 2004

Expiration Date: EXPIRES 01 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

010343

inorganic ventures / iv labs

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

certificate of analysis

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

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Thallium in 0.5% (abs) HNO_3**

Catalog Number:	CGTL1-1, CGTL1-2, and CGTL1-5
Lot Number:	**X-TL01091**
Starting Material:	TINO3
Starting Material Purity (%):	99.999824
Starting Material Lot No	G09P28
Matrix:	0.5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/27/05
DATE EXPIRED: 2/1/06
DATE OPENED: 1/28/05 DR
INORG: 4990 PO: F55133

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 999 ± 3 µg/mL

Certified Density: 1.001 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.)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

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

4.1 **Assay Method #1** **999 ± 3 µg/mL (Avg of 2 runs)**
ICP Assay NIST SRM 3158 Lot Number: 993012

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Al	< 0.02018	M	Dy	< 0.01211	O	Li	< 0.00002	M	Pr	< 0.00061	M	Te	< 0.06055
M	Sb	< 0.00101	M	Er	< 0.01009	M	Lu	< 0.00081	M	Re	< 0.00202	M	Tb	< 0.00061
M	As	< 0.02018	M	Eu	< 0.00606	O	Mg	0.00030	M	Rh	< 0.00202	s	Tl	
M	Ba	< 0.02018	M	Gd	< 0.00202	M	Mn	< 0.00807	M	Rb	< 0.00202	M	Th	< 0.00202
M	Be	< 0.00101	M	Ga	< 0.00202	O	Hg	< 0.01200	M	Ru	< 0.00404	M	Tm	< 0.00081
M	Bi	< 0.00081	M	Ge	< 0.01211	M	Mo	< 0.00404	M	Sm	< 0.00202	M	Sn	< 0.01009
O	B	< 0.00140	M	Au	< 0.00606	M	Nd	< 0.00404	M	Sc	< 0.02018	M	Ti	< 0.10091
O	Cd	< 0.00540	M	Hf	< 0.00404	O	Ni	< 0.00090	M	Se	< 0.01615	M	W	< 0.02018
O	Ca	0.00015	M	Ho	< 0.00101	M	Nb	< 0.00101	O	Si	< 0.00340	M	U	< 0.00404
M	Ce	< 0.01009	M	In	< 0.02018	n	Os		M	Ag	< 0.00404	M	V	< 0.00404
M	Cs	< 0.00061	M	Ir	< 0.01009	M	Pd	< 0.01009	O	Na	0.00124	M	Yb	< 0.00202
M	Cr	< 0.01009	O	Fe	< 0.00100	O	P	< 0.00260	M	Sr	< 0.00101	M	Y	< 0.08073
M	Co	< 0.00606	M	La	< 0.00101	M	Pt	< 0.00404	O	S	< 0.03000	O	Zn	0.00154
M	Cu	< 0.01211	M	Pb	< 0.00606	O	K	< 0.00180	M	Ta	< 0.01413	M	Zr	< 0.01009

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

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4990

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 204.383; +1; 6; $Tl(H_2O)_6^{+}$

Chemical Compatibility - Soluble in HCl, HNO_3, and H_2SO_4. Stable with most metals and inorganic anions. The sulfite, thiocyanate and oxalate are moderately soluble; the phosphate and arsenite are slightly soluble and the sulfide is insoluble.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

Tl Containing Samples (Preparation and Solution) - Metal (Best dissolved in HNO_3 which forms chiefly the Tl^{+} ion.); Oxide (The thallous oxide is readily soluble in water. The thallic oxide requires high levels of acid); Ores (Carbonate fusion in Pt^{+} followed by HCl dissolution); Organic Matrices (Sulfuric/peroxide digestion or dry ash and dissolution in HCl).

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

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at * concs.)
ICP-OES	190.864 nm	0.04 / 0.004 µg/mL	1	ion	V, Ti
ICP-OES	276.787 nm	0.1 / 0.01 µg/mL	1	atom	Ta, V, Fe, Cr
ICP-OES	351.924 nm	0.2 / 0.02 µg/mL	1	atom	Th, Ce, Zr
ICP-MS	205 amu	2 ppt	n/a	M^{+}	$^{187}Os^{16}O$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

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

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

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

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

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

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11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: August 05, 2004

Expiration Date: EXPIRES 1 FEB 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas Maida
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

4064
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010347

inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Boron in H_2O**

Catalog Number:	CGB1-1, CGB1-2, and CGB1-5
Lot Number:	**X-B02047**
Starting Material:	H_3BO_3
Starting Material Purity (%):	99.999998
Starting Material Lot No	OV0133
Matrix:	H_2O

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 3/1/2006
DATE OPENED: 2/28/05
INORG: 5047 PO: F55148

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1005 ± 2 µg/mL

Certified Density: 0.999 g/mL (measured at 22° C)

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

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

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

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

4.1 **Assay Method #1** **1005 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3107 Lot Number: 991907

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INCL

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O Al < 0.00090	M Dy < 0.00600	O Li < 0.00002	M Pr < 0.00030	M Te < 0.03000
M Sb < 0.00050	M Er < 0.00500	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
M As < 0.01000	M Eu < 0.00300	O Mg < 0.00006	M Rh < 0.00100	M Tl < 0.00100
O Ba < 0.00010	M Gd < 0.00100	O Mn < 0.00002	M Rb < 0.00100	M Th < 0.00100
O Be < 0.00017	O Ga < 0.00160	O Hg < 0.01500	M Ru < 0.00200	M Tm < 0.00040
M Bi < 0.00040	M Ge < 0.00600	M Mo < 0.00200	M Sm < 0.00100	M Sn < 0.00500
s B	M Au < 0.00300	M Nd < 0.00200	O Sc < 0.00002	M Ti < 0.05000
M Cd < 0.00300	M Hf < 0.00200	O Ni < 0.00230	O Se < 0.00620	M W < 0.01000
O Ca < 0.00007	M Ho < 0.00050	M Nb < 0.00050	O Si 0.00067	M U < 0.00200
O Ce < 0.00300	M In < 0.01000	n Os	M Ag < 0.00200	O V < 0.00083
M Cs < 0.00030	M Ir < 0.00500	M Pd < 0.00500	O Na < 0.00010	M Yb < 0.00100
M Cr < 0.00500	O Fe < 0.00110	O P < 0.00250	M Sr < 0.00050	M Y < 0.04000
O Co < 0.00110	M La < 0.00050	M Pt < 0.00200	O S < 0.10000	O Zn < 0.00019
M Cu < 0.00600	M Pb < 0.00300	O K < 0.00300	M Ta < 0.00700	M Zr < 0.00500

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 10.811; +3; 4; $B(OH)_3$ and $B(OH)_4^-$

Chemical Compatibility - Moderately soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices and very soluble in NH_4OH. Stable with all metals and inorganic anions at low to moderate ppm levels.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-1,000 ppm solutions chemically stable for years in 1% HNO_3 / LDPE container. 1000 -10,000 ppm stable for years in dilute NH_4OH / LDPE container.

B Containing Samples (Preparation and Solution) - Metal (Crystalline form is scarcely attacked by acids or alkaline solutions; amorphous form is soluble in conc. HNO_3 or H_2SO_4); $B(OH)_3$ (water soluble); Ores(avoid acid digestions and use caustic fusions in Pt^0); Organic Matrices (dry ash mixed with Na_2CO_3 in Pt^0 at 450°C then increase heat to 1000°C to fuse; or perform a Na_2O_2 fusion in a Ni^0 crucible / Parr bomb).

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

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	249.773 nm	0.003 / 0.001 µg/mL	1	atom	W, Ce, Co, Th, Ta, Mn, Mo, Fe
ICP-OES	249.678 nm	0.004 / 0.003 µg/mL	1	atom	Os, W, Co, Cr, Hf
ICP-OES	208.959 nm	0.007 / 0.0005 µg/mL	1	atom	Mo
ICP-MS	11 amu	700 ppt	n/a	M'	

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

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

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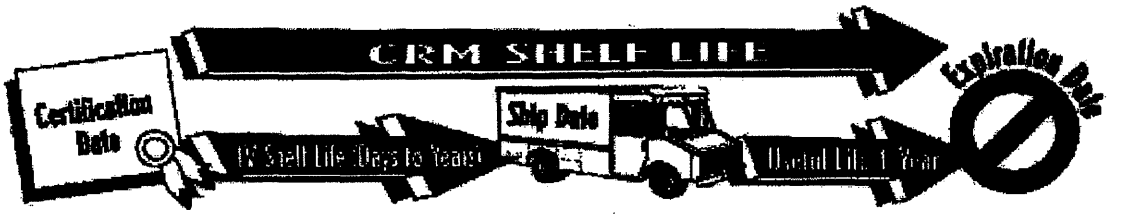
11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



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

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

Certification Date: April 13, 2004

Expiration Date: EXPIRES 1 MAR 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

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inorganic ventures / iv labs

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

certificate of analysis

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

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Molybdenum in H_2O tr. NH_4OH**

Catalog Number:	CGMO1-1, CGMO1-2, and CGMO1-5
Lot Number:	**X-MO02004**
Starting Material:	$(NH_4)_6Mo_7O_{24}xH_2O$
Starting Material Purity (%):	99.995645
Starting Material Lot No	23221
Matrix:	H_2O tr. NH_4OH

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05
DATE EXPIRED: 3/1/2006
DATE OPENED: 2/28/05 DR
INORG: 5050 PO: F55148

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1002 ± 3 µg/mL

Certified Density: 0.998 g/mL (measured at 22° C)

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

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

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

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

4.1 **Assay Method #1** **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **1002 ± 3 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3134 Lot Number: 891307

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4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	<	0.05000	M	Dy	<	0.01202	O	Li	<	0.01000	O	Pr	<	0.10000	i	Te		
M	Sb	<	0.00100	M	Er	<	0.01002	M	Lu	<	0.00080	M	Re		0.00541	M	Tb	<	0.00060
M	As		0.00801	M	Eu	<	0.00601	O	Mg	<	0.05000	M	Rh	<	0.00200	M	Tl	<	0.00200
M	Ba	<	0.02004	M	Gd	<	0.00200	M	Mn	<	0.00801	M	Rb	<	0.00200	M	Th	<	0.00200
M	Be	<	0.00100	M	Ga	<	0.00200	i	Hg			M	Ru	<	0.00401	M	Tm	<	0.00080
M	Bi	<	0.00080	M	Ge	<	0.01202	s	Mo			M	Sm	<	0.00200	M	Sn	<	0.01002
O	B	<	0.50000	M	Au	<	0.00601	O	Nd	<	0.05000	O	Sc	<	0.05000	O	Ti	<	0.00500
O	Cd	<	0.50000	M	Hf	<	0.00401	M	Ni	<	0.01603	M	Se	<	0.01603	M	W		0.03907
O	Ca		0.00150	M	Ho	<	0.00100	M	Nb	<	0.00100	O	Si	<	0.10000	M	U	<	0.00401
O	Ce	<	0.05000	M	In	<	0.02004	n	Os			M	Ag	<	0.00401	M	V	<	0.00401
M	Cs	<	0.00060	M	Ir	<	0.01002	M	Pd	<	0.01002	O	Na	<	0.10000	M	Yb	<	0.00200
M	Cr	<	0.01002	O	Fe	<	0.50000	i	P			M	Sr	<	0.00100	M	Y	<	0.08014
M	Co	<	0.00601	M	La	<	0.00100	M	Pt	<	0.00401	i	S			M	Zn	<	0.04007
M	Cu	<	0.01202	M	Pb	<	0.00601	O	K		0.03500	M	Ta	<	0.01403	M	Zr	<	0.01002

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 95.94; +6; 6,7,8,9; $[MoO_4]^{-2}$(chemical form as received)

Chemical Compatibility - Mo is received in a NH_4OH matrix giving the operator the option of using HCl or HF to stabilize acidic solutions. The $[MoO_4]^{-2}$ is soluble in concentrated HCl $[MoOCl_4]^{-2}$, dilute HF / HNO_3 $[MoOF_4]^{-2}$ and basic media $[MoO_4]^{-2}$. Stable at ppm levels with some metals provided it is fluorinated. Do not mix with Alkaline or Rare Earths when HF is present. Stable with most inorganic anions provided it is in the $[MoO_4]^{-2}$ chemical form.

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the $[MoOF_4]^{-2}$ for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $[MoO_4]^{-2}$ chemically stable for years in 1% NH_4OH in a LDPE container.

Mo Containing Samples (Preparation and Solution) - Metal (Soluble in HF / HNO_3 or hot dilute HCl); Oxide (soluble in HF or NH_4OH) ; Organic Matrices (Dry ash at 450°C in Pt^0 and dissolve oxide with HF or HCl).

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

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	202.030 nm	0.008 / 0.0002 µg/mL	1	ion	Os, Hf
ICP-OES	203.844 nm	0.012 / 0.002 µg/mL	1	ion	
ICP-OES	204.598 nm	0.012 / 0.001 µg/mL	1	ion	Ir, Ta
ICP-MS	95 amu	3 ppt	n/a	M^+	$^{40}Ar^{39}K^{16}O$, $^{79}Br^{16}O$, $^{194}Os^{2+}$, $^{194}Pt^{2+}$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

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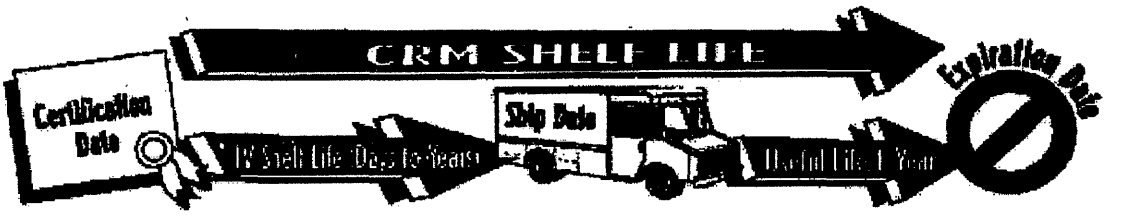
3of4

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: May 26, 2004

Expiration Date: EXPIRES 1 MAY 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

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inorganic ventures / iv labs

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

certificate of analysis

CUSTOM-GRADE SOLUTION 1000 µg/mL Phosphorus in H_2O

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

Lot Number: **W-P01123**

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

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 06/01/04
DATE EXPIRED: 06/01/2005 VOS
DATE OPENED: 06/01/04
INORG: 4593 PO: E53393

CERTIFIED CONCENTRATION: 1006 ± 4 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: 1006 ± 4 µg/mL
Method: Acidimetric Titration vs NIST SRM 84k KHP.

Instrument Analysis: 1002 ± 4 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): 1.001 g/mL **(over)**

QA:KL Rev.0108040N

Paul R. Haines
Quality Assurance Manager

Expires: EXPIRES 1 JUN 2005

QUALITY STANDARD DOCUMENTATION

1. ISO 9001:2000 QMI Registered Quality System (Certificate Number 010105)

   Members of IQ Net : 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)**

2. ISO/IEC Guide 34-2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate 883.02
3. ISO/IEC17025-1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate 883.01
4. MIL-STD-45662A
5. 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licencing of Production and Utilization Facilities
6. 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

   Please contact our Quality Assurance Department for further information and copies of documents pertaining to our Quality Standard certifications.

STABILITY/ EXPIRATION DOCUMENTATION

Shelf Life - The length of time that a properly stored and packaged standard will remain within the specified uncertainty. Shelf life is affected by chemical stability and transpiration issues. Inorganic Ventures' Standard Solutions are chemically stable indefinitely. Transpiration loss is linear with time and limits the time a standard can be used with confidence. The smaller the bottle the higher the rate of transpiration. Inorganic Ventures' studies indicate that the shelf life of our 500 mL bottle is 4 years and the shelf life of our 125 mL bottle is 21 months.

Expiration Date - The date after which a standard solution should not be used. A one year expiration date is recommended by most state and federal regulatory agencies. Transpiration issues and repeated use of solutions over a one year period may adversely affect the integrity of standard.

PACKAGING DOCUMENTATION

Purified acid, 18 megohm double deionized water that has been filtered through a 0.2 μm filter and in-house procedure IV-PACK-001 is used to clean all bottles. Contact us for technical information relating to contamination issues in packaging materials.

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.

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 428359B and 454678. 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 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-8.

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 traceabl to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

TECHNICAL SUPPORT

All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799 INT'L 1-732-901-1900 FAX 1-732-901-1903 E-MAIL IVtech@ivstandards.com

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inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Silicon in H_2O tr. HNO_3 tr. HF**

Catalog Number:	CGSI1-1, CGSI1-2, and CGSI1-5
Lot Number:	**X-SI02087**
Starting Material:	SiO_2
Starting Material Purity (%):	99.996367
Starting Material Lot No	C05310C
Matrix:	H_2O tr. HNO_3 tr. HF

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/31/05 AR
DATE EXPIRED: 3/1/2006 AR
DATE OPENED: 1/31/05
INORG: 4999 PO: E55139

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 996 ± 2 µg/mL

Certified Density: 1.002 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

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

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

4.1 **Assay Method #1** **996 ± 2 µg/mL**
ICP Assay NIST SRM 3150 Lot Number: 991108

Assay Method #2 **999 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

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4999

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.02730	M	Dy	< 0.01358	O	Li	< 0.00009	M	Pr	< 0.00068	M	Te	< 0.06791
M	Sb	< 0.00113	M	Er	< 0.01132	M	Lu	< 0.00091	M	Re	< 0.00226	M	Tb	< 0.00068
M	As	< 0.02264	M	Eu	< 0.00679	O	Mg	< 0.04991	M	Rh	< 0.00226	M	Tl	< 0.00226
M	Ba	< 0.02264	M	Gd	< 0.00226	M	Mn	< 0.00906	M	Rb	< 0.00226	M	Th	< 0.00226
O	Be	< 0.00091	M	Ga	< 0.00226	O	Hg	< 0.04991	M	Ru	< 0.00453	M	Tm	< 0.00091
M	Bi	< 0.00091	M	Ge	< 0.01358	M	Mo	< 0.00453	M	Sm	< 0.00226	M	Sn	< 0.01132
O	B	0.02409	M	Au	< 0.00679	M	Nd	< 0.00453	O	Sc	< 0.00091	O	Ti	0.01325
M	Cd	< 0.00679	M	Hf	< 0.00453	O	Ni	< 0.01044	M	Se	< 0.01811	M	W	< 0.02264
O	Ca	0.00135	M	Ho	< 0.00113	M	Nb	< 0.00113	s	Si		M	U	< 0.00453
M	Ce	< 0.01132	M	In	< 0.02264	n	Os		M	Ag	< 0.00453	O	V	< 0.00408
M	Cs	< 0.00068	M	Ir	< 0.01132	M	Pd	< 0.01132	O	Na	0.02008	M	Yb	< 0.00226
O	Cr	< 0.00681	O	Fe	< 0.00499	O	P	< 0.02269	O	Sr	< 0.00032	M	Y	< 0.09055
M	Co	< 0.00679	M	La	< 0.00113	M	Pt	< 0.00453	O	S	< 0.11342	M	Zn	< 0.04528
O	Cu	< 0.00454	M	Pb	< 0.00679	O	K	< 0.00771	M	Ta	0.00200	M	Zr	< 0.01132

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

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4999

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 28.0855; +4; 6; $Si(OH)_x(F)_y^{2-}$

Chemical Compatibility - Soluble in HCl, HF, H_3PO_4, H_2SO_4 and HNO_3 as the $Si(OH)_x(F)_y^{2-}$. Avoid neutral to basic media. Unstable at ppm levels with metals that would pull F^- away (i.e. Do not mix with Alkaline or Rare Earths, or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions with a tendency to hydrolyze forming silicic acid (silicic acid is soluble up to ~100 ppm in water) in all dilute acids except HF.

Stability - 2-100 ppb levels - stability unknown - (alone or mixed with all other metals) as the $Si(OH)_x(F)_y^{2-}$. 1-10,000 ppm single element solutions as the $Si(OH)_x(F)_y^{2-}$ chemically stable for years in 2-5 % HNO_3 / trace HF in a LDPE container.

Si Containing Samples (Preparation and Solution) - Metal (Soluble in 1:1:1 H_2O / HF / HNO_3); Oxide - SiO_2, amorphic (Dissolve by heating in 1:1:1 H_2O / HF / HNO_3); Oxide - quartz (Fuse in Pt[a] with Na_2CO_3); Geological Samples (Fuse in Pt[a] with Na_2CO_3 followed by HCl solution of the fuseate); Organic Matrices containing silicates and non volatile silicon compounds (Dry ash at 450°C in Pt[a] and dissolve by gently warming with 1:1:1 H_2O / HF / H_2SO_4 or fuse / ash with Na_2CO_3 and dissolve fuseate with HCl / H_2O); Silicone Oils - dimethyl silicones depolymerize to form volatile monomer units when heated (Measure directly in alcoholic KOH / xylene mixture where sample is treated first with the KOH at 60-100 °C to "unzip" the Si-O-Si polymeric structure or digest with concentrated H_2SO_4/H_2O_2 followed by cooling and dissolution of the dehydrated silica with HF.) Note that the direct analysis of silicone oils in an organic solvent will result in false high results due to high vapor pressure of volatile monomer units like hexamethylcyclotrisiloxane. The KOH forms the $K_2'Si(CH_3)_xO^-$ salt which is not volatile at room temperature.

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

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ 10 ppm conc.)
ICP-OES	251.611 nm	0.012 / 0.003 µg/mL	1	ion	Ta, U, Zn, Th
ICP-OES	212.412 nm	0.02 / 0.01 µg/mL	1	ion	Hf, Os, Mo, Ta
ICP-OES	288.158 nm	0.03 / 0.004 µg/mL	1	ion	Ta, Ce, Cr, Cd, Th
ICP-MS	28 amu	4000 - 8000 ppt	n/a	M'	$^{14}N_2$, $^{12}C^{16}O$

HF Note: This standard should not be prepared or stored in glass.

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

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

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

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

Certification Date: March 24, 2004

Expiration Date: EXPIRES 01 2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

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inorganic ventures / iv labs

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

certificate of analysis

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

2.0 DESCRIPTION OF CRM Custom-Grade **1000 µg/mL Titanium in 1.4% (abs) HNO_3 tr. HF**

Catalog Number:	CGTI1-1, CGTI1-2, and CGTI1-5
Lot Number:	**X-QTI01116**
Starting Material:	Ti granules
Starting Material Purity (%):	99.960814
Starting Material Lot No	K27M07
Matrix:	1.4% (abs) HNO_3 tr. HF

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 998 ± 4 µg/mL

Certified Density: 1.010 g/mL (measured at 22° C)

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

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

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

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

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

4.1 **Assay Method #1** **998 ± 4 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3162a Lot Number: 992801

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS pg. 1 of 2
DATE RECEIVED: 12/02/04
DATE EXPIRED: 12/01/2005 WOS
DATE OPENED: 12/02/04
INORG: 4908 PO: F55102

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 < 0.01201	M Dy < 0.01190	O Li < 0.00080	M Pr < 0.00060	M Te < 0.05951
M Sb < 0.00099	M Er < 0.00992	M Lu < 0.00079	M Re < 0.00198	M Tb < 0.00060
M As < 0.01984	M Eu < 0.00595	O Mg < 0.00040	M Rh < 0.00198	M Tl < 0.00198
M Ba < 0.01984	M Gd < 0.00198	O Mn 0.00161	M Rb < 0.00198	M Th < 0.00198
M Be < 0.00099	M Ga < 0.00198	O Hg < 0.06004	M Ru < 0.00397	M Tm < 0.00079
M Bi < 0.00079	M Ge < 0.01190	M Mo < 0.00397	M Sm < 0.00198	M Sn < 0.00992
O B < 0.00801	M Au < 0.00595	M Nd < 0.00397	O Sc < 0.00008	s Ti
M Cd < 0.00595	M Hf < 0.00397	M Ni < 0.01587	M Se < 0.01587	M W < 0.01984
O Ca < 0.00024	M Ho < 0.00099	M Nb < 0.00099	O Si < 0.01601	M U < 0.00397
M Ce < 0.00992	M In < 0.01984	n Os	M Ag < 0.00397	O V < 0.00801
M Cs < 0.00060	M Ir < 0.00992	M Pd < 0.00992	O Na 0.14051	M Yb < 0.00198
M Cr < 0.00992	O Fe < 0.00400	O P < 0.02001	M Sr < 0.00099	M Y < 0.07935
M Co < 0.00595	M La < 0.00099	M Pt < 0.00397	i S	O Zn < 0.00080
O Cu < 0.01201	M Pb < 0.00595	O K 0.26095	M Ta < 0.01389	M Zr < 0.00992

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 47.867; +4; 6; $Ti(F)_6^{-2}$

Chemical Compatibility - Soluble in concentrated HCl, HF, H_3PO_4, H_2SO_4 and HNO_3. Avoid neutral to basic media. Unstable at ppm levels with metals that would pull F^- away (i.e. Do not mix with Alkaline or Rare Earths or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions with a tendency to hydrolyze forming the hydrated oxide in all dilute acids except HF.

Stability - 2-100 ppb levels stable (Alone or mixed with all other metals) as the $Ti(F)_6^{-2}$ for months in 1% HNO_3 / LDPE container; 1-10,000 ppm single element solutions as the $Ti(F)_6^{-2}$ chemically stable for years in 2-5% HNO_3 / trace HF in an LDPE container.

Ti Containing Samples (Preparation and Solution) - Metal (Soluble in H_2O / HF *caution -powder reacts violently*); Oxide - low temperature history *anatase or rutile* (Dissolved by heating in 1:1:1 H_2O / HF / H_2SO_4); Oxide - high temperature history (>800°C) *brookite* (fuse in Pt^+ with $K_2S_2O_7$); Ores (fuse in Pt^+ with KF + $K_2S_2O_7$ - no KF if silica not present); Organic Matrices (Dry ash at 450°C in Pt^+ and dissolve by heating with 1:1:1 H_2O / HF / H_2SO_4 or fuse ash with pyrosulfate if oxide is as plastic pigment and likely in brookite crystalline form).

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 334.941 nm	0.0038 / 0.000028 µg/mL	1	ion	Nb, Ta, Cr, U
ICP-OES 336.121 nm	0.0053 / 0.000034 µg/mL	1	ion	W, Mo, Co
ICP-OES 323.452 nm	0.0054 / 0.00092 µg/mL	1	ion	Ce, Ar, Ni
ICP-MS 48 amu	14 ppt	n/a	M⁺	$^{32}S^{16}O$, $^{32}S^{14}N$, $^{14}N^{16}O^{16}O$, $^{14}N^{14}N$, $^{40}Ar^{12}C$, ^{48}Ca, [$^{96}X^{16}O$ (where X = Zr, Mo, Ru)]

HF Note: This standard should not be prepared or stored in glass.

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

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010106
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

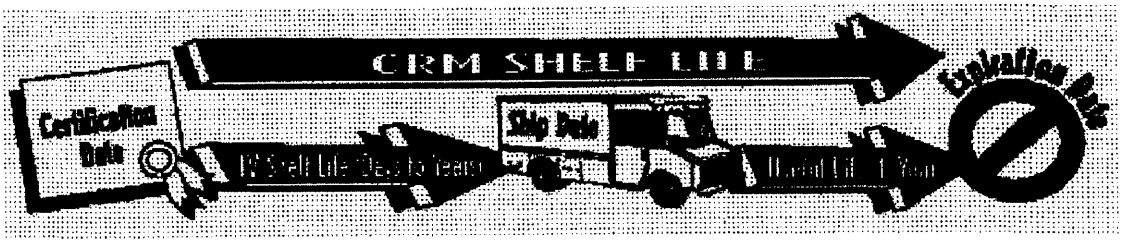
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

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

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 12/02/04
DATE EXPIRED: 12/01/2005 v03
DATE OPENED: 12/02/04
INORG: 4908 PO: F55102

010364

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



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

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

Certification Date: September 28, 2004

Expiration Date:

EXPIRES
1 2 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas T Maida
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010365

inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Strontium in 0.1% (abs) HNO_3**

Catalog Number:	CGSR1-1, CGSR1-2, and CGSR1-5
Lot Number:	**W-SR01124**
Starting Material:	$SrCO_3$
Starting Material Purity (%):	99.996751
Starting Material Lot No	22593, 22878
Matrix:	0.1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS 1 of 2
DATE RECEIVED: 7/8/04
DATE EXPIRED: 8/1/2005 DR
DATE OPENED: 7/8/04
INORG: 4635 PO: F53408

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1004 ± 2 µg/mL

Certified Density: 1.001 g/mL (measured at 22° C)

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

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

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

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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

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

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

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

4.1 **Assay Method #1** **1005 ± 2 µg/mL**
ICP Assay NIST SRM 3153a Lot Number: 990906

Assay Method #2 **1004 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00090	M	Dy	< 0.00055	O	Li	< 0.00003	M	Pr	< 0.00003	O	Te	< 0.10000
M	Sb	< 0.00005	M	Er	< 0.00046	M	Lu	< 0.00004	M	Re	< 0.00009	M	Tb	< 0.00003
O	As	< 0.00500	M	Eu	< 0.00028	O	Mg	0.00030	O	Rh	< 0.00600	M	Tl	< 0.00009
O	Ba	0.02200	M	Gd	< 0.00009	O	Mn	< 0.00003	i	Rb		M	Th	< 0.00009
O	Be	< 0.00009	M	Ga	< 0.00009	O	Hg	< 0.01500	O	Ru	< 0.00300	M	Tm	< 0.00004
M	Bi	< 0.00004	M	Ge	< 0.00055	M	Mo	< 0.00018	M	Sm	< 0.00009	M	Sn	< 0.00046
O	B	< 0.00060	M	Au	< 0.00028	M	Nd	< 0.00018	M	Sc	< 0.00092	M	Ti	< 0.00459
M	Cd	< 0.00028	M	Hf	< 0.00018	O	Ni	< 0.00300	O	Se	< 0.05000	M	W	< 0.00092
O	Ca	0.02500	M	Ho	< 0.00005	M	Nb	< 0.00005	O	Si	< 0.00340	M	U	< 0.00018
M	Ce	< 0.00046	O	In	< 0.00200	n	Os		M	Ag	< 0.00018	M	V	< 0.00018
M	Cs	< 0.00003	M	Ir	< 0.00046	O	Pd	< 0.00400	O	Na	0.00410	M	Yb	< 0.00009
O	Cr	< 0.00080	O	Fe	< 0.00110	O	P	< 0.00480	s	Sr		O	Y	< 0.00004
M	Co	< 0.00028	M	La	< 0.00005	M	Pt	< 0.00018	n	S		O	Zn	0.00720
O	Cu	< 0.00140	M	Pb	< 0.00028	O	K	< 0.00170	M	Ta	< 0.00064	M	Zr	< 0.00046

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 87.62; +2; 6; $Sr(H_2O)_6^{+2}$
Chemical Compatibility - Soluble in HCl, and HNO_3. Avoid H_2SO_4, HF and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate and tungstate in neutral aqueous media.
Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1 - 3.5% HNO_3 / LDPE container.
Sr Containing Samples (Preparation and Solution) - Metal (Best dissolved in diluted HNO_3); Ores (Carbonate fusion in Pt* followed by HCl dissolution); Organic Matrices (Dry ash and dissolution in dilute HCl).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ppbcns.)
ICP-OES	407.771 nm	0.0004 / 0.00006 µg/mL	1	ion	U, Ce
ICP-OES	421.552 nm	0.0008 / 0.00004 µg/mL	1	ion	Rb
ICP-OES	460.733 nm	0.07 / 0.003 µg/mL	1	atom	Ce
ICP-MS	88 amu	1200 ppt	n/a	M+	$^{72}Ge^{16}O$, $^{176}Yb^{+2}$, $^{175}Lu^{+2}$, $^{176}Hf^{+2}$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

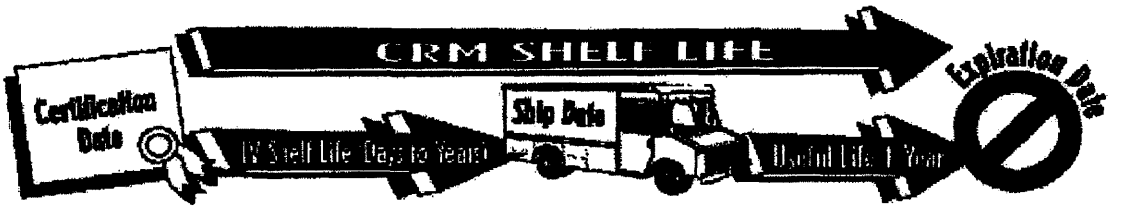
10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

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

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



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 22, 2003

Expiration Date: EXPIRES 01 2005

INORGANIC LABS/RADCHEM LABS 2 of 2
DATE RECEIVED: 7/8/04
DATE EXPIRED: 8/1/2005
DATE OPENED: 7/8/04
INORG: 4635 PO: DR/F53408

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines 010368

010369

inorganic ventures / iv labs

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

certificate of analysis

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

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Tin in H_2O tr HNO_3 tr HF**

Catalog Number:	CGSN1-1, CGSN1-2, and CGSN1-5
Lot Number:	**Y-QSN01140**
Starting Material:	Sn Shot
Starting Material Purity (%):	99.999438
Starting Material Lot No	G12M23
Matrix:	H_2O tr HNO_3 tr HF

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 994 ± 4 µg/mL

Certified Density: 0.998 g/mL (measured at 22° C)

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

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

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

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

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

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

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

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

4.1 **Assay Method #1** **994 ± 4 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3161a Lot Number: 993107

Assay Method #2 **998 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 3/31/05
DATE EXPIRED: 3/1/06
DATE OPENED: 3/31/05
INORG: 5124 PO: 521646

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	0.00050	M	Dy	< 0.01205	O	Li	< 0.00002	M	Pr	< 0.00060	M	Te	< 0.06026
O	Sb	< 0.01000	M	Er	< 0.01004	M	Lu	< 0.00080	M	Re	< 0.00201	M	Tb	< 0.00060
M	As	< 0.02009	M	Eu	< 0.00603	O	Mg	< 0.00003	M	Rh	< 0.00201	M	Tl	< 0.00201
O	Ba	< 0.00070	M	Gd	< 0.00201	M	Mn	< 0.00804	M	Rb	< 0.00201	M	Th	< 0.00201
M	Be	< 0.00100	M	Ga	< 0.00201	O	Hg	< 0.01500	M	Ru	< 0.00402	M	Tm	< 0.00080
M	Bi	< 0.00080	M	Ge	< 0.01205	M	Mo	< 0.00402	M	Sm	< 0.00201	s	Sn	
O	B	< 0.01200	M	Au	< 0.00603	M	Nd	< 0.00402	M	Sc	< 0.02009	M	Ti	< 0.10043
O	Cd	0.00009	M	Hf	< 0.00402	O	Ni	< 0.01000	M	Se	< 0.01607	M	W	[illegible]
O	Ca	< 0.00150	M	Ho	< 0.00100	M	Nb	< 0.00100	O	Si	< 0.00340	M	U	[illegible]
M	Ce	< 0.01004	M	In	< 0.02009	n	Os		M	Ag	< 0.00402	M	V	[illegible]
M	Cs	< 0.00060	M	Ir	< 0.01004	M	Pd	< 0.01004	O	Na	< 0.00010	M	Yb	[illegible]
M	Cr	< 0.01004	O	Fe	< 0.00110	O	P	< 0.00500	M	Sr	< 0.00100	M	Y	[illegible]
O	Co	< 0.00200	M	La	< 0.00100	M	Pt	< 0.00402	n	S		M	Zn	< 0.04017
M	Cu	< 0.01205	M	Pb	0.00593	O	K	< 0.00200	M	Ta	< 0.01406	M	Zr	< 0.01004

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

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

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 118.710; +4; 4,5, 6, 7,8; $Sn(OH)_xF_y^{2-}$

Chemical Compatibility - Soluble in HCl and dilute HF / HNO_3. Avoid neutral to basic media. Unstable at ppm levels with metals that would pull F^- away. (i.e. Do not mix with Alkaline or Rare Earths or high levels of transition elements unless they are fluorinated.) Stable with most inorganic anions provided it is in the chemical form shown above.

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the $Sn(OH)_xF_y^{2-}$ for 1 year in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $Sn(OH)_xF_y^{2-}$ chemically stable for years in 2-5% HNO_3 / trace HF in a LDPE container.

Sn Containing Samples (Preparation and Solution) - Metal (Soluble in HF / HNO_3 or HCl); Oxides - SnO (soluble in HCl), SnO_2 -very resistant to all acids including HF(Fusion with equal parts of Na_2CO_3 and S. It is then soluble in water or dilute acids as the thiostannate.); Alloys (Treat first 0.1 g with 10 mL conc. H_2SO_4 to boiling until the alloy disintegrates and nearly all of the sulfuric acid is expelled. Then add 100 mL O_2 free water and 50 mL of conc HCl or transfer to a plastic container and add 1 mL HF in either case warming gently to bring about solution.); Organic Matrices (Volatility and precipitation of the insoluble stannic oxide are problems. Consultation of the literature should be made for individual matrices / Sn compounds.)

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

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES	189.989 nm	0.03 / 0.003 µg/mL	1	ion	
ICP-OES	242.949 nm	0.1 / 0.01 µg/mL	1	atom	W, Mo, Rh, Ta, Co
ICP-MS	120 amu	5 ppt	n/a	M^+	^{120}Te, $^{104}Ru^{16}O$, $^{104}Pd^{16}O$

HF Note: This standard should not be prepared or stored in glass.

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

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

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

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

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

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 01, 2005

Expiration Date: EXPIRES 01/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas Maida
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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010373

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Bismuth in 3.5% (abs) HNO_3**

Catalog Number:	CGBI1-1, CGBI1-2, and CGBI1-5
Lot Number:	**X-BI01091**
Starting Material:	Bi needles
Starting Material Purity (%):	99.999090
Starting Material Lot No	G25L16
Matrix:	3.5% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 V03
DATE OPENED: 07/29/04
INORG: 4658 PO: E53417

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 999 ± 2 µg/mL

Certified Density: 1.026 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **999 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3106 Lot Number: 991212

Assay Method #2 **1003 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00012	M	Dy	< 0.01202	O	Li	< 0.00002	M	Pr	< 0.00060	M	Te	< 0.06008
M	Sb	< 0.00100	M	Er	< 0.01001	M	Lu	< 0.00080	M	Re	< 0.00200	M	Tb	< 0.00060
M	As	< 0.02003	M	Eu	< 0.00601	O	Mg	0.00070	M	Rh	< 0.00200	M	Tl	< 0.00200
M	Ba	< 0.02003	M	Gd	< 0.00200	O	Mn	< 0.00020	M	Rb	< 0.00200	M	Th	< 0.00200
M	Be	< 0.00100	M	Ga	< 0.00200	O	Hg	< 0.01500	M	Ru	< 0.00401	M	Tm	< 0.00080
s	Bi		M	Ge	< 0.01202	M	Mo	< 0.00401	M	Sm	< 0.00200	M	Sn	< 0.01001
M	B	< 0.14018	M	Au	< 0.00601	M	Nd	< 0.00401	M	Sc	< 0.02003	M	Ti	< 0.10013
O	Cd	0.00017	M	Hf	< 0.00401	M	Ni	< 0.01602	M	Se	< 0.01602	M	W	< 0.02003
O	Ca	0.00245	M	Ho	< 0.00100	M	Nb	< 0.00100	O	Si	0.00105	M	U	< 0.00401
M	Ce	< 0.01001	O	In	0.00105	n	Os		M	Ag	< 0.00401	M	V	< 0.00401
M	Cs	< 0.00060	M	Ir	< 0.01001	O	Pd	< 0.00400	O	Na	0.00240	M	Yb	< 0.00200
O	Cr	0.00020	O	Fe	0.00014	O	P	< 0.01000	M	Sr	< 0.00100	M	Y	< 0.08011
M	Co	< 0.00601	M	La	< 0.00100	M	Pt	< 0.00401	O	S	< 0.03000	O	Zn	0.00008
O	Cu	0.00014	O	Pb	0.00135	O	K	0.00039	M	Ta	< 0.01402	M	Zr	< 0.01001

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do nd return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 208.9804; +3; 6 ;$Bi(O)(H_2O)_6^{3+}$

Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4 and HF. **Avoid** basic media forming insoluble hydroxide. Stable with most metals and inorganic anions in acidic media. Many salts that are insoluble in water are soluble in HCl, HNO_3 and HF. The major problem with Bi^{3+} is its tendency to hydrolyze at higher concentrations or in dilute acid. Nitric acid solutions should be 5% to hold the Bi in solution in the 100 to 10000 µg/mL concentration range

Stability - 2-100 ppb levels stable for months in 1 % HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 5 - 7% HNO_3 / LDPE container.

Bi Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HNO_3); Alloys (Dissolve in conc. 4:1 HCl /HNO_3. Heating may be required.); Organic based (dry ash at 450°C and dissolve ash in HNO_3 or acid digestion with conc. hot sulfuric acid adding hydrogen peroxide dropwise and carefully until clear.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤ 5 ppm conc.)
ICP-OES	223.061 nm	0.04 / 0.005 µg/mL	1	atom	Th, Ir, Tl Cu
ICP-OES	306.772 nm	0.08 / 0.01 µg/mL	1	atom	Th, U, Zr, Hf, Fe
ICP-OES	222.825 nm	0.1 / 0.02 µg/mL	1	atom	Cr, Hf, Ce, Os
ICP-MS	209 amu	2 ppt	n/a	M^+	$^{193}Ir^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO-ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

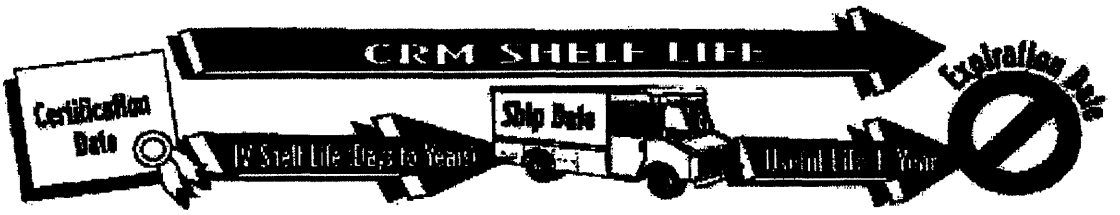
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 v03
DATE OPENED: 07/29/04
INORG: 4658 PO: F53417

010376

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 **IV Shelf Life** - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 **Expiration Date** - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 19, 2004

Expiration Date: EXPIRES 1 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010377

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Lanthanum in 1.4% (abs) HNO_3**

Catalog Number:	CGLA1-1 and CGLA1-5
Lot Number:	**W-LA01094**
Starting Material:	La2O3
Starting Material Purity (%):	99.991832
Starting Material Lot No	RP-LA-0-5-017
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS 1 of 2
DATE RECEIVED: 09/01/04
DATE EXPIRED: 10/01/2005 VPJ
DATE OPENED: 09/01/04
INORG: 4763 PO: F53434

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1003 ± 3 µg/mL

Certified Density: 1.010 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

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** **1003 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 **1003 ± 4 µg/mL**
ICP Assay NIST SRM 3127a Lot Number: 890402

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.

M	Al	< 0.00992	M	Dy	< 0.00595	O	Li	< 0.00002	M	Pr	< 0.00030	M	Te	< 0.02975
M	Sb	< 0.00050	M	Er	< 0.00496	M	Lu	< 0.00040	M	Re	< 0.00099	M	Tb	< 0.00030
M	As	< 0.00992	M	Eu	< 0.00298	O	Mg	0.00281	M	Rh	< 0.00099	M	Tl	< 0.00099
M	Ba	< 0.00992	O	Gd	< 0.00080	O	Mn	< 0.00002	M	Rb	< 0.00099	M	Th	< 0.00099
M	Be	< 0.00050	M	Ga	< 0.00099	i	Hg		M	Ru	< 0.00198	M	Tm	< 0.00040
M	Bi	< 0.00040	M	Ge	< 0.00595	M	Mo	< 0.00198	M	Sm	< 0.00099	M	Sn	< 0.00496
O	B	< 0.03600	M	Au	< 0.00298	M	Nd	0.00020	O	Sc	< 0.00003	M	Ti	< 0.04958
M	Cd	< 0.00298	M	Hf	< 0.00198	M	Ni	< 0.00793	M	Se	< 0.00793	M	W	< 0.00992
O	Ca	0.00903	M	Ho	< 0.00050	M	Nb	< 0.00050	O	Si	< 0.01000	M	U	< 0.00198
O	Ce	< 0.00300	M	In	< 0.00992	n	Os		M	Ag	< 0.00198	O	V	< 0.00080
M	Cs	< 0.00030	M	Ir	< 0.00496	M	Pd	< 0.00496	O	Na	< 0.05000	M	Yb	< 0.00099
M	Cr	< 0.00496	O	Fe	< 0.00150	n	P		O	Sr	< 0.00004	M	Y	< 0.03966
M	Co	< 0.00298	s	La		M	Pt	< 0.00198	O	S	< 0.04300	O	Zn	0.10539
M	Cu	< 0.00595	M	Pb	< 0.00298	O	K	< 0.10000	M	Ta	< 0.00694	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

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 138.9055; +3; 6 to 8, 9,10 for some compounds; $La(OH)_x(H_2O)_y^{(3-x)+}$

Chemical Compatibility - Soluble in HCl, and HNO_3. Avoid HF, H_3PO_4, H_2SO_4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride and sparingly soluble sulfates (La - Eu exhibit low sulfate solubility). Avoid mixing with elements / solutions containing moderate amounts of fluoride.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5 % HNO_3 / LDPE container.

La Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolved by heating in H_2O / HNO_3); Ores (Carbonate fusion in Pt° followed by HCl dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H_2O / HCl or HNO_3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≤10ppm.)
ICP-OES	333.749 nm	0.01 / 0.001 µg/mL	1	ion	
ICP-OES	408.672 nm	0.01 / 0.001 µg/mL	1	ion	Th
ICP-OES	412.323 nm	0.01 / 0.001 µg/mL	1	ion	Ce, Th
ICP-MS	139 amu	1 ppt	n/a	M^+	$^{123}Sb^{16}O$, $^{123}Te^{16}O$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2
DATE RECEIVED: 09/01/04
DATE EXPIRED: 10/01/2005 VOS
DATE OPENED: 09/01/04
INORG: 4763 PO: E53434

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 23, 2003

Expiration Date:

EXPIRES
1/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010381

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **10000 µg/mL Sodium in 1.4% (abs) HNO_3**

Catalog Number:	CGNA10-1, CGNA10-2, and CGNA10-5
Lot Number:	**W-NA03010**
Starting Material:	Na_2CO_3
Starting Material Purity (%):	99.999819
Starting Material Lot No	42063
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 NOS
DATE OPENED: 07/29/04
INORG: 4651 PO: F53417

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,006 ± 6 µg/mL

Certified Density: 1.032 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **10,006 ± 6 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **10,019 ± 33 µg/mL**
ICP Assay NIST SRM 3152a Lot Number: 990907

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00090	M	Dy	< 0.00600	O	Li	< 0.00003	M	Pr	< 0.00030	M	Te	< 0.02998
M	Sb	< 0.00050	M	Er	< 0.00500	M	Lu	< 0.00040	M	Re	< 0.00100	M	Tb	< 0.00030
M	As	< 0.00999	M	Eu	< 0.00300	O	Mg	0.00010	M	Rh	< 0.00100	M	Tl	< 0.00100
M	Ba	< 0.00999	M	Gd	< 0.00100	O	Mn	< 0.00003	M	Rb	< 0.00100	M	Th	< 0.00100
O	Be	< 0.00020	M	Ga	< 0.00100	O	Hg	< 0.01500	M	Ru	< 0.00200	M	Tm	< 0.00040
M	Bi	< 0.00040	O	Ge	< 0.00150	M	Mo	< 0.00200	M	Sm	< 0.00100	M	Sn	< 0.00500
O	B	< 0.00060	O	Au	< 0.00300	M	Nd	< 0.00200	O	Sc	< 0.00002	O	Ti	< 0.00070
M	Cd	< 0.00300	M	Hf	< 0.00200	O	Ni	< 0.00230	O	Se	< 0.05000	M	W	< 0.00999
O	Ca	0.00050	M	Ho	< 0.00050	M	Nb	< 0.00050	O	Si	< 0.00340	M	U	< 0.00200
M	Ce	< 0.00500	M	In	< 0.00999	n	Os		M	Ag	< 0.00200	O	V	< 0.00090
M	Cs	< 0.00030	M	Ir	< 0.00500	M	Pd	< 0.00500	S	Na		M	Yb	< 0.00100
M	Cr	< 0.00500	O	Fe	< 0.00110	O	P	< 0.04000	M	Sr	< 0.00050	M	Y	< 0.03997
M	Co	< 0.00300	M	La	< 0.00050	M	Pt	< 0.00200	O	S	< 0.07200	O	Zn	0.00250
O	Cu	< 0.00140	M	Pb	< 0.00300	O	K	0.04000	M	Ta	< 0.00700	M	Zr	< 0.00500

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 22.98977; +1; (6); Na^{+}(aq) largely ionic in nature (Coordination Number in parentheses is assumed, not certain.)

Chemical Compatibility - Soluble in HCl, HNO_3, H_2SO_4 and HF aqueous matrices. Stable with all metals and inorganic anions.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Na Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Lithium carbonate fusion in graphite crucible followed by HCl dissolution - blank levels of Na in lithium carbonate critical); Organic Matrices (Sulfuric / peroxide digestion or nitric/sulfuric/perchloric acid decomposition).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ppbcns.)
ICP-OES	589.595 nm	0.07 / 0.00009 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	588.995 nm	0.03 / 0.006 µg/mL	1	atom	2nd order radiation from R.E.s on some optical designs
ICP-OES	330.237 nm	2.0 / 0.09 µg/mL	1	atom	Pd, Zn
ICP-MS	23 amu	310 ppt	n/a	M+	$^{46}Ti^{+2}$, $^{46}Ca^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

010383

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: October 27, 2003

Expiration Date:

EXPIRES
1 2005

INORGANIC LABS/RADCHEM LABS pg. 2 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 VOS
DATE OPENED: 07/29/04
INORG: 4657 PO: E53417

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	010384
Certificate Approved By:	Katalin Le, QC Supervisor	
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	

010385

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Palladium in 3.3% (abs) HCl**

Catalog Number:	CGPD1-1, CGPD1-2, and CGPD1-5
Lot Number:	**X-PD02027**
Starting Material:	Pd(NO3)2
Starting Material Purity (%):	99.999248
Starting Material Lot No	11974A-00
Matrix:	3.3% (abs) HCl

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 2/28/05 DR
DATE EXPIRED: 3/1/2006
DATE OPENED: 2/28/05
INORG: 5045 PO: E55148

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1004 ± 1 µg/mL

Certified Density: 1.022 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\sum x_i}{n}$

Uncertainty (±) = $\frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1004 ± 1 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3138 Lot Number: 990207

Assay Method #2 **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

5045
1 of 4

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		0.00400	M	Dy	<	0.00060	O	Li	<	0.04000	M	Pr	<	0.00003	O	Te	<	0.01300
O	Sb	<	0.00500	M	Er	<	0.00050	M	Lu	<	0.00004	M	Re	<	0.00010	M	Tb	<	0.00003
O	As	<	0.01400	M	Eu	<	0.00030	O	Mg	<	0.01100	O	Rh	<	0.00600	M	Tl	<	0.00010
M	Ba	<	0.00100	M	Gd	<	0.00010	O	Mn	<	0.00650	M	Rb	<	0.00010	M	Th	<	0.00010
O	Be	<	0.00009	M	Ga	<	0.00010	O	Hg	<	0.01100	O	Ru	<	0.00200	M	Tm	<	0.00004
M	Bi	<	0.00004	M	Ge	<	0.00060	M	Mo	<	0.00020	M	Sm	<	0.00010	O	Sn	<	0.00700
O	B	<	0.00090	O	Au	<	0.00300	M	Nd	<	0.00020	O	Sc	<	0.00009	O	Ti	<	0.00100
O	Cd	<	0.00600	M	Hf	<	0.00020	O	Ni		0.01800	M	Se	<	0.00080	M	W	<	0.00100
O	Ca		0.00700	M	Ho	<	0.00005	M	Nb	<	0.00005	O	Si		0.00600	M	U	<	0.00020
M	Ce	<	0.00050	O	In	<	0.03300	n	Os			O	Ag	<	0.00670	M	V	<	0.00020
M	Cs	<	0.00003	M	Ir	<	0.00050	s	Pd			O	Na		0.01500	M	Yb	<	0.00010
O	Cr		0.00450	O	Fe		0.04600	O	P		0.00600	M	Sr	<	0.00005	M	Y	<	0.00400
M	Co	<	0.00030	M	La	<	0.00005	O	Pt	<	0.00600	O	S	<	0.02500	O	Zn	<	0.00060
O	Cu		0.00360	M	Pb	<	0.00030	O	K	<	0.02000	M	Ta	<	0.00070	M	Zr	<	0.00050

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.
Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 106.42; +2; 6; $Pd(H_2O)_6^{2+}$
Chemical Compatibility - Stable in HCl, HNO_3, H_2SO_4, HF, H_3PO_4. Avoid basic media. Stable with most metals and inorganic anions in acidic media. Avoid contact with water soluble organics such as aldehydes since Pd^{2+} is easily reduced.
Stability - 2-100 ppb levels. 2ppb Pd is stable for 1 day in 1% HNO_3 / LDPE container. 10 ppb is stable for 3 days in 1% HNO_3 / LDPE container. 100 ppb is stable for ≥ 5 months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.
Pd Containing Samples (Preparation and Solution) - Metal (Soluble in HNO_3 or Aqua Regia); Oxides (Soluble in HCl); Ores (Dissolve in HCl / HNO_3).
Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	340.458 nm	0.04 / 0.003 µg/mL	1 atom		Ce, Th, Zr
ICP-OES	363.470 nm	0.05 / 0.007 µg/mL	1 atom		
ICP-OES	229.651 nm	0.07 / 0.004 µg/mL	1 ion		Co
ICP-MS	105 amu	2 ppt	n/a	M'	$^{40}Ar^{65}Cu$, $^{89}Y^{16}O$

50/45
2 of 4

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

010387

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 13, 2004

Expiration Date: EXPIRES 1 MAR 2006

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12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Nick Maida, QA Administrator	Nicholas Maida
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

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inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Sulfur in H_2O**

Catalog Number:	CGS1-1, CGS1-2, and CGS1-5
Lot Number:	**X-S01069**
Starting Material:	H_2SO_4
Starting Material Purity (%):	99.999965
Starting Material Lot No	N38818
Matrix:	H_2O

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 12/9/04
DATE EXPIRED: 01/01/2006 KE
DATE OPENED: 12/9/04
INORG: 4917 PO: F55102

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1007 ± 7 µg/mL

Certified Density: 1.000 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

$$\text{Uncertainty } (\pm) = \frac{2[(\sum s)^2]^{1/2}}{(n)^{1/2}}$$

$(\bar{x})$ = 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** **1012 ± 2 µg/mL**
Acidimetric NIST SRM 84k Lot Number: 84k

Assay Method #2 **1007 ± 7 µg/mL**
ICP Assay NIST SRM 3154 Lot Number: 892205

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.00025	M	Dy	< 0.01197	O	Li	< 0.00016	M	Pr	< 0.00060	M	Te	< 0.05984
M	Sb	< 0.00100	M	Er	< 0.00997	M	Lu	< 0.00080	M	Re	< 0.00200	M	Tb	< 0.00060
M	As	< 0.01995	M	Eu	< 0.00598	O	Mg	< 0.00004	M	Rh	< 0.00200	M	Tl	< 0.00200
M	Ba	< 0.01995	M	Gd	< 0.00200	M	Mn	< 0.00798	M	Rb	< 0.00200	M	Th	< 0.00200
O	Be	< 0.00200	M	Ga	< 0.00200	O	Hg	< 0.01100	M	Ru	< 0.00399	M	Tm	< 0.00080
M	Bi	< 0.00080	M	Ge	< 0.01197	M	Mo	< 0.00399	M	Sm	< 0.00200	M	Sn	< 0.00997
O	B	< 0.00990	M	Au	< 0.00598	M	Nd	< 0.00399	M	Sc	< 0.01995	M	Ti	< 0.09974
M	Cd	< 0.00598	M	Hf	< 0.00399	O	Ni	< 0.00230	O	Se	< 0.00620	M	W	< 0.01995
O	Ca	0.00020	M	Ho	< 0.00100	M	Nb	< 0.00100	O	Si	< 0.00410	M	U	< 0.00399
M	Ce	< 0.00997	M	In	< 0.01995	n	Os		M	Ag	< 0.00399	M	V	< 0.00399
M	Cs	< 0.00060	M	Ir	< 0.00997	M	Pd	< 0.00997	O	Na	< 0.00010	M	Yb	< 0.00200
M	Cr	< 0.00997	O	Fe	0.00015	O	P	< 0.00480	M	Sr	< 0.00100	M	Y	< 0.07979
M	Co	< 0.00598	M	La	< 0.00100	M	Pt	< 0.00399	s	S		O	Zn	0.00125
M	Cu	< 0.01197	M	Pb	< 0.00598	O	K	< 0.00170	M	Ta	< 0.01396	M	Zr	< 0.00997

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 32.066; +6; 6; ($O^{=}$); $S(OH)_6$

Chemical Compatibility - Soluble in HCl, HNO_3, H_3PO_4 and HF aqueous matrices water and NH_4OH. Stable with all metals and inorganic anions at low to moderate ppm levels under acidic conditions except Ba and Pb and to a lesser extent Sr, and Ca.

Stability - 2-100 ppb levels- stability unknown- in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in LDPE container.

S Containing Samples (Preparation and Solution) - We most often get questions about the determination of S in Rocks, Silicates and insoluble sulfates (the finely powered sample is fused in a Pt* crucible with ≈ 6 times its weight of Na_2CO_3 + 0.5 grams KNO_3. The fuseate is extracted with water. Any $BaSO_4$ present in the sample is transposed by the carbonate fusion to the $BaCO_3$ which is left behind in the water-insoluble residue. If $PbSO_4$ is present the fuseate should be boiled with a sodium carbonate saturated with CO_2 solution for 1 hour or more where the $PbSO_4$ will be transposed to the water insoluble carbonate which can be filtered off. Boiling the fuseate with a saturated carbonate solution is good insurance for samples containing Ba, Sr, and Ca. The Ba, Pb, Sr, Ca, free filtrate can be acidified and measured by ICP.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	166.669nm	0.2 / 0.19 µg/mL	1	atom	Si, B
ICP-OES	182.034 nm	0.3 / 0.024 µg/mL	1	atom	
ICP-OES	143.328 nm	0.4 / 0.035 µg/mL	1	atom	
ICP-MS	32 amu	30,000 ppt	n/a	M^+	$^{16}O_2$, $^{14}N^{18}O$, $^{15}N^{17}O$, $^{16}N^{16}O^1H$, $^{15}N^{16}O^1H$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"
- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"
- Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission
- Domestic Licensing of Production and Utilization Facilities

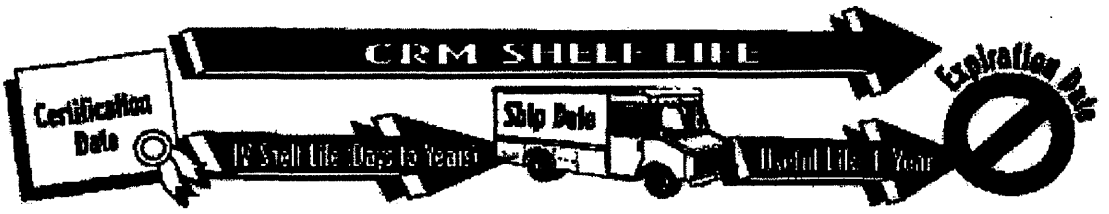
10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 12/9/2004
DATE EXPIRED: 01/01/2006 ok for KE
DATE OPENED: 12/9/04
INORG: 4917 PO: F55102

010392

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: April 30, 2004

Expiration Date: EXPIRES 01.2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010393

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Thorium in 3% (abs) HNO_3**

Catalog Number:	CGTH1-1, CGTH1-2, and CGTH1-5
Lot Number:	**X-TH01064**
Starting Material:	Th(NO3)4x4H2O
Starting Material Purity (%):	99.998809
Starting Material Lot No	X-25828-7
Matrix:	3% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS pg. 1 of 2
DATE RECEIVED: 11/02/04
DATE EXPIRED: 12/01/2005 v05
DATE OPENED: 11/02/04
INORG: 4844 PO: F54766

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 998 ± 3 µg/mL

Certified Density: 1.022 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value $(\bar{x}) = \frac{\sum x_i}{n}$

Uncertainty $(\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements
$\sum S$ = The summation of all significant estimated errors (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

- "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
- This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **998 ± 3 µg/mL**
ICP Assay NIST SRM 3159 Lot Number: 992912

Assay Method #2 **999 ± 3 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Al	< 0.00998	M	Dy	< 0.00599	O	Li	< 0.05000	M	Pr	< 0.00030	M	Te	< 0.02995
M	Sb	< 0.00050	M	Er	< 0.00499	M	Lu	< 0.00040	M	Re	< 0.00100	M	Tb	< 0.00030
M	As	< 0.00998	M	Eu	< 0.00300	O	Mg	< 0.02000	M	Rh	< 0.00100	M	Tl	< 0.00100
M	Ba	< 0.00998	M	Gd	< 0.00100	M	Mn	0.00049	M	Rb	< 0.00100	s	Th	
M	Be	< 0.00050	M	Ga	< 0.00100	i	Hg		M	Ru	< 0.00200	M	Tm	< 0.00040
M	Bi	< 0.00040	M	Ge	< 0.00599	M	Mo	< 0.00200	M	Sm	< 0.00100	M	Sn	< 0.00499
M	B	< 0.06987	M	Au	< 0.00300	M	Nd	0.00044	M	Sc	< 0.00998	M	Ti	< 0.04991
M	Cd	< 0.00300	M	Hf	< 0.00200	M	Ni	< 0.00799	M	Se	< 0.00799	M	W	< 0.00998
O	Ca	< 0.10000	M	Ho	< 0.00050	M	Nb	< 0.00050	i	Si		M	U	0.00406
M	Ce	0.00267	M	In	< 0.00998	n	Os		M	Ag	< 0.00200	M	V	< 0.00200
M	Cs	< 0.00030	M	Ir	< 0.00499	M	Pd	< 0.00499	O	Na	< 0.05000	M	Yb	< 0.00100
M	Cr	< 0.00499	O	Fe	< 0.05000	i	P		M	Sr	< 0.00050	M	Y	< 0.03993
M	Co	< 0.00300	M	La	0.00076	M	Pt	< 0.00200	i	S		M	Zn	0.00425
M	Cu	< 0.00599	M	Pb	< 0.00300	O	K	< 0.03000	M	Ta	< 0.00699	M	Zr	0.01978

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 010395

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 - 232.0381; +4; 8; $Th(OH)^{+4}$ and $Th(OH)_2^{+2}$

Chemical Compatibility - Soluble in HCl, and HNO_3. Avoid H_3PO_4, H_2SO_4 and HF although solubilities may not be a problem depending upon pH and matrix (For example: ThF_4 is soluble in acids). Avoid neutral to basic media. Th^{+4} is stable with most metals and inorganic anions forming an insoluble carbonate, oxide, fluoride, oxalate, sulfate and phosphate in neutral to slightly acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

Th Containing Samples (Preparation and Solution) - Metal (Soluble in Aqua Regia); Oxide (The heated oxide is not soluble in acids except hot conc. H_2SO_4); Ores (Na_2O_2 fusion at 480 ± 20°C for 7 minutes, cool and treat sintered mass with 50 mL cold water and stand until disintegrated. The mass is transferred to a beaker and acidified with HCl with 25 mL excess HCl added. Any residue is collected on a Whatman No. 42 filter, dried and ignited to 1000 °C in Pt^4 crucible and the ash treated with H_2SO_4 / HF and fumed. If residue remains, then treat it by peroxide fusion as above.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES 283.730 nm	0.07 / 0.007 µg/mL	1	ion	U, Zr
ICP-OES 283.231 nm	0.07 / 0.007 µg/mL	1	ion	U, Mo, Ti, Fe, Cr
ICP-OES 274.716 nm	0.08 / 0.008 µg/mL	1	ion	Ti, Ta, Fe, V
ICP-MS 232 amu	1 ppt	n/a	M^+	

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 11/02/04
DATE EXPIRED: 12/01/2005 VOS
DATE OPENED: 11/02/04
INORG: 4844 PO: F547666

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: June 24, 2004

Expiration Date:

EXPIRES
1 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul Gaines

010397

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Uranium in 1% (abs) HNO_3**

Catalog Number:	CGU1-1, CGU1-2, and CGU1-5
Lot Number:	**X-U01061**
Starting Material:	$UO_2(NO_3)_2.6H_2O$
Starting Material Purity (%):	99.994419
Starting Material Lot No	RB0018
Matrix:	1% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 10/14/04 DR
DATE EXPIRED: 11/1/2005
DATE OPENED: 10/15/04
INORG: 4828 PO: F54761

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 997 ± 2 µg/mL

Certified Density: 1.007 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.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1002 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

Assay Method #2 **997 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3164 Lot Number: 891509

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.

M	Al	0.05166	M	Dy	< 0.01494	M	Li	< 0.02490	M	Pr	< 0.00075	M	Te	< 0.07470
M	Sb	< 0.00125	M	Er	< 0.01245	M	Lu	< 0.00100	M	Re	< 0.00249	M	Tb	0.00003
M	As	< 0.02490	M	Eu	< 0.00747	M	Mg	< 0.07470	M	Rh	< 0.00249	M	Tl	< 0.00249
M	Ba	< 0.02490	M	Gd	0.00310	M	Mn	0.00083	M	Rb	< 0.00249	M	Th	< 0.00249
M	Be	< 0.00125	M	Ga	< 0.00249	i	Hg		M	Ru	< 0.00498	M	Tm	< 0.00100
M	Bi	< 0.00100	M	Ge	< 0.01494	M	Mo	0.00093	M	Sm	0.00010	O	Sn	< 0.10000
M	B	< 0.17429	M	Au	< 0.00747	M	Nd	< 0.00498	M	Sc	< 0.02490	M	Ti	0.00258
M	Cd	0.00103	M	Hf	< 0.00498	M	Ni	< 0.01992	M	Se	< 0.01992	M	W	< 0.02490
O	Ca	0.05395	M	Ho	0.00052	M	Nb	< 0.00125	i	Si		s	U	
M	Ce	0.00010	M	In	< 0.02490	n	Os		M	Ag	< 0.00498	M	V	< 0.00498
M	Cs	< 0.00075	M	Ir	< 0.01245	M	Pd	< 0.01245	O	Na	0.00664	M	Yb	< 0.00249
M	Cr	< 0.01245	M	Fe	< 0.49798	i	P		M	Sr	< 0.00125	M	Y	0.00062
M	Co	< 0.00747	M	La	0.00145	M	Pt	< 0.00498	i	S		M	Zn	0.00114
M	Cu	0.00072	M	Pb	0.00217	i	K		M	Ta	< 0.01743	M	Zr	< 0.01245

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 238.0289; +6; 8; UO_2^{2+}(uranyl)

Chemical Compatibility - Soluble in HCl and HNO_3. Avoid H_3PO_4. H_2SO_4 and HF matrices should not be a problem depending upon [U]. Although the UO_2^{2+} ion is distinctly basic, any U^{4+} will precipitate in basic media. UO_2^{2+} salts are generally soluble in water and UO_2^{2+} is stable with most metals and inorganic anions. The uranyl phosphate is insoluble in water. UF_4 and UF_6 are water soluble.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3 / LDPE container.

U Containing Samples (Preparation and Solution) - Metal (Dissolves rapidly in HCl and HNO_3); Oxide (Soluble in HNO_3); Ores (Digest for 1-2 hours with 1 gram of ore to 30 mL 1:1 HNO_3. Silica insolubles are removed by filtration after bringing the sample to fumes with conc. H_2SO_4.)

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ concs.)
ICP-OES	385.958 nm	0.3 / 0.01 µg/mL	1	ion	Th, Fe
ICP-OES	367.007 nm	0.3 / 0.02 µg/mL	1	ion	Th, Ce
ICP-OES	263.553 nm	0.3 / 0.01 µg/mL	1	ion	Ce, Ir, Th, Rh, W, Zr, Ta, Ti, V, Hf, Fe, Re, Ru
ICP-MS	238 amu	2 ppt	n/a	M⁺	$^{206}Pb^{16}O_2$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for Information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

010400

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: April 15, 2004

Expiration Date: EXPIRES 1 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010401

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Tungsten in 1% (abs) HNO_3/1% (abs) HF**

Catalog Number:	CGW1-1 and CGW1-5
Lot Number:	**W-W01082**
Starting Material:	W Powder
Starting Material Purity (%):	99.990703
Starting Material Lot No	21418,C31H46,D02J21,E03K06,D11F29
Matrix:	1% (abs) HNO_3/1% (abs) HF

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1001 ± 3 µg/mL

Certified Density: 1.007 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1001 ± 3 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3163 Lot Number: 990209

Assay Method #2 **1001 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS Page 1 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 V03
DATE OPENED: 07/29/04
INORG: 4660 PO: E53417

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	0.01792	M	Dy	< 0.00595	O	Li	< 0.00008	M	Pr	< 0.00030	M	Te	< 0.02974
M	Sb	< 0.00050	M	Er	< 0.00496	M	Lu	< 0.00040	i	Re		M	Tb	< 0.00030
M	As	< 0.00991	M	Eu	< 0.00297	O	Mg	0.00120	M	Rh	< 0.00099	M	Tl	< 0.00099
M	Ba	< 0.00991	M	Gd	< 0.00099	M	Mn	< 0.00397	M	Rb	< 0.00099	M	Th	< 0.00099
M	Be	< 0.00050	M	Ga	< 0.00099	O	Hg	< 0.04778	M	Ru	< 0.00198	M	Tm	< 0.00040
M	Bi	< 0.00040	M	Ge	< 0.00595	M	Mo	0.00050	M	Sm	< 0.00099	M	Sn	< 0.00496
O	B	< 1.19460	M	Au	< 0.00297	M	Nd	< 0.00198	O	Sc	< 0.00036	M	Ti	0.00198
M	Cd	< 0.00297	M	Hf	< 0.00198	M	Ni	< 0.00793	M	Se	< 0.00793	S	W	
O	Ca	0.00080	M	Ho	< 0.00050	O	Nb	< 0.06371	O	Si	< 0.01354	M	U	< 0.00198
M	Ce	< 0.00496	M	In	< 0.00991	n	Os		M	Ag	< 0.00198	M	V	< 0.00198
M	Cs	< 0.00030	M	Ir	< 0.00496	M	Pd	< 0.00496	O	Na	0.04778	M	Yb	< 0.00099
M	Cr	< 0.00496	O	Fe	< 0.03982	n	P		M	Sr	< 0.00050	M	Y	< 0.03965
M	Co	< 0.00297	M	La	< 0.00050	M	Pt	< 0.00198	n	S		M	Zn	< 0.01983
M	Cu	< 0.00595	M	Pb	0.00060	O	K	0.03146	O	Ta	< 0.39820	M	Zr	0.00079

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 183.85; +6; 6,7,8,9; WOF_4^{+} (chemical form as received)

Chemical Compatibility - W is very readily hydrolyzed requiring 0.1 to 1% HF solutions for stable acidic solutions. The WOF_4^{+} is soluble in % levels of HCl and HNO_3 provided it is in the WOF_4^{+} form. Stable at ppm levels with some metals provided it is fluorinated. Do not mix with Alkaline or Rare Earths. Is best to be mixed only with other fluorinated metals (Ti, Zr, Hf, Nb, Ta, Mo, Si, Sn, Ge). Look for yellow WO_3 precipitate if mixed with other transition elements at higher levels indicating instability. The yellow WO_3 will form over a period of weeks even in trace HF, therefore, HF levels of W multi- element blends should be ~ 1 %.

Stability - 2-100 ppb levels stable (Alone or mixed with all other metals that are at comparable levels) as the WOF_4^{+} for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the WOF_4^{+} chemically stable for years in 1% HF in an LDPE container.

W Containing Samples (Preparation and Solution) - Metal (Soluble in HF / HNO_3); Oxide (Soluble in HF or NH_4OH) ; Organic Matrices (Dry ash at 450 °C in Pt⁴ and dissolve oxide with HF).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≥50ppm.)
ICP-OES 207.911 nm	0.03 / 0.001 µg/mL	1	ion	Ru, In
ICP-OES 224.875 nm	0.05 / 0.005 µg/mL	1	ion	Co, Rh, Ag
ICP-OES 209.475 nm	0.05 / 0.005 µg/mL	1	ion	Mo
ICP-MS 182 amu	5 ppt	n/a	M⁺	$^{166}Er^{16}O$

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter) , Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 07/29/04
DATE EXPIRED: 08/01/2005 VOS
DATE OPENED: 07/29/04
INORG: 4660 PO: E53417

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 **IV Shelf Life** - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 **Expiration Date** - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: December 18, 2003

Expiration Date:

EXPIRES
1?2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010405

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 DESCRIPTION OF CRM

Custom-Grade **1000 µg/mL Yttrium in 1.4% (abs) HNO_3**

Catalog Number:	CGY1-1, CGY1-2, and CGY1-5
Lot Number:	**Y-QY01107**
Starting Material:	Y2O3
Starting Material Purity (%):	99.999896
Starting Material Lot No	9918901OYL
Matrix:	1.4% (abs) HNO_3

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 1/31/05
DATE EXPIRED: 3/1/2006 DR
DATE OPENED: 1/31/05
INORG: 5000 PO: F55739

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 998 ± 2 µg/mL

Certified Density: 1.011 g/mL (measured at 22° C)

The Certified Value is the wet assay value. The following equations are used in the calculations of the certified value and the uncertainty:

Certified Value $(\bar{x}) = \frac{\sum x_i}{n}$

$(\bar{x})$ = mean
x_i = individual results
n = number of measurements

Uncertainty $(\pm) = 2\left[\frac{\sum s_i^2}{(n)}\right]^{1/2}$

$\sum s_i$ = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

- "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)
- This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **996 ± 2 µg/mL**
ICP Assay NIST SRM 3167a Lot Number: 790412

Assay Method #2 **998 ± 2 µg/mL**
EDTA NIST SRM 928 Lot Number: 880710

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4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al	< 0.00090	M	Dy	0.00030	O	Li	< 0.00002	M	Pr	< 0.00030	M	Te	< 0.02985
M	Sb	< 0.00050	M	Er	< 0.00498	M	Lu	< 0.00040	M	Re	< 0.00100	M	Tb	0.00099
M	As	< 0.00995	M	Eu	0.00027	O	Mg	0.00001	M	Rh	< 0.00100	M	Tl	< 0.00100
M	Ba	< 0.00995	M	Gd	< 0.00100	O	Mn	< 0.00002	M	Rb	< 0.00100	M	Th	< 0.00100
M	Be	< 0.00050	M	Ga	< 0.00100	O	Hg	< 0.02000	M	Ru	< 0.00199	M	Tm	0.00007
M	Bi	< 0.00040	M	Ge	< 0.00597	M	Mo	< 0.00199	M	Sm	0.00014	M	Sn	< 0.00498
O	B	< 0.00100	M	Au	< 0.00299	M	Nd	0.00008	O	Sc	< 0.00003	M	Ti	< 0.04976
M	Cd	< 0.00299	M	Hf	< 0.00199	M	Ni	< 0.00796	M	Se	< 0.00796	M	W	< 0.00995
O	Ca	0.00026	M	Ho	0.00006	M	Nb	< 0.00050	O	Si	0.00016	M	U	< 0.00199
M	Ce	0.00010	M	In	< 0.00995	n	Os		O	Ag	< 0.02000	O	V	< 0.00080
M	Cs	< 0.00030	M	Ir	< 0.00498	O	Pd	< 0.10000	O	Na	< 0.05000	M	Yb	0.00028
M	Cr	< 0.00498	O	Fe	0.00079	O	P	< 0.07000	O	Sr	< 0.00004	s	Y	
M	Co	< 0.00299	M	La	0.00025	M	Pt	< 0.00199	O	S	< 0.04300	O	Zn	< 0.00040
M	Cu	< 0.00597	M	Pb	< 0.00299	O	K	< 0.10000	M	Ta	< 0.00697	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

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

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7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 88.9059; +3; 6; $Y(OH)(H_2O)_x^{+2}$

Chemical Compatibility - Soluble in HCl, H_2SO_4 and HNO_3. Avoid HF, H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming an insoluble carbonate, oxide, oxalate, and fluoride. Avoid mixing with elements / solutions containing moderate amounts of fluoride.

Stability - 2-100 ppb levels stable for months in 1% HNO_3/ LDPE container. 1-10,000 ppm solutions chemically stable for years in 2-5% HNO_3/ LDPE container.

Y Containing Samples (Preparation and Solution) - Metal (Soluble in acids); Oxide (Dissolve by heating in H_2O/ HNO_3); Ores (Carbonate fusion in Pt^0 followed by HCl dissolution); Organic Matrices (Dry ash and dissolve in 1:1 H_2O / HCl or HNO_3).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line		Estimated D.L.	Order	Type	Interferences (underlined indicates severe)
ICP-OES	360.073 nm	0.005 / 0.000036 µg/mL	1	ion	Ce, Th
ICP-OES	371.030 nm	0.004 / 0.00007 µg/mL	1	ion	Ce
ICP-OES	377.433 nm	0.005 / 0.0009 µg/mL	1	ion	Ta, Th
ICP-MS	89 amu	0.8 ppt	n/a	M^+	$^{74}Ge^{16}O$, $^{178}Hf^{+2}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

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5000

010408

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: January 19, 2005

Expiration Date: EXPIRES 01/2006

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	Debbie Newman, Production Manager	Debbie Newman
Certificate Approved By:	Katalin Le, QC Manager	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010409

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 **Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statisical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade **1000 µg/mL Zirconium in H_2O tr. HNO_3 tr. HF**

Catalog Number:	CGZR1-1 and CGZR1-5
Lot Number:	**W-ZR01056**
Starting Material:	ZrO_2
Starting Material Purity (%):	99.994542
Starting Material Lot No	22855
Matrix:	H_2O tr. HNO_3 tr. HF

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
DATE RECEIVED: 01/23/04
DATE EXPIRED: 08/01/2005 V03
DATE OPENED: 01/23/04
INORG: 4442 PO: F52306

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1004 ± 2 µg/mL

Certified Density: 0.999 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

Certified Value ($\bar{x}$) = $\frac{\Sigma x_i}{n}$

Uncertainty (±) = $\frac{2[(\Sigma s_i)^2]^{1/2}}{(n)^{1/2}}$

($\bar{x}$) = mean
x_i = individual results
n = number of measurements
Σs_i = The summation of all significant estimated errors. (Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

☐ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

☐ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** **1004 ± 2 µg/mL (Avg 2 runs)**
ICP Assay NIST SRM 3169 Lot Number: 990109

Assay Method #2 **1000 µg/mL**
Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001.Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

O	Al		0.01416	M	Dy	<	0.01188	O	Li	<	0.00012	M	Pr	<	0.00059	M	Te	<	0.05942
M	Sb	<	0.00099	M	Er	<	0.00990	M	Lu	<	0.00079	M	Re	<	0.00198	M	Tb	<	0.00059
M	As	<	0.01981	M	Eu	<	0.00594	O	Mg	<	0.00012	M	Rh	<	0.00198	M	Tl	<	0.00198
M	Ba	<	0.01981	M	Gd	<	0.00198	O	Mn	<	0.00401	M	Rb	<	0.00198	M	Th	<	0.00198
O	Be	<	0.40048	M	Ga	<	0.00198	O	Hg	<	0.04405	M	Ru	<	0.00396	M	Tm	<	0.00079
M	Bi	<	0.00079	M	Ge	<	0.01188	O	Mo	<	0.40048	M	Sm	<	0.00198	M	Sn	<	0.00990
M	B	<	0.13864	M	Au	<	0.00594	M	Nd	<	0.00396	O	Sc	<	0.00064	O	Ti	<	0.16019
O	Cd	<	0.02123	M	Hf		0.04403	O	Ni		0.01214	M	Se	<	0.01585	M	W	<	0.01981
O	Ca		0.00809	M	Ho	<	0.00099	O	Nb	<	0.08010	O	Si	<	0.80096	M	U	<	0.00396
M	Ce	<	0.00990	M	In	<	0.01981	n	Os			O	Ag	<	0.40048	M	V	<	0.00396
M	Cs	<	0.00059	M	Ir	<	0.00990	M	Pd	<	0.00990	O	Na	<	0.02803	M	Yb	<	0.00198
O	Cr	<	0.00881	O	Fe		0.00344	O	P	<	0.01922	M	Sr	<	0.00099	O	Y	<	0.00401
M	Co	<	0.00594	M	La	<	0.00099	M	Pt	<	0.00396	O	S	<	0.28033	O	Zn	<	0.04005
M	Cu	<	0.01188	M	Pb	<	0.00594	O	K	<	0.00681	M	Ta	<	0.01386	s	Zr		

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP
For the validation of analytical methods
For the preparation of "working reference samples"
For interference studies and the determination of correction coefficients
For detection limit and linearity studies
For additional intended uses, contact IV Technical Staff

010411

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 91.224; +4; 6,7,8; $Zr(F)_6^{-2}$

Chemical Compatibility - Soluble in concentrated HCl, HF, H_2SO_4 (very hot) and HNO_3. Avoid H_3PO_4 and neutral to basic media. Unstable at ppm levels with metals that would pull F^- away (i.e. Do not mix with Alkaline or Rare Earths or high levels of transition elements unless they are fluorinated). Stable with most inorganic anions but precipitation with phosphate, oxalate, and tartrate with a tendency to hydrolyze forming the hydrated oxide in all dilute acids except HF.

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the $Zr(F)_6^{-2}$ + $Zr(OH)_4F_2^{-2}$ for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $Zr(F)_6^{-2}$ chemically stable for years in 2-5% HNO_3 / trace HF in an LDPE container.

Zr Containing Samples (Preparation and Solution) - Metal (Soluble in H_2O / HF / HNO_3); Oxide - unlike TiO_2 the ZrO_2 is best fused in one of the following ways (Na_2O_2 in Ni*, Na_2CO_3 in Pt* or Borax in Pt*); Organic Matrices (Dry ash at 450 °C in Pt* and dissolve by fusing with Na_2CO_3 and dissolving in HF / HNO_3 / H_2O).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at ≈ppm conc.)
ICP-OES 343.823 nm	0.007 / 0.0004 µg/mL	1	ion	Hf, Nb
ICP-OES 339.198 nm	0.008 / 0.0007 µg/mL	1	ion	Th, Mo
ICP-OES 272.261 nm	0.018 / 0.001 µg/mL	1	ion	Cr, V, Th, W
ICP-MS 90 amu	2 ppt	n/a	M⁺	$^{74}Ge^{16}O$, $^{74}Se^{16}O$, [$^{180}X^{16}O$ (where X = Hf, Ta, W)]

HF Note: This standard should not be prepared or stored in glass.

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Saftey Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105
Recognized by:
Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)
Members of IQ Net International Certification Network:
Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland(PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration" - Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers" - Reference Materials Production - Accredited A2LA Certificate Number 883.02
A2LA Mutual Recognition Agreement Partners:
Australia (NATA), Austria (BmwA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission - Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS P3-2 of 3
DATE RECEIVED: 01/23/04
DATE EXPIRED: 08/01/2005 VDS
DATE OPENED: 01/23/04
INORG: 4442 PO: F52306

010412

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.
Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 19, 2003

Expiration Date: EXPIRES 01/02/05

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By:	JoAnn Struthers, QA Administrative Assistant	JoAnn Struthers
Certificate Approved By:	Katalin Le, QC Supervisor	Katalin Le
Certifying Officer:	Paul Gaines, Chemist, Senior Technical Director	Paul R Gaines

010413

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050502-4
SRR: 27541
SDG: 262525
CASE: CNWRA
VTSR: May 02, 2005
PROJECT#: 06002.01.222

Pipette Calibrations

Book/Page 04 015

SwRI - Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log 010414

Balance #: 12 Thermometer #: G011 diH20 Temperature (°C): 23

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
Lab30	1000	1.0085	1.0081	1.0088
TMA1	1000	1.0049	1.0038	1.0004
TMA2	1000	1.0078	1.0054	1.0028
TMA3	1000	Not	Found	—
TMA6	1000	1.0076	1.0059	1.0040
TMB1	900	0.9084	0.9025	0.9001
TMC1	800	0.8049	0.7961	0.~~8~~8030 KE 4-15-05
TMDD1	750	0.7516	0.7494	0.7470
TMD1	700	0.6952 ~~0.7024~~ KE 4-15-05	~~0.7043~~ 0.6955 0.7043	~~0.7024~~ 0.6967
TMD2	700	0.7024	0.7043	0.7024
TME1	600	0.5956	0.5967	0.5941
TMF2	500	0.4979	0.4982	0.4984
TMF5	500	0.5034	0.5003 KE 4-15-05	~~0.4~~ 0.5016
ICF1	500 KE 4-15-05	~~0.5~~ 0.4985	0.4974	0.4938
L30-500	500	0.5011	0.5016	0.5016
TMG3	400	0.3933	0.3935	0.3921
TMH1	300	out	of	service
TMH2	300	0.2976	0.2965	0.2965
TMJ1	250	0.2476	0.2477	0.2478
TMJ2	250	0.2486	0.2483	0.2477
TMJ3	250	0.2489	0.2499	0.2497
TMK2	200	0.2000	0.2000	0.1998
TML1	150	0.1482	0.1480	0.1483
TMM1	120	0.1201	0.1196	0.1191
TMN3	100	out	of	Service
ICN1	100	0.0996	0.0999	0.0996
TMQ1	80	0.0795	0.0799	0.0800
TMR1	70	out	of	Service
TMS1	60	out	of	Service
LAB-30A	50	Not	found	
TMU1	40	0.0402	0.0398	0.0400
TMU2	40	0.0406	0.0400	0.0397
TMV1	30	0.0297	0.0294	0.0297
L30-20	20	0.0203	0.0201	0.0200
TMW1	25	0.0248	0.0247	0.0246
TMY1	15	Out	of	Service

Analyst: [signature] Date: 4-15-05

Reviewed by: [signature] Date: 4-15-05

FRM-243-b (Rev 3/Mar 03)

Book/Page: 04 016 010415

SwRI – Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

(Space provide for Inorganic Laboratories' Fixed Volume Pipette Verification Spreadsheet)

Kendall 4/15/05

SwRI - Div. 01, Inorganic Labs' Fixed Volume Pipette Spreadsheet

Eppendorf #	True Value (uL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
Lab30	1000	1.0085	1.0081	1.0088	1.008	100.85
TMA1	1000	1.0049	1.0038	1.0004	1.003	100.30
TMA2	1000	1.0078	1.0054	1.0028	1.005	100.53
TMA3	1000	Out of Service				
TMA6	1000	1.0076	1.0059	1.0040	1.006	100.58
TMB1	900	0.9084	0.9025	0.9001	0.904	100.41
TMC1	800	0.8049	0.7961	0.8030	0.801	100.17
TMDD1	750	0.7516	0.7494	0.7470	0.749	99.91
TMD1	700	0.6952	0.6955	0.6967	0.696	99.40
TMD2	700	0.7024	0.7043	0.7024	0.703	100.43
TME1	600	0.5956	0.5967	0.5941	0.595	99.24
TMF2	500	0.4979	0.4982	0.4984	0.498	99.63
TMF5	500	0.5034	0.5003	0.5016	0.502	100.35
ICF1	500	0.4985	0.4974	0.4938	0.497	99.31
L30-500	500	0.5011	0.5016	0.5016	0.501	100.29
TMG3	400	0.3933	0.3935	0.3921	0.393	98.24
TMH1	300	Out of Service				
TMH2	300	0.2976	0.2965	0.2965	0.297	98.96
TMJ1	250	0.2476	0.2477	0.2478	0.248	99.08
TMJ2	250	0.2486	0.2483	0.2477	0.248	99.28
TMJ3	250	0.2489	0.2499	0.2497	0.250	99.80
TMK2	200	0.2000	0.2000	0.1998	0.200	99.97
TML1	150	0.1482	0.1480	0.1483	0.148	98.78
TMM1	120	0.1201	0.1196	0.1191	0.120	99.67
TMN3	100	out	of	service	0.000	0.00
ICN1	100	0.0996	0.0999	0.0996	0.100	99.70
TMQ1	80	0.0795	0.0799	0.0800	0.080	99.75
TMR1	70	Out of Service				
TMS1	60	Out of Service				
LAB-30A	50	not	found		0.000	0.00
TMU1	40	0.0402	0.0398	0.0400	0.040	100.00
TMU2	40	0.0406	0.0400	0.0397	0.040	100.25
TMV1	30	0.0297	0.0294	0.0297	0.030	98.67
L30-20	20	0.0203	0.0201	0.0200	0.020	100.67
TMW1	25	0.0248	0.0247	0.0246	0.025	98.80
TMY1	15	Out	of	service		

FRM-246 (Rev 1/Mar 03)

Book/page: 08 009

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010416

Warren A. Naegeli 05/26/05

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					
ADJ200-A	100					
	200					
	20					
ADJ200-C	100					
	200					
	20					
ADJ200-D	100					
	200					
	20	0.0200	0.0198	0.0198	0.020	99.33
ADJ200-G	100	0.0998	0.0991	0.0983	0.099	99.07
	200	0.2012	0.2002	0.1977	0.200	99.85
	20	0.0204	0.0204	0.0202	0.020	101.67
ADJ200-H	100	0.0993	0.0993	0.0997	0.099	99.43
	200	0.1995	0.2000	0.1998	0.200	99.88
	20	0.0196	0.0200	0.0198	0.020	99.00
ADJ200-J	100	0.0994	0.0992	0.0996	0.099	99.40
	200	0.2011	0.2004	0.2003	0.201	100.30
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					
	20					
ADJ200-K	100					
	200					

FRM-247a (Rev 3/Oct 03)

Book/page: 08 010

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16 Thermometer #: 6011 diH20 Temperature (° C) 22.0

	Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
20 µL – 200 µL		20			
	ADJ200-A	100			
		200			
		20			
	ADJ200-C	100			
		200			
		20			
	ADJ200-D	100			
		200			
		20	0.0200	0.0198	0.0198
	ADJ200-G	100	0.0988	0.0991	0.0983
		200	0.2012	0.2002	0.1977
		20	0.0204	0.0204	0.0202
	ADJ200-H	100	0.0993	0.0993	0.0997
		200	0.1995	0.2000	0.1998
		20	0.0196	0.0200	0.0198
	ADJ200-J	100	0.0994	0.0992	0.0996
		200	0.2011	0.2004	0.2003
		20			
	ADJ200-K	100			
		200			
		20			
	ADJ200	100			
		200			

~~WAN 05/02/05~~ ~~010417~~

Analyst: Warren A. Naegeli Date: 05/02/05

Reviewed by: Valerie Ozuna Date: 05/26/05

Book/page: 08 069

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010418

Warren A. Naegeli 05/26/05

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100				0.000	0.00
ADJ1000-C	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-D	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-E	500				0.000	0.00
	1000				0.000	0.00
	100				0.000	0.00
ADJ1000-F	500				0.000	0.00
	1000				0.000	0.00
	100	0.1017	0.1018	0.1017	0.102	101.73
ADJ1000-G	500	0.4934	0.4945	0.4960	0.495	98.93
	1000	0.9919	0.9960	0.9992	0.996	99.57
	100	0.1010	0.1013	0.1017	0.101	101.33
ADJ1000-H	500	0.4954	0.4990	0.4978	0.497	99.48
	1000	0.9969	0.9992	1.0071	1.001	100.11
	100	0.0995	0.0993	0.0996	0.099	99.47
ADJ1000-J	500	0.4961	0.4966	0.4967	0.496	99.29
	1000	1.0018	0.9998	0.9978	1.000	99.98
	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 2/Oct 03)

Book/page: 08 070

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 16 Thermometer #: 6011 diH20 Temperature (° C) 22.0

	Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
100 µL – 1000 µL		100			
	ADJ1000-C	500			
		1000			
		100			
	ADJ1000-D	500			
		1000			
		100			
	ADJ1000-E	500			
		1000			
		100			
	ADJ1000-F	500			
		1000			
		100	0.1017	0.1018	0.1017
	ADJ1000-G	500	0.4934	0.4945	0.4960
		1000	0.9919	0.9960	0.9992
		100	0.1010	0.1013	0.1017
	ADJ1000-H	500	0.4954	0.4990	0.4978
		1000	0.9969	0.9992	1.0071
		100	0.0995	0.0993	0.0996
	ADJ1000-J	500	0.4961	0.4966	0.4967
		1000	1.0018	0.9998	0.9978
		100			
	ADJ1000-K	500			
		1000			
		100			
	ADJ1000	500			
		1000			

WAN 05/02/05

610449

Analyst: Wanda A. Nagelli Date: 05/02/05

Reviewed by: [illegible] Date: 05/26/05

Book/page: 08 129

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010420

Warren A. Naegeli 05/26/05

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	500				0.000	0.00
ADJ5000-C	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-G	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-H	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000-I	2500				0.000	0.00
	5000				0.000	0.00
	500	0.5070	0.5055	0.5046	0.506	101.14
ADJ5000-J	2500	2.5064	2.5057	2.5038	2.505	100.21
	5000	5.0696	5.0245	5.0218	5.039	100.77
	500	0.5084	0.5098	0.5071	0.508	101.69
ADJ5000-K	2500	2.4846	2.4861	2.4895	2.487	99.47
	5000	5.0117	4.9884	4.9769	4.992	99.85
	500	0.5028	0.5053	0.5021	0.503	100.68
ADJ5000-L	2500	2.4953	2.4958	2.4917	2.494	99.77
	5000	5.0105	4.9925	4.9900	4.998	99.95
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00
	500				0.000	0.00
ADJ5000	2500				0.000	0.00
	5000				0.000	0.00

FRM-247c (Rev 2/Mar 03)

Book/page: 08 130

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

010421

Balance #: 116 Thermometer #: 6011 diH20 Temperature (° C) 22.0

500 µL – 5000 µL

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
	500			
ADJ5000-C	2500			
	5000			
	500			
ADJ5000-G	2500			
	5000			
	500			
ADJ5000-H	2500			
	5000			
	500			
ADJ5000-I	2500			
	5000			
	500	0.5070	0.5055	0.5046
ADJ5000-J	2500	2.5064	2.5057	2.5038
	5000	5.0696	5.0245	5.0218
	500	0.5084	0.5098	0.5071
ADJ5000-K	2500	2.4846	2.4861	2.4895
	5000	5.0117	4.9884	4.9769
	500	0.5028	0.5053	0.5021
ADJ5000-L	2500	2.4953	2.4958	2.4917
	5000	5.0105	4.9925	4.9900
	500			
ADJ5000-M	2500			
	5000			
	500			
ADJ5000-N	2500			
	5000			
	500			
ADJ5000	2500			
	5000			
	500			
ADJ5000	2500			
	5000			

WAN 05/02/05

WAN 05/02/05

Analyst: Warren A. Naegeli Date: 05/02/05

Reviewed by: Walter Agin Date: 05/26/05

FRM-244 (c) (Rev 3/Apr 04)

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050502-4
SRR: 27541
SDG: 262525
CASE: CNWRA
VTSR: May 02, 2005
PROJECT#: 06002.01.222

010422

Balance Calibrations

010423

Southwest Research Institute
Division 01
BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
12	Bldg. 70 Lab 27	1122510787	±0.0005	
Date	**Std Wt (g)**	**Recorded Wt (g)**	**Operator**	
5-9-05	2.0000	2.0000	KE	SN:99-J50526-15
5-10-05	2.0000	2.0000	KE	"
5-11-05	2.0000	2.0000	KE	"
5-12-05	2.0000	2.0000	KE	"
5-13-05	2.0000	2.0000	KE	"
5-16-05	2.0000	2.0000	KE	"
5-17-05	2.0000	2.0000	KE	"
5-18-05	2.0000	2.0000	JW	"
5-19-05	2.0000	2.0000	KE	"
5-~~19~~-20-05	2.0000	2.0000	KE	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

Southwest Research Institute®
Division 01
BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
19	Bldg. 70 Lab 27	0068597	±0.05	
Date	**Std Wt (g)**	**Recorded Wt (g)**	**Operator**	
5-17-05	10.00	10.00	KE	SN:99-J50624-5
5-18-05	10.00	10.00	JW	"
5-19-05	10.00	10.00	KE	"
5-20-05	10.00	10.00	KE	"
5-23-05	10.00	10.00	KE	"
5-24-05	10.00	10.00	KE	"
5-25-05	10.00	10.00	KE	

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

010424

Southwest Research Institute
Division 01
BALANCE VERIFICATION LOG

BALANCE #:	LOCATION:	SERIAL #:	TOLERANCE:	COMMENTS:
34	Bldg. 70 Lab 27	1116031935	±0.0005	
Date	**Std Wt (g)**	**Recorded Wt (g)**	**Operator**	
5-10-05	2.0000	2.0000	KE	SN:99-J50526-15
5-11-05	2.0000	2.0000	KE	~
5-12-05	2.0000	2.0000	KE	"
5-13-05	2.0000	1.9999	KE	"
5-16-05	2.0000	2.0000	KE	"
5-17-05	2.0000	2.0000	KE	"
5-18-05	2.0000	2.0000	JW	"
5-19-05	2.0000	2.0000	KE	"
5-20-05	2.0000	2.0000	KE	"
5-23-05	2.0000	2.0000	KE	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

FRM-112 (Rev 2/Aug 03)

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050502-4
SRR: 27541
SDG: 262525
CASE: CNWRA
VTSR: May 02, 2005
PROJECT#: 06002.01.222

010425

DI Water Verification

D.I. WATER SYSTEM NOTEBOOK
SOUTHWEST RESEARCH INSTITUTE
BUILDING 70

040005

Contact U.S. Filter (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

010426

HIGH PURITY SYSTEM (HP)

DATE / TIME	INITIALS	RESISTIVITY MONITOR (M OHMS)	RESISTIVITY MONITOR QC LT.	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
4/30/04 5:52pm	DR	18.04	✓	✓	✓	1540.1	All OK
5/3/04 4:45pm	DR	18.05	✓	✓	✓	1552.6	All OK
5/4/04 5:22pm	DR	18.05	✓	✓	✓	1570.8	—
5/5/04 5:40pm	DR	18.05	✓	✓	✓	1585.3	—
5/6/04 6:35pm	DR	18.05	✓	✓	✓	1598.9	—
5/7/04 5:18pm	DR	18.06	✓	✓	✓	1626.8	—
5/10/04 6:26pm	DR	18.03	✓	✓	✓	1650.3	—
5/11/04 6:37pm	DR	18.04	✓	✓	✓	1666.8	—
5/12/04 5:04pm	DR	18.03	✓	✓	✓	1680.1	—
5/13/04 11:22pm	DR	18.04	✓	✓	✓	1706.6	—
5/14/04 6:22pm	DR	18.04	✓	X	✓	1732.1	need P.O. call U.S. Filter
5/17/04 6:23pm	DR	18.05	✓	X	✓	1756.0	need P.O.
5/18/04 6:25pm	DR	18.04	✓	X	✓	1782.0	call P.O. and U.S. Filter
5/19/04 6:09pm	DR	18.03	✓	X	✓	1815.4	waiting on U.S. Filter
5/20/04 12:01pm	DR	18.04	✓	✓	✓	1829.3	TANK X-chang. Back online.
5/21/04 6:23pm	DR	18.03	✓	✓	✓	1867.0	—

Legend: Check = Green (OK); X = Red (call for service)

LOW PURITY SYSTEM (LP)

DATE / TIME	INITIALS	QC LIGHTS QC 1	QC LIGHTS QC 2	USAGE (GALS)	COMMENTS
4/30/04 5:52pm	DR	✓	✓	894.9	All OK.
5/3/04 4:46pm	DR	✓	✓	895.3	—
5/4/04 5:23pm	DR	✓	✓	895.8	—
5/5/04 5:40pm	DR	✓	✓	897.3	—
5/6/04 6:36pm	DR	✓	✓	897.4	—
5/7/04 5:19pm	DR	✓	✓	898.0	—
5/10/04 6:26pm	DR	✓	✓	898.1	—
5/11/04 6:37pm	DR	✓	✓	898.2	—
5/12/04 5:09pm	DR	✓	✓	898.3	—
5/13/04 11:22pm	DR	✓	✓	898.5	—
5/14/04 6:21pm	DR	✓	✓	898.8	—
5/17/04 6:24pm	DR	✓	✓	899.8	—
5/18/04 6:26pm	DR	✓ (16.0)	✓	902.1	—
5/19/04 6:10pm	DR	X (16.0)	✓	904.5	waiting on U.S. Filter.
5/20/04 12:03pm	DR	✓ (15.0)	✓	908.1	Tank Xchange. Back online.
5/21/04 6:23pm	DR	✓ (14.5)	✓	909.6	—

Legend: Check = Green (OK); X = Red (call for service)

D Spor 7/6/04

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 050502-4
SRR: 27541
SDG: 262525
CASE: CNWRA
VTSR: May 02, 2005
PROJECT#: 06002.01.222

010427

SURVEILLANCE REPORTS
From Division 30

010427-A

Institute Quality Assurance Surveillance Report

Project Number: 20.06002.01.031	Report Number: 2005-SR-0213	Page 1 of 1

Surveillance Scope: Monitor the Tests for Trace Metal Analysis by ICP and ICPMS testing. The client is SwRI® Division 20 and this is a QA Nuclear surveillance.

Reference Documents: Task Order 050325-1, 050426-3 and 050502-4.

Starting Date: 6/01/2005 **Ending Date:** 6/01/2005

Institute QA Representative: Mark R. Ehnstrom MRE

Person(s) Conducting Test/Exam/Procedure: Various Division 01 personnel

Satisfactory Findings: Test records were reviewed for ICP and ICPMS testing for major and minor elements for three task orders for Division 20. Test notes clearly indicated that 10 CFR 50, Appendix B and 10 CFR Part 21 were applicable to this testing. The sample Receipt and Laboratory Sample Identification numbers were noted. Documentation packages included information such as Laboratory Fixed and Adjustable Pipette Verification Log information; Balance Verification Logs; ICP Calibration Blank Solution Information; and Certificates of Analysis and of Reference Materials from the suppliers that provided materials during the test.

Unsatisfactory Findings: N/A

Nonconformance Report Number: N/A **CAR/SCAR Number:** N/A

Attachments: None

Recommendations/Actions: Direct reference to specific test methods or SwRI procedures could not be identified in two of the data packages. These two packages stated that the test method was, "Buy SwRI Method." It is recommended that the specific test methods be referenced in the instruction area of the Laboratory Task Order Form.

Equipment Calibration: Standards used for calibration were traceable to NIST.

Approved: _____
Institute Quality Assurance

Date: 06/06/2006

Distribution: Original – IQS Records
Cc: CC-J. Boyd (01)
R. Presas (01)
C. Hobson (30)