

010001

SOUTHWEST RESEARCH INSTITUTE

NUCLEAR PROJECT

CLIENT: Division 20

TASK ORDER: 040415-2

SRR: 25770

SDG: 243222

CASE: CNWRA

VTSR: April 14, 2004

PROJECT#: 06002.01.141

FINAL REPORT

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010002

Sample ID

CNWRA 1

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 243222

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.005	0.005
Barium	0.297	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	1.69	0.05
Cadmium	<0.005	0.005
Calcium	29.1	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.01	0.01
Magnesium	0.098	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	0.059	0.01
Palladium	<0.005	0.005
Phosphorus	<0.02	0.02
Potassium	0.414	0.2
Selenium	<0.015	0.015
Silicon	0.274	0.05
Silver	<0.005	0.005
Sodium	3.64	0.2
Strontium	0.212	0.005
Sulfur	24.9	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.112	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010003

Sample ID

CNWRA 10

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 243223

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.005	0.005
Barium	0.007	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	0.138	0.05
Cadmium	<0.005	0.005
Calcium	17.8	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.035	0.01
Magnesium	2.78	0.05
Manganese	0.025	0.005
Molybdenum	<0.01	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	0.020	0.02
Potassium	5.08	0.2
Selenium	<0.015	0.015
Silicon	19.5	0.05
Silver	<0.005	0.005
Sodium	34.9	0.2
Strontium	0.079	0.005
Sulfur	6.81	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	0.015	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010004

Sample ID

CNWRA 11

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 243224

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.005	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	<0.05	0.05
Cadmium	<0.005	0.005
Calcium	5.00	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.01	0.01
Magnesium	<0.05	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	<0.02	0.02
Potassium	<0.2	0.2
Selenium	<0.015	0.015
Silicon	<0.05	0.05
Silver	<0.005	0.005
Sodium	8.86	0.2
Strontium	<0.005	0.005
Sulfur	<0.05	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010005

Sample ID

CNWRA 2

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 243225

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.005	0.005
Barium	0.183	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	1.23	0.05
Cadmium	<0.005	0.005
Calcium	0.248	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.01	0.01
Magnesium	<0.05	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	0.016	0.01
Palladium	<0.005	0.005
Phosphorus	<0.02	0.02
Potassium	<0.2	0.2
Selenium	<0.015	0.015
Silicon	0.465	0.05
Silver	<0.005	0.005
Sodium	2.89	0.2
Strontium	<0.005	0.005
Sulfur	0.432	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.032	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

DUPLICATE SUMMARY

010006

Sample ID

CNwRA 2

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 243225

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Aluminum	<0.05	<0.05	0.00%
Antimony	<0.02	<0.02	0.00%
Arsenic	<0.005	<0.005	0.00%
Barium	0.183	0.182	0.84%
Beryllium	<0.005	<0.005	0.00%
Bismuth	<0.01	<0.01	0.00%
Boron	1.23	1.22	1.10%
Cadmium	<0.005	<0.005	0.00%
Calcium	0.248	0.242	2.27%
Chromium	<0.015	<0.015	0.00%
Cobalt	<0.005	<0.005	0.00%
Copper	<0.005	<0.005	0.00%
Iron	<0.1	<0.1	0.00%
Lanthanum	<0.005	<0.005	0.00%
Lead	<0.005	<0.005	0.00%
Lithium	NA	NA	NA
Magnesium	<0.05	<0.05	0.00%
Manganese	<0.005	<0.005	0.00%
Molybdenum	<0.01	<0.01	0.00%
Nickel	0.016	0.015	6.04%
Palladium	<0.005	<0.005	0.00%
Phosphorus	<0.02	<0.02	0.00%
Potassium	NA	NA	NA
Selenium	<0.015	<0.015	0.00%
Silicon	0.465	0.456	1.90%
Silver	<0.005	<0.005	0.00%
Sodium	NA	NA	NA
Strontium	<0.005	<0.005	0.00%
Sulfur	0.432	0.419	2.97%
Thallium	<0.02	<0.02	0.00%
Thorium	<0.015	<0.015	0.00%
Tin	<0.01	<0.01	0.00%
Titanium	<0.005	<0.005	0.00%
Tungsten	<0.01	<0.01	0.00%
Uranium	<0.1	<0.1	0.00%
Vanadium	<0.005	<0.005	0.00%
Yttrium	<0.005	<0.005	0.00%
Zinc	0.032	0.032	1.99%
Zirconium	<0.005	<0.005	0.00%

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010007

Sample ID

CNWR 3

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 243226

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.005	0.005
Barium	0.273	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	2.09	0.05
Cadmium	<0.005	0.005
Calcium	0.202	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.01	0.01
Magnesium	<0.05	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	0.036	0.01
Palladium	<0.005	0.005
Phosphorus	0.059	0.02
Potassium	0.316	0.2
Selenium	<0.05	0.05
Silicon	1.57	0.05
Silver	<0.005	0.005
Sodium	4.49	0.2
Strontium	<0.005	0.005
Sulfur	0.395	0.05
Thallium	<0.075	0.075
Thorium	<0.015	0.015
Tin	0.079	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.077	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010008

Sample ID

CNWRA 4

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 243227

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.005	0.005
Barium	0.765	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	2.01	0.05
Cadmium	<0.005	0.005
Calcium	2.62	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	0.008	0.005
Iron	<0.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.01	0.01
Magnesium	0.537	0.05
Manganese	0.049	0.005
Molybdenum	<0.01	0.01
Nickel	0.024	0.01
Palladium	<0.005	0.005
Phosphorus	<0.02	0.02
Potassium	9.80	0.2
Selenium	<0.015	0.015
Silicon	1.54	0.05
Silver	<0.005	0.005
Sodium	20.1	0.2
Strontium	0.014	0.005
Sulfur	1.04	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.268	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010009

Sample ID

CNWRA 5

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 243228

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	0.194	0.05
Antimony	<0.02	0.02
Arsenic	<0.005	0.005
Barium	0.464	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	2.47	0.05
Cadmium	<0.005	0.005
Calcium	1.31	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.01	0.01
Magnesium	0.364	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	0.037	0.02
Potassium	1.26	0.2
Selenium	<0.015	0.015
Silicon	2.97	0.05
Silver	<0.005	0.005
Sodium	7.47	0.2
Strontium	0.008	0.005
Sulfur	0.987	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	<0.01	0.01
Titanium	0.007	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	0.119	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010010

Sample ID

CNWRA 6

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 243229

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.005	0.005
Barium	0.012	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	0.142	0.05
Cadmium	<0.005	0.005
Calcium	24.7	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.035	0.01
Magnesium	3.29	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	0.025	0.02
Potassium	5.53	0.2
Selenium	<0.015	0.015
Silicon	24.3	0.05
Silver	<0.005	0.005
Sodium	37.3	0.2
Strontium	0.100	0.005
Sulfur	8.52	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	0.016	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010011

Sample ID

CNWRA 7

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 243230

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.005	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	0.258	0.05
Cadmium	<0.005	0.005
Calcium	2.49	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	0.136	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.270	0.01
Magnesium	0.112	0.05
Manganese	<0.005	0.005
Molybdenum	0.046	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	0.057	0.02
Potassium	3.81	0.2
Selenium	<0.05	0.05
Silicon	7.88	0.05
Silver	<0.005	0.005
Sodium	206	0.2
Strontium	0.007	0.005
Sulfur	10.4	0.05
Thallium	<0.075	0.075
Thorium	<0.015	0.015
Tin	0.062	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

DUPLICATE SUMMARY

010012

Sample ID

CNWRA 7

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 243230

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Aluminum	NA	NA	NA
Antimony	NA	NA	NA
Arsenic	NA	NA	NA
Barium	NA	NA	NA
Beryllium	NA	NA	NA
Bismuth	NA	NA	NA
Boron	NA	NA	NA
Cadmium	NA	NA	NA
Calcium	NA	NA	NA
Chromium	NA	NA	NA
Cobalt	NA	NA	NA
Copper	NA	NA	NA
Iron	NA	NA	NA
Lanthanum	NA	NA	NA
Lead	NA	NA	NA
Lithium	0.270	0.265	1.57%
Magnesium	NA	NA	NA
Manganese	NA	NA	NA
Molybdenum	NA	NA	NA
Nickel	NA	NA	NA
Palladium	NA	NA	NA
Phosphorus	NA	NA	NA
Potassium	3.81	3.82	0.39%
Selenium	NA	NA	NA
Silicon	NA	NA	NA
Silver	NA	NA	NA
Sodium	206	203	1.51%
Strontium	NA	NA	NA
Sulfur	NA	NA	NA
Thallium	NA	NA	NA
Thorium	NA	NA	NA
Tin	NA	NA	NA
Titanium	NA	NA	NA
Tungsten	NA	NA	NA
Uranium	NA	NA	NA
Vanadium	NA	NA	NA
Yttrium	NA	NA	NA
Zinc	NA	NA	NA
Zirconium	NA	NA	NA

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010013

Sample ID

CNWRA 8

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 243231

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	0.010	0.005
Barium	0.008	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	0.136	0.05
Cadmium	<0.005	0.005
Calcium	13.3	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.038	0.01
Magnesium	2.05	0.05
Manganese	0.006	0.005
Molybdenum	<0.01	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	<0.02	0.02
Potassium	5.68	0.2
Selenium	<0.015	0.015
Silicon	25.7	0.05
Silver	<0.005	0.005
Sodium	41.9	0.2
Strontium	0.067	0.005
Sulfur	6.96	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	0.013	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	0.006	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

MATRIX SPIKE SUMMARY

010014

Sample ID

CNWRA 8

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 243231

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Aluminum	<0.05	1.95	2	97.3%
Antimony	<0.02	0.505	0.5	101.1%
Arsenic	0.010	2.04	2	101.7%
Barium	0.008	2.03	2	100.9%
Beryllium	<0.005	0.049	0.05	98.7%
Bismuth	NA	NA	NA	NA
Boron	NA	NA	NA	NA
Cadmium	<0.005	0.050	0.05	99.5%
Calcium	13.3	33.7	20	102.0%
Chromium	<0.015	0.197	0.2	98.5%
Cobalt	<0.005	0.501	0.5	100.2%
Copper	<0.005	0.252	0.25	100.8%
Iron	<0.1	1.08	1	108.4%
Lanthanum	NA	NA	NA	NA
Lead	<0.005	0.497	0.5	99.3%
Lithium	NA	NA	NA	NA
Magnesium	2.05	22.4	20	101.5%
Manganese	0.006	0.509	0.5	100.7%
Molybdenum	NA	NA	NA	NA
Nickel	<0.01	0.490	0.5	98.0%
Palladium	NA	NA	NA	NA
Phosphorus	NA	NA	NA	NA
Potassium	NA	NA	NA	NA
Selenium	<0.015	2.23	2	111.6%
Silicon	NA	NA	NA	NA
Silver	<0.005	0.051	0.05	102.5%
Sodium	NA	NA	NA	NA
Strontium	NA	NA	NA	NA
Sulfur	NA	NA	NA	NA
Thallium	<0.02	2.08	2	103.8%
Thorium	NA	NA	NA	NA
Tin	NA	NA	NA	NA
Titanium	NA	NA	NA	NA
Tungsten	NA	NA	NA	NA
Uranium	NA	NA	NA	NA
Vanadium	0.006	0.505	0.5	99.9%
Yttrium	NA	NA	NA	NA
Zinc	<0.005	0.509	0.5	101.8%
Zirconium	NA	NA	NA	NA

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010015

Sample ID

CNWRA 9

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 243232

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	0.008	0.005
Barium	0.014	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	0.142	0.05
Cadmium	<0.005	0.005
Calcium	12.8	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	0.045	0.01
Magnesium	1.07	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	<0.02	0.02
Potassium	3.82	0.2
Selenium	<0.015	0.015
Silicon	26.2	0.05
Silver	<0.005	0.005
Sodium	48.6	0.2
Strontium	0.071	0.005
Sulfur	8.09	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	0.012	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	0.007	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

SOUTHWEST RESEARCH INSTITUTE

MATRIX SPIKE SUMMARY

010016

Sample ID

CNWRA 9

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: 243232

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Aluminum	NA	NA	NA	NA
Antimony	NA	NA	NA	NA
Arsenic	NA	NA	NA	NA
Barium	NA	NA	NA	NA
Beryllium	NA	NA	NA	NA
Bismuth	NA	NA	NA	NA
Boron	NA	NA	NA	NA
Cadmium	NA	NA	NA	NA
Calcium	NA	NA	NA	NA
Chromium	NA	NA	NA	NA
Cobalt	NA	NA	NA	NA
Copper	NA	NA	NA	NA
Iron	NA	NA	NA	NA
Lanthanum	NA	NA	NA	NA
Lead	NA	NA	NA	NA
Lithium	NA	NA	NA	NA
Magnesium	NA	NA	NA	NA
Manganese	NA	NA	NA	NA
Molybdenum	NA	NA	NA	NA
Nickel	NA	NA	NA	NA
Palladium	NA	NA	NA	NA
Phosphorus	NA	NA	NA	NA
Potassium	3.82	24.1	20	101.3%
Selenium	NA	NA	NA	NA
Silicon	NA	NA	NA	NA
Silver	NA	NA	NA	NA
Sodium	48.6	68.6	20	100.1%
Strontium	NA	NA	NA	NA
Sulfur	NA	NA	NA	NA
Thallium	NA	NA	NA	NA
Thorium	NA	NA	NA	NA
Tin	NA	NA	NA	NA
Titanium	NA	NA	NA	NA
Tungsten	NA	NA	NA	NA
Uranium	NA	NA	NA	NA
Vanadium	NA	NA	NA	NA
Yttrium	NA	NA	NA	NA
Zinc	NA	NA	NA	NA
Zirconium	NA	NA	NA	NA

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE

LABORATORY CONTROL SAMPLE 010017

Sample ID

LCSW - F15W1 / F15E2

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: NA

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Aluminum	1.91	2	95.4%
Antimony	0.490	0.5	97.9%
Arsenic	1.99	2	99.7%
Barium	2.01	2	100.6%
Beryllium	0.049	0.05	98.8%
Bismuth	NA	NA	NA
Boron	NA	NA	NA
Cadmium	0.050	0.05	99.3%
Calcium	21.0	20	104.8%
Chromium	0.208	0.2	104.2%
Cobalt	0.499	0.5	99.8%
Copper	0.252	0.25	100.8%
Iron	1.14	1	114.1%
Lanthanum	NA	NA	NA
Lead	0.497	0.5	99.4%
Lithium	NA	NA	NA
Magnesium	20.7	20	103.4%
Manganese	0.504	0.5	100.7%
Molybdenum	NA	NA	NA
Nickel	0.498	0.5	99.6%
Palladium	NA	NA	NA
Phosphorus	NA	NA	NA
Potassium	19.2	20	95.8%
Selenium	2.04	2	101.8%
Silicon	NA	NA	NA
Silver	0.050	0.05	101.0%
Sodium	19.1	20	95.3%
Strontium	NA	NA	NA
Sulfur	NA	NA	NA
Thallium	2.06	2	102.9%
Thorium	NA	NA	NA
Tin	NA	NA	NA
Titanium	NA	NA	NA
Tungsten	NA	NA	NA
Uranium	NA	NA	NA
Vanadium	0.498	0.5	99.6%
Yttrium	NA	NA	NA
Zinc	0.497	0.5	99.4%
Zirconium	NA	NA	NA

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE

BLANK SUMMARY

010018

Sample ID

PBW - F15E1 / F15E2

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Water

Project No.: 20.06002.01.141

Lab System ID: NA

SRR: 25770

TO: 040415-2

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Aluminum	<0.05	0.05
Antimony	<0.02	0.02
Arsenic	<0.005	0.005
Barium	<0.005	0.005
Beryllium	<0.005	0.005
Bismuth	<0.01	0.01
Boron	<0.05	0.05
Cadmium	<0.005	0.005
Calcium	<0.05	0.05
Chromium	<0.015	0.015
Cobalt	<0.005	0.005
Copper	<0.005	0.005
Iron	<0.1	0.1
Lanthanum	<0.005	0.005
Lead	<0.005	0.005
Lithium	<0.01	0.01
Magnesium	<0.05	0.05
Manganese	<0.005	0.005
Molybdenum	<0.01	0.01
Nickel	<0.01	0.01
Palladium	<0.005	0.005
Phosphorus	<0.02	0.02
Potassium	<0.2	0.2
Selenium	<0.015	0.015
Silicon	<0.05	0.05
Silver	<0.005	0.005
Sodium	<0.2	0.2
Strontium	<0.005	0.005
Sulfur	<0.05	0.05
Thallium	<0.02	0.02
Thorium	<0.015	0.015
Tin	<0.01	0.01
Titanium	<0.005	0.005
Tungsten	<0.01	0.01
Uranium	<0.1	0.1
Vanadium	<0.005	0.005
Yttrium	<0.005	0.005
Zinc	<0.005	0.005
Zirconium	<0.005	0.005

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010019

Sample ID

CNWRA A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040415-2

SRR: 25770

Lab System ID: 243233

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	1.05	0.1
Fluoride	0.162	0.1
Nitrate-N	<0.1	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.1	0.1
Sulfate	133	2

SOUTHWEST RESEARCH INSTITUTE

DUPLICATE SUMMARY

010020

Sample ID

CNWRA A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040415-2

SRR: 25770

Lab System ID: 243233

Analysis	Sample Result (mg/L)	Duplicate Result (mg/L)	RPD
Bromide	<0.1	<0.1	0.00%
Chloride	1.05	1.00	4.88%
Fluoride	0.162	0.165	1.83%
Nitrate-N	<0.1	<0.1	0.00%
Nitrite-N	<0.1	<0.1	0.00%
Phosphate-P	<0.1	<0.1	0.00%
Sulfate	133	132	0.75%

SOUTHWEST RESEARCH INSTITUTE

MATRIX SPIKE SUMMARY

010021

Sample ID

CNWRA A

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040415-2

SRR: 25770

Lab System ID: 243233

Analysis	Sample Result (mg/L)	Spike Result (mg/L)	Spike Added (mg/L)	Recovery
Bromide	<0.1	3.96	4.00	99.0%
Chloride	1.05	2.85	2.00	90.0%
Fluoride	0.162	1.03	1.00	86.8%
Nitrate-N	<0.1	0.843	0.904	93.3%
Nitrite-N	<0.1	0.893	1.00	89.3%
Phosphate-P	<0.1	1.63	1.91	85.3%
Sulfate	133	211	80.0	97.5%

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010022

Sample ID

CNWRA B

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040415-2

SRR: 25770

Lab System ID: 243234

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	1.03	0.1
Fluoride	<0.1	0.1
Nitrate-N	<0.1	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.1	0.1
Sulfate	0.468	0.1

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010023

Sample ID

CNWRA C

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040415-2

SRR: 25770

Lab System ID: 243235

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	0.258	0.1
Fluoride	<0.1	0.1
Nitrate-N	<0.1	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.1	0.1
Sulfate	0.588	0.1

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010024

Sample ID

CNWRA D

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040415-2

SRR: 25770

Lab System ID: 243236

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	4.13	0.1
Fluoride	0.320	0.1
Nitrate-N	0.114	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.1	0.1
Sulfate	2.08	0.1

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010025

Sample ID

CNWRA E

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040415-2

SRR: 25770

Lab System ID: 243237

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	8.88	0.1
Fluoride	0.399	0.1
Nitrate-N	0.124	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	0.222	0.1
Sulfate	2.86	0.1

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010026

Sample ID

CNWRA F

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040415-2

SRR: 25770

Lab System ID: 243238

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	6.84	0.1
Fluoride	1.06	0.1
Nitrate-N	1.55	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.1	0.1
Sulfate	25.1	2

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET 010027

Sample ID

CNWRA G

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040415-2

SRR: 25770

Lab System ID: 243239

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	7.96	0.1
Fluoride	3.99	0.1
Nitrate-N	<0.1	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.1	0.1
Sulfate	26.5	2

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010028

Sample ID

CNWRA H

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040415-2

SRR: 25770

Lab System ID: 243240

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	6.74	0.1
Fluoride	2.11	0.1
Nitrate-N	1.57	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.1	0.1
Sulfate	21.0	2

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010029

Sample ID

CNWRA I

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040415-2

SRR: 25770

Lab System ID: 243241

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	6.50	0.1
Fluoride	1.85	0.1
Nitrate-N	1.10	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.1	0.1
Sulfate	23.6	2

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010030

Sample ID

CNWRA J

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040415-2

SRR: 25770

Lab System ID: 243242

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	6.85	0.1
Fluoride	1.26	0.1
Nitrate-N	0.161	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.1	0.1
Sulfate	20.7	2

SOUTHWEST RESEARCH INSTITUTE

SAMPLE ANALYSIS DATA SHEET

010031

Sample ID
CNWRA K

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: 04/14/04

Matrix: Water

Project No.: 06002.01.141

Task Order: 040415-2

SRR: 25770

Lab System ID: 243243

Analysis	Sample Result (mg/L)	Reporting Limit (mg/L)
Bromide	<0.1	0.1
Chloride	<0.1	0.1
Fluoride	<0.1	0.1
Nitrate-N	0.380	0.1
Nitrite-N	<0.1	0.1
Phosphate-P	<0.1	0.1
Sulfate	<0.1	0.1

SOUTHWEST RESEARCH INSTITUTE

LABORATORY CONTROL SAMPLE 010032

Sample ID

LCSW

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Water

Project No.: 06002.01.141

Task Order: 040415-2

SRR: 25770

Lab System ID: NA

Analysis	Sample Result (mg/L)	True Value (mg/L)	Recovery
Bromide	412	400	103%
Chloride	205	200	103%
Fluoride	101	100	101%
Nitrate-N	87.2	90.4	96.5%
Nitrite-N	99.0	101	98.0%
Phosphate-P	196	191	103%
Sulfate	411	400	103%

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE

BLANK SUMMARY

010033

Sample ID

PBW

Lab Name: Southwest Research Institute

Client: Division 20

Lab Code: SwRI

Date Received: NA

Matrix: Water

Project No.: 06002.01.141

Task Order: 040415-2

SRR: 25770

Lab System ID: NA

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

NA- Not Applicable.

SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT **010034**
CLIENT: Division 20
TASK ORDER: 040415-2
SRR: 25770
SDG: 243222
CASE: CNWRA
VTSR: April 14, 2004
PROJECT#: 06002.01.141

Task Orders/01-QPP-015

Laboratory Task Order

TO #: 040415-2 Revision: 2

010035

Project(s): 06002.01.141
 Manager(s): DAMMANN, MIKE
 To PM: 05/12/04
 To QA: 09/14/04
 To Client: 09/14/04

SDG: 243222
 VTSR: 04/14/04
 CASE: CNWRA

SRR #s: 25770
 Client(s): DIV 20

Instructions

DIVISION 20 - CNWRA. 30-day TAT. Using 28-day TAT for report/PM, QAU, 29-day TAT for hardcopy (subject to change). Point of Contact is Brad Werling (x6565). Analysis for Major and Minor elements ICP and Anions by IC. Work is 10 CFR 50, Part 21, Appendix B. CONTACT Charlie Butcher (ext. 5928, pager 271-5172) before starting ANY WORK on this task order. CONTACT PM WITH ANY QUESTIONS.
 revision 1. corrected POC extension. (dr041504)
 revision 2: Updated task order. (dr091304)

Documents Related to this task order: 10102[COC 25770]

Test: DIL-DILUTION

Holding: 28 days from CED

Section: METALPREP

Prep, Dilution

Cnt: 11

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
243222		1	Water	CNWRA 1	13 Apr 04	11 May 04
243223		1	Water	CNWRA 10	13 Apr 04	11 May 04
243224		1	Water	CNWRA 11	13 Apr 04	11 May 04
243225		1	Water	CNWRA 2	13 Apr 04	11 May 04
243226		1	Water	CNWRA 3	13 Apr 04	11 May 04
243227		1	Water	CNWRA 4	13 Apr 04	11 May 04
243228		1	Water	CNWRA 5	13 Apr 04	11 May 04
243229		1	Water	CNWRA 6	13 Apr 04	11 May 04
243230		1	Water	CNWRA 7	13 Apr 04	11 May 04
243231		1	Water	CNWRA 8	13 Apr 04	11 May 04
243232		1	Water	CNWRA 9	13 Apr 04	11 May 04

Test: IC-SWRI

Holding: 28 days from CED

Section: WETCHEM

Ion Chromatography by SwRI Method

Cnt: 11

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
243233		1	Water	CNWRA A	13 Apr 04	11 May 04
243234		1	Water	CNWRA B	13 Apr 04	11 May 04
243235		1	Water	CNWRA C	13 Apr 04	11 May 04
243236		1	Water	CNWRA D	13 Apr 04	11 May 04
243237		1	Water	CNWRA E	13 Apr 04	11 May 04
243238		1	Water	CNWRA F	13 Apr 04	11 May 04
243239		1	Water	CNWRA G	13 Apr 04	11 May 04
243240		1	Water	CNWRA H	13 Apr 04	11 May 04
243241		1	Water	CNWRA I	13 Apr 04	11 May 04
243242		1	Water	CNWRA J	13 Apr 04	11 May 04
243243		1	Water	CNWRA K	13 Apr 04	11 May 04

Test: ICP-SWRI

Holding: 180 days from CED

Section: METALS

ICP Analysis by SwRI Method

Cnt: 11

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
243222		1	Water	CNWRA 1	13 Apr 04	10 Oct 04
243223		1	Water	CNWRA 10	13 Apr 04	10 Oct 04
243224		1	Water	CNWRA 11	13 Apr 04	10 Oct 04
243225		1	Water	CNWRA 2	13 Apr 04	10 Oct 04
243226		1	Water	CNWRA 3	13 Apr 04	10 Oct 04

Laboratory Task Order

TO #: 040415-2 Revision: 2

010036

SDG: 243222
VTSR: 04/14/04
CASE: CNWRA

SRR #s: 25770
Client(s): DIV 20

Project(s): 06002.01.141
Manager(s): DAMMANN, MIKE
To PM: 05/12/04
To QA: 09/14/04
To Client: 09/14/04

System ID	Type	Cont	Matrix	Customer ID	CED	Method Date
243227		1	Water	CNWRA 4	13 Apr 04	10 Oct 04
243228		1	Water	CNWRA 5	13 Apr 04	10 Oct 04
243229		1	Water	CNWRA 6	13 Apr 04	10 Oct 04
243230		1	Water	CNWRA 7	13 Apr 04	10 Oct 04
243231		1	Water	CNWRA 8	13 Apr 04	10 Oct 04
243232		1	Water	CNWRA 9	13 Apr 04	10 Oct 04

CONTROLLED COPY
IF STAMP IS NOT RED, THIS DOCUMENT IS UNCONTROLLED

01-QPP-015
Division 01
Revision 4
November 2002

010037

Document No. 3



Chemistry and Chemical
Engineering Division

QUALITY PROJECT PLAN FOR

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

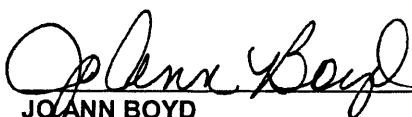
DIV. 20
SRR #25770
PROJECT #06002.01.141
CASE: DIV. 20
VTSR: 04/14/04 1045

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

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

SwRI AUTHORIZATION SIGNATORIES

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



JOANN BOYD

Quality Assurance Manager

(210) 522-2169

10/30/02

DATE



REZA KARIMI

Director, Department of Analytical and Environmental Chemistry

(210) 522-2412

10/30/02

DATE



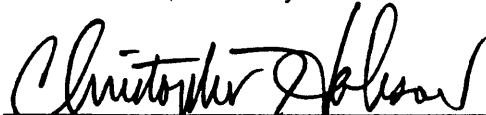
MICHAEL G. MACNAUGHTON

Vice President, Chemistry and Chemical Engineering Division

(210) 522-5162

10/30/02

DATE



CHRISTOPHER HOBSON

Quality Assurance Engineer

(210) 522-5838

10/30/02

DATE

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

1.0 INTRODUCTION

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

2.0 SCOPE

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

3.0 REFERENCES

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

4.0 APPLICABLE SECTIONS OF SwRI PROGRAM QUALITY PLAN (PQP-NUCLEAR)**4.1 Indoctrination and Training**

- 4.1.1 Personnel performing duties affecting quality shall receive quality training to the *SwRI Program Quality Plan (PQP-Nuclear)*, *Nuclear Services* prior to performing any work on projects for nuclear utilities. Institute Quality Systems (IQS) personnel shall perform this training and documentation shall be evident in the personnel training files maintained in Division Quality Assurance.
- 4.1.2 Indoctrination and training of personnel shall be conducted in accordance with **SOP-01-6.2.1**, *Qualification and Training*.

4.2 Qualification of Personnel

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

4.3 Design Control

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

4.4 Right of Access

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

4.5 Control of Supplier-Generated Documents

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

4.6 Acceptance of Services Only

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

4.7 Commercial Grade Items

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

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

4.8 Inspection

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

(e) Test records.

4.9 Inspection and Testing

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

4.10 Handling, Storage, Packaging, Preservation, and Delivery

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

4.11 Quality Assurance Records

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

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

4.12 10 CFR, Part 21

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

4.13 Certified Test Report

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

4.14 Valid Documents List

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

5.0 HISTORY OF REVISIONS

Revision 4

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

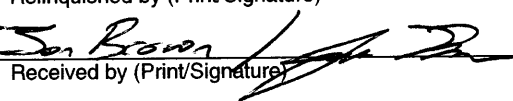

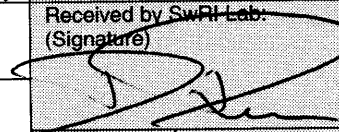
Extensive revision to comply with Project Quality Plan PQP-Nuclear, *Nuclear Services*, which replaces SwRI NQAPM, *Nuclear Quality Assurance Program Manual*.

010046

**SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040415-2
SRR: 25770
SDG: 243222
CASE: CNWRA
VTSR: April 14, 2004
PROJECT#: 06002.01.141**

Chain of Custody/Login Paperwork

10102

Shipper Name/ Address		SAMPLE LIST/CHAIN OF CUSTODY										Requested Turnaround:		
Client		Southwest Research Institute Chemistry and Chemical Engineering Division 6220 Culebra Road San Antonio, Texas 78238-5166										<input type="checkbox"/> 2 Weeks <input type="checkbox"/> 3 Weeks <input checked="" type="checkbox"/> Other: 4 wk		
		Client Purchase Order/Other ID					Site/Zone ID					SwRI Contact		
		Analyses Requested										REMARKS		
Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Analysis set major + minor elements - CP								Preservation a = HCl to pH <2 b = HNO ₃ to pH <2 c = H ₂ SO ₄ to pH <2 d = NaOH to pH >12 e = Cool (4°C±2°C) f = Other (specify) - none
CNWRA 1	4-13-04		W		1	X							f	Nuclear Safety
CNWRA 2						X							f	related - use
CNWRA 3						X							f	appropriate QA
CNWRA 4						X							f	procedures
CNWRA 5						X							f	
CNWRA 6						X							f	POC - Brad Werling
CNWRA 7						X							f	X6565 fax 5184
CNWRA 8						X							f	
CNWRA 9						X							f	
CNWRA 10						X							f	
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		Relinquished by (Print/Signature) 					Date 4/14/04		Time 10:45		SwRI Project#: 20.06002.01.141	
				Received by (Print/Signature) 					Date		Time		Received by SwRI Lab: (Signature) 	
				Relinquished by (Print/Signature)					Date		Time		Date 4/14/04	
				Received by (Print/Signature)					Date		Time		Time 1045	
				Relinquished by (Print/Signature)					Date		Time		Samples Disposed: Date	
				Comments: 628/91					Date		Time		Time 1045	
									Date		Time		Samples Disposed by:	

010047

[illegible]

010048

10102

Shipper Name/ Address		SAMPLE LIST/CHAIN OF CUSTODY										Requested Turnaround:		
Client		Southwest Research Institute Chemistry and Chemical Engineering Division 6220 Culebra Road San Antonio, Texas 78238-5166										<input type="checkbox"/> 2 Weeks <input type="checkbox"/> 3 Weeks <input checked="" type="checkbox"/> Other: <u>4 wk</u>		
		Client Purchase Order/Other ID					Site/Zone ID					SwRI Contact		
		Analyses Requested										REMARKS		
Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers	Analysis by								
CNWRA A	4-13-04		W		1	X								
CNWRA B						X								
CNWRA C						X								
CNWRA D						X								
CNWRA E						X								
CNWRA F						X								
CNWRA G						X								
CNWRA H						X								
CNWRA I						X								
CNWRA J						X								
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		Relinquished by (Print/Signature) <i>Jon Brown</i>					Date 4-13-04		Time 10:45		SwRI Project#: 20.06002.01.141	
				Received by (Print/Signature) <i>[Signature]</i>					Date		Time		Received by SwRI Lab: (Signature)	
				Relinquished by (Print/Signature)					Date		Time		Date 4/14/04	
				Received by (Print/Signature)					Date		Time		Time 1045	
Temp: 22.0°C Comments: 628/91		Therm #: 027		Relinquished by (Print/Signature)					Date		Time		Samples Disposed: Date	
													Time 1045	
													Samples Disposed by:	

PROJECT #06002.01.141
 CASE: DIV. 20
 DIV. 20
 SRR #25770
 VTSR: 04/14/04 1045

Preservation
 a = HCl to pH <2
 b = HNO₃ to pH <2
 c = H₂SO₄ to pH <2
 d = NaOH to pH >12
 e = Cool (4°C±2°C)
 f = Other (specify) none
 Nuclear Safety
 related - use
 appropriate QA
 procedures
 ROC: Brad Werling
 X 6565 Fax 5184

010049

10102

Shipper Name/Address		SAMPLE LIST/CHAIN OF CUSTODY										Requested Turnaround:			
Client		Southwest Research Institute Chemistry and Chemical Engineering Division 6220 Culebra Road San Antonio, Texas 78238-5166										<input type="checkbox"/> 2 Weeks <input type="checkbox"/> 3 Weeks <input checked="" type="checkbox"/> Other: <u>4 wk</u>			
		Client Purchase Order/Other ID					Site/Zone ID					SwRI Contact			
		Analyses Requested										SwRI Contact			
Sample ID	Sample Collection Date (mm/dd/yy)	Sample Collection Time	Matrix Type	Sample Type	# of Containers							REMARKS			
CNWRA K	4-13-04		W		1	X						Preservation a = HCl to pH <2 b = HNO ₃ to pH <2 c = H ₂ SO ₄ to pH <2 d = NaOH to pH >12 e = Cool (4°C±2°C) f = Other (specify) <u>none</u>			
												Nuclear Safety Related - use appropriate QA procedures			
												POC - Brad Werling x6565 fax 5184			
												20.06002.01.141			
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				Relinquished by (Print/Signature) <u>Joe Brown / [Signature]</u>					Date	Time	SwRI Project#: <u>20.06002.01.141</u>		
						Received by (Print/Signature)					Date	Time	Received by SwRI Lab: (Signature) <u>[Signature]</u>		
						Relinquished by (Print/Signature)					Date	Time	Date <u>4/14/04</u> Time <u>10:45</u>		
						Received by (Print/Signature)					Date	Time	Samples Disposed: Date Time		
Temp: <u>22.0°C</u> Therm #: <u>027</u>							Relinquished by (Print/Signature)					Date	Time	Samples Disposed by:	
Comments: <u>628/91</u>															

DIV. 20
SR #25770
PROJECT #06002.01.141
CASE: DIV. 20
VTSR: 04/14/04 1045

010050

SAMPLE LOG-IN SHEET

010051

Lab Name Southwest Research Institute			Page 1 of 1	
Received By (Print Name) DINO ROMAN			Log-in Date 04/14/2004	
Received By (Signature) <i>[Signature]</i>				
Case Number CNWRA		Sample Delivery Group No.		SAS Number <i>W/A</i>
Remarks: 06002.01.141				Remarks: Condition of Sample Shipment, etc
		EPA Sample #	Sample Tag #	Assigned Lab #
1. Custody Seal(s)	Present Absent* Intact/Broken	CNWRA 1	None	243222
2. Custody Seal Nos.	<i>✓</i> <i>W/A</i>	CNWRA 10	None	243223
		CNWRA 11	None	243224
3. Chain-of Custody Records	Present /Absent*	CNWRA 2	None	243225
4. Traffic Reports or Packing Lists	Present Absent	CNWRA 3	None	243226
5. Airbill	Airbill/Sticker Present /Absent*	CNWRA 4	None	243227
		CNWRA 5	None	243228
6. Airbill No.	HAND DELIVERED	CNWRA 6	None	243229
		CNWRA 7	None	243230
7. Sample Tags	Present Absent	CNWRA 8	None	243231
Sample Tag Numbers	Listed Not listed on Chain of Custody	CNWRA 9	None	243232
8. Sample Condition	<i>✓</i> Intact Broken*/ Leaking	CNWRA A	None	243233
9. Cooler Temperature	22.0C	CNWRA B	None	243234
10. Does Information on custody records, traffic reports, and sample tags agree?	Yes /No*	CNWRA C	None	243235
		CNWRA D	None	243236
11. Date Received at Lab	04/14/2004	CNWRA E	None	243237
12. Time Received	10:45:00	CNWRA F	None	243238
		CNWRA G	None	243239
		CNWRA H	None	243240
Fraction	<i>Inorg</i>	CNWRA I	None	243241
Area #	<i>Inorg #2</i>	CNWRA J	None	243242
By	DINO ROMAN	CNWRA K	None	243243
On	04/14/2004			

* Contact SMO and attach record of resolution

Reviewed By *CYNTHIA A. SALCEDA*
Date *04/17/2004*

Logbook No. Sample Receipt (25770)
Logbook Page No. 5042 *(SEE FOLIO 2-3 OF 4)*

010052

**SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT
CLIENT: Division 20
TASK ORDER: 040415-2
SRR: 25770
SDG: 243222
CASE: CNWRA
VTSR: April 14, 2004
PROJECT#: 06002.01.141**

Copies of Login Book

Sample Login Book

Apr 14, 2004

010053

SwRI Login Area
Division 1

Sample Receipt: 25769		Project: 10154.01.009	Client: Div. 18 (Brossia
VTSR Date: Apr 14, 2004		VTSR Time: 10:50:00	Manager: DAMMANN, MIKE
System ID	Customer Sample ID	Matrix	
243207	Filter #7	Product	
243208	Filter #8	Product	
243209	Filter #9	Product	
243210	Grease #1	Solid	
243211	Grease #2	Solid	
243212	Grease #3	Solid	
243213	Grease #4	Solid	
243214	Grease #5	Solid	
243215	N2837	Liquid	
243216	N2878	Liquid	
243217	N7338	Liquid	
243218	N7647	Liquid	
243219	O-Ring Filter #19	Product	
243220	O-Ring Filter #20	Product	
243221	WD 40	Liquid	

Sample Receipt: 25770		Project: 06002.01.141	Client: DIV 20
VTSR Date: Apr 14, 2004		VTSR Time: 10:45:00	Manager: DAMMANN, MIKE
System ID	Customer Sample ID	Matrix	
243222	CNWRA 1	Water	
243223	CNWRA 10	Water	
243224	CNWRA 11	Water	
243225	CNWRA 2	Water	
243226	CNWRA 3	Water	
243227	CNWRA 4	Water	
243228	CNWRA 5	Water	
243229	CNWRA 6	Water	
243230	CNWRA 7	Water	
243231	CNWRA 8	Water	
243232	CNWRA 9	Water	
243233	CNWRA A	Water	

Sample Login Book

Apr 14, 2004

010054

SwRI Login Area
Division 1

Sample Receipt: 25770		Project: 06002.01.141	Client: DIV 20
VTSR Date: Apr 14, 2004		VTSR Time: 10:45:00	Manager: DAMMANN, MIKE
System ID	Customer Sample ID	Matrix	
243234	CNWRA B	Water	
243235	CNWRA C	Water	
243236	CNWRA D	Water	
243237	CNWRA E	Water	
243238	CNWRA F	Water	
243239	CNWRA G	Water	
243240	CNWRA H	Water	
243241	CNWRA I	Water	
243242	CNWRA J	Water	
243243	CNWRA K	Water	

Sample Receipt: 25771		Project: 10192.01.10X	Client: Lynx, LTD.
VTSR Date: Apr 14, 2004		VTSR Time: 14:00:00	Manager: SUN, GANG
System ID	Customer Sample ID	Matrix	
243247	0404081305	Water	
243248	0404120704	Water	
243249	0404120951	Water	
243250	0404121005	Water	
243251	0404121305	Water	
243252	0404121324	Water	
243253	0404130956	Water	

Sample Receipt: 25772		Project: 10192.01.10X	Client: Lynx, LTD.
VTSR Date: Apr 14, 2004		VTSR Time: 14:00:00	Manager: SUN, GANG
System ID	Customer Sample ID	Matrix	
243254	0404121410	Water	
243255	0404131030	Water	

010055

**SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT**

CLIENT: Division 20

TASK ORDER: 040415-2

SRR: 25770

SDG: 243222

CASE: CNWRA

VTSR: April 14, 2004

PROJECT#: 06002.01.141

RAW DATA

Div 20
to#040415-2, 040521-6
06002.01.141

105401

Range
1/24/04

2 Spies
7/1/04

system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
243222"	Ag3280"	0.005	U	mg/L	0.005			-0.00032	06/15/04"	12:44"
243222"	Al3082"	0.05	U	mg/L	0.05			-0.01361	06/15/04"	12:44"
243222"	As1890"	0.005	U	mg/L	0.005			-0.00071	06/15/04"	12:44"
243222"	B_2496"	1.69		mg/L	0.05			1.68823	06/15/04"	12:44"
243222"	Ba4934"	0.297		mg/L	0.005			0.29658	06/15/04"	12:44"
243222"	Be3130"	0.005	U	mg/L	0.005			0.00005	06/15/04"	12:44"
243222"	Bi2230"	0.01	U	mg/L	0.01			0.00299	06/15/04"	12:44"
243222"	Ca3179"	29.1		mg/L	0.05			29.10540	06/15/04"	12:44"
243222"	Cd2265"	0.005	U	mg/L	0.005			0.00040	06/15/04"	12:44"
243222"	Co2286"	0.005	U	mg/L	0.005			0.00247	06/15/04"	12:44"
243222"	Cr2677"	0.015	U	mg/L	0.015			-0.00069	06/15/04"	12:44"
243222"	Cu3247"	0.005	U	mg/L	0.005			-0.00064	06/15/04"	12:44"
243222"	Fe2714"	0.1	U	mg/L	0.1			0.08023	06/15/04"	12:44"
243222"	K_766	0.414		mg/L	0.2			0.4138	06/15/04	13:18:25
243222"	La3988"	0.005	U	mg/L	0.005			-0.00017	06/15/04"	12:44"
243222"	Li670	0.01	U	mg/L	0.01			0.0020	06/15/04	13:18:25
243222"	Mg2790"	0.098		mg/L	0.05			0.09757	06/15/04"	12:44"
243222"	Mn2576"	0.005	U	mg/L	0.005			0.00408	06/15/04"	12:44"
243222"	Mo2020"	0.01	U	mg/L	0.01			0.00148	06/15/04"	12:44"
243222"	Na589	3.64		mg/L	0.2			3.6375	06/15/04	13:18:25
243222"	Ni2316"	0.059		mg/L	0.01			0.05876	06/15/04"	12:44"
243222"	P_1782"	0.02	U	mg/L	0.02			-0.00263	06/15/04"	12:44"
243222"	Pb220"	0.005	U	mg/L	0.005			0.00144	06/15/04"	12:44"
243222"	Pd3404"	0.005	U	mg/L	0.005			-0.00181	06/15/04"	12:44"
243222"	S_1820"	24.9		mg/L	0.05			24.93973	06/15/04"	12:44"
243222"	Sb2068"	0.02	U	mg/L	0.02			0.00192	06/15/04"	12:44"
243222"	Se196"	0.015	U	mg/L	0.015			0.00261	06/15/04"	12:44"
243222"	Si2881"	0.274		mg/L	0.05			0.27400	06/15/04"	12:44"
243222"	Sn1899"	0.01	U	mg/L	0.01			-0.00092	06/15/04"	12:44"
243222"	Sr4215"	0.212		mg/L	0.005			0.21215	06/15/04"	12:44"
243222"	Th2837"	0.015	U	mg/L	0.015			-0.00138	06/15/04"	12:44"
243222"	Ti3349"	0.005	U	mg/L	0.005			0.00007	06/15/04"	12:44"
243222"	Tl1908"	0.02	U	mg/L	0.02			0.00223	06/15/04"	12:44"
243222"	U_4090"	0.1	U	mg/L	0.1			0.00820	06/15/04"	12:44"
243222"	V_2924"	0.005	U	mg/L	0.005			0.00016	06/15/04"	12:44"
243222"	W_2079"	0.01	U	mg/L	0.01			-0.00129	06/15/04"	12:44"
243222"	Y_3710"	0.005	U	mg/L	0.005			-0.00015	06/15/04"	12:44"
243222"	Zn2062"	0.112		mg/L	0.005			0.11164	06/15/04"	12:44"
243222"	Zr3496"	0.005	U	mg/L	0.005			0.00013	06/15/04"	12:44"
243223"	Ag3280"	0.005	U	mg/L	0.005			-0.00038	06/15/04"	12:48"
243223"	Al3082"	0.05	U	mg/L	0.05			-0.01765	06/15/04"	12:48"
243223"	As1890"	0.005	U	mg/L	0.005			0.00189	06/15/04"	12:48"
243223"	B_2496"	0.138		mg/L	0.05			0.13826	06/15/04"	12:48"
243223"	Ba4934"	0.007		mg/L	0.005			0.00717	06/15/04"	12:48"
243223"	Be3130"	0.005	U	mg/L	0.005			0.00005	06/15/04"	12:48"
243223"	Bi2230"	0.01	U	mg/L	0.01			-0.00022	06/15/04"	12:48"
243223"	Ca3179"	17.8		mg/L	0.05			17.75094	06/15/04"	12:48"
243223"	Cd2265"	0.005	U	mg/L	0.005			0.00016	06/15/04"	12:48"
243223"	Co2286"	0.005	U	mg/L	0.005			0.00098	06/15/04"	12:48"
243223"	Cr2677"	0.015	U	mg/L	0.015			-0.00085	06/15/04"	12:48"
243223"	Cu3247"	0.005	U	mg/L	0.005			-0.00097	06/15/04"	12:48"
243223"	Fe2714"	0.1	U	mg/L	0.1			0.00866	06/15/04"	12:48"
243223"	K_766	5.08		mg/L	0.2			5.0838	06/15/04	13:22:00
243223"	La3988"	0.005	U	mg/L	0.005			-0.00020	06/15/04"	12:48"

0056

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system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
243223"	Li670	0.035		mg/L	0.01			0.0353	06/15/04	13:22:00
243223"	Mg2790"	2.78		mg/L	0.05			2.78323	06/15/04"	12:48"
243223"	Mn2576"	0.025		mg/L	0.005			0.02539	06/15/04"	12:48"
243223"	Mo2020"	0.01	U	mg/L	0.01			0.00309	06/15/04"	12:48"
243223"	Na589	34.9		mg/L	0.2			34.8656	06/15/04	13:22:00
243223"	Ni2316"	0.01	U	mg/L	0.01			0.00083	06/15/04"	12:48"
243223"	P_1782"	0.020		mg/L	0.02			0.02024	06/15/04"	12:48"
243223"	Pb220"	0.005	U	mg/L	0.005			0.00131	06/15/04"	12:48"
243223"	Pd3404"	0.005	U	mg/L	0.005			-0.00121	06/15/04"	12:48"
243223"	S_1820"	6.81		mg/L	0.05			6.80944	06/15/04"	12:48"
243223"	Sb2068"	0.02	U	mg/L	0.02			0.00168	06/15/04"	12:48"
243223"	Se196"	0.015	U	mg/L	0.015			0.00645	06/15/04"	12:48"
243223"	Si2881"	19.5		mg/L	0.05			19.50259	06/15/04"	12:48"
243223"	Sn1899"	0.015		mg/L	0.01			0.01464	06/15/04"	12:48"
243223"	Sr4215"	0.079		mg/L	0.005			0.07866	06/15/04"	12:48"
243223"	Th2837"	0.015	U	mg/L	0.015			-0.00249	06/15/04"	12:48"
243223"	Ti3349"	0.005	U	mg/L	0.005			-0.00034	06/15/04"	12:48"
243223"	Tl1908"	0.02	U	mg/L	0.02			-0.01242	06/15/04"	12:48"
243223"	U_4090"	0.1	U	mg/L	0.1			0.01111	06/15/04"	12:48"
243223"	V_2924"	0.005	U	mg/L	0.005			0.00168	06/15/04"	12:48"
243223"	W_2079"	0.01	U	mg/L	0.01			-0.00276	06/15/04"	12:48"
243223"	Y_3710"	0.005	U	mg/L	0.005			-0.00006	06/15/04"	12:48"
243223"	Zn2062"	0.005	U	mg/L	0.005			0.00027	06/15/04"	12:48"
243223"	Zr3496"	0.005	U	mg/L	0.005			-0.00010	06/15/04"	12:48"
243224"	Ag3280"	0.005	U	mg/L	0.005			-0.00011	06/15/04"	12:53"
243224"	Al3082"	0.05	U	mg/L	0.05			-0.01335	06/15/04"	12:53"
243224"	As1890"	0.005	U	mg/L	0.005			0.00055	06/15/04"	12:53"
243224"	B_2496"	0.05	U	mg/L	0.05			-0.00189	06/15/04"	12:53"
243224"	Ba4934"	0.005	U	mg/L	0.005			0.00020	06/15/04"	12:53"
243224"	Be3130"	0.005	U	mg/L	0.005			0.00002	06/15/04"	12:53"
243224"	Bi2230"	0.01	U	mg/L	0.01			0.00227	06/15/04"	12:53"
243224"	Ca3179"	5.00		mg/L	0.05			4.99723	06/15/04"	12:53"
243224"	Cd2265"	0.005	U	mg/L	0.005			0.00045	06/15/04"	12:53"
243224"	Co2286"	0.005	U	mg/L	0.005			0.00012	06/15/04"	12:53"
243224"	Cr2677"	0.015	U	mg/L	0.015			-0.00022	06/15/04"	12:53"
243224"	Cu3247"	0.005	U	mg/L	0.005			-0.00044	06/15/04"	12:53"
243224"	Fe2714"	0.1	U	mg/L	0.1			-0.00309	06/15/04"	12:53"
243224"	K_766	0.2	U	mg/L	0.2			0.0033	06/15/04	13:25:03
243224"	La3988"	0.005	U	mg/L	0.005			0.00000	06/15/04"	12:53"
243224"	Li670	0.01	U	mg/L	0.01			0.0007	06/15/04	13:25:03
243224"	Mg2790"	0.05	U	mg/L	0.05			0.00021	06/15/04"	12:53"
243224"	Mn2576"	0.005	U	mg/L	0.005			-0.00001	06/15/04"	12:53"
243224"	Mo2020"	0.01	U	mg/L	0.01			0.00020	06/15/04"	12:53"
243224"	Na589	8.86		mg/L	0.2			8.8576	06/15/04	13:25:03
243224"	Ni2316"	0.01	U	mg/L	0.01			0.00076	06/15/04"	12:53"
243224"	P_1782"	0.02	U	mg/L	0.02			0.00764	06/15/04"	12:53"
243224"	Pb220"	0.005	U	mg/L	0.005			-0.00136	06/15/04"	12:53"
243224"	Pd3404"	0.005	U	mg/L	0.005			-0.00047	06/15/04"	12:53"
243224"	S_1820"	0.05	U	mg/L	0.05			-0.03086	06/15/04"	12:53"
243224"	Sb2068"	0.02	U	mg/L	0.02			-0.00051	06/15/04"	12:53"
243224"	Se196"	0.015	U	mg/L	0.015			-0.00264	06/15/04"	12:53"
243224"	Si2881"	0.05	U	mg/L	0.05			0.03229	06/15/04"	12:53"
243224"	Sn1899"	0.01	U	mg/L	0.01			-0.00062	06/15/04"	12:53"
243224"	Sr4215"	0.005	U	mg/L	0.005			0.00013	06/15/04"	12:53"

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system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
243224"	Th2837"	0.015	U	mg/L	0.015			0.00156	06/15/04"	12:53"
243224"	Ti3349"	0.005	U	mg/L	0.005			0.00005	06/15/04"	12:53"
243224"	Tl1908"	0.02	U	mg/L	0.02			-0.00021	06/15/04"	12:53"
243224"	U_4090"	0.1	U	mg/L	0.1			-0.00951	06/15/04"	12:53"
243224"	V_2924"	0.005	U	mg/L	0.005			0.00051	06/15/04"	12:53"
243224"	W_2079"	0.01	U	mg/L	0.01			-0.00089	06/15/04"	12:53"
243224"	Y_3710"	0.005	U	mg/L	0.005			-0.00002	06/15/04"	12:53"
243224"	Zn2062"	0.005	U	mg/L	0.005			0.00031	06/15/04"	12:53"
243224"	Zr3496"	0.005	U	mg/L	0.005			0.00030	06/15/04"	12:53"
243225"	Ag3280"	0.005	U	mg/L	0.005			0.00010	06/15/04"	12:58"
243225"	Al3082"	0.05	U	mg/L	0.05			-0.00267	06/15/04"	12:58"
243225"	As1890"	0.005	U	mg/L	0.005			-0.00013	06/15/04"	12:58"
243225"	B_2496"	1.23		mg/L	0.05			1.23179	06/15/04"	12:58"
243225"	Ba4934"	0.183		mg/L	0.005			0.18317	06/15/04"	12:58"
243225"	Be3130"	0.005	U	mg/L	0.005			0.00004	06/15/04"	12:58"
243225"	Bi2230"	0.01	U	mg/L	0.01			0.00648	06/15/04"	12:58"
243225"	Ca3179"	0.248		mg/L	0.05			0.24774	06/15/04"	12:58"
243225"	Cd2265"	0.005	U	mg/L	0.005			0.00046	06/15/04"	12:58"
243225"	Co2286"	0.005	U	mg/L	0.005			0.00073	06/15/04"	12:58"
243225"	Cr2677"	0.015	U	mg/L	0.015			-0.00068	06/15/04"	12:58"
243225"	Cu3247"	0.005	U	mg/L	0.005			-0.00057	06/15/04"	12:58"
243225"	Fe2714"	0.1	U	mg/L	0.1			-0.00081	06/15/04"	12:58"
243225"	K_766	0.2	U	mg/L	0.2			0.1353	06/15/04	13:28:07
243225"	La3988"	0.005	U	mg/L	0.005			0.00015	06/15/04"	12:58"
243225"	Li670	0.01	U	mg/L	0.01			0.0015	06/15/04	13:28:07
243225"	Mg2790"	0.05	U	mg/L	0.05			0.03015	06/15/04"	12:58"
243225"	Mn2576"	0.005	U	mg/L	0.005			0.00111	06/15/04"	12:58"
243225"	Mo2020"	0.01	U	mg/L	0.01			0.00059	06/15/04"	12:58"
243225"	Na589	2.89		mg/L	0.2			2.8862	06/15/04	13:28:07
243225"	Ni2316"	0.016		mg/L	0.01			0.01570	06/15/04"	12:58"
243225"	P_1782"	0.02	U	mg/L	0.02			0.00390	06/15/04"	12:58"
243225"	Pb220"	0.005	U	mg/L	0.005			0.00026	06/15/04"	12:58"
243225"	Pd3404"	0.005	U	mg/L	0.005			-0.00138	06/15/04"	12:58"
243225"	S_1820"	0.432		mg/L	0.05			0.43194	06/15/04"	12:58"
243225"	Sb2068"	0.02	U	mg/L	0.02			-0.00289	06/15/04"	12:58"
243225"	Se196"	0.015	U	mg/L	0.015			-0.00026	06/15/04"	12:58"
243225"	Si2881"	0.465		mg/L	0.05			0.46477	06/15/04"	12:58"
243225"	Sn1899"	0.01	U	mg/L	0.01			0.00157	06/15/04"	12:58"
243225"	Sr4215"	0.005	U	mg/L	0.005			0.00141	06/15/04"	12:58"
243225"	Th2837"	0.015	U	mg/L	0.015			-0.00143	06/15/04"	12:58"
243225"	Ti3349"	0.005	U	mg/L	0.005			0.00019	06/15/04"	12:58"
243225"	Tl1908"	0.02	U	mg/L	0.02			0.00190	06/15/04"	12:58"
243225"	U_4090"	0.1	U	mg/L	0.1			0.02786	06/15/04"	12:58"
243225"	V_2924"	0.005	U	mg/L	0.005			0.00002	06/15/04"	12:58"
243225"	W_2079"	0.01	U	mg/L	0.01			0.00147	06/15/04"	12:58"
243225"	Y_3710"	0.005	U	mg/L	0.005			-0.00003	06/15/04"	12:58"
243225"	Zn2062"	0.032		mg/L	0.005			0.03244	06/15/04"	12:58"
243225"	Zr3496"	0.005	U	mg/L	0.005			0.00043	06/15/04"	12:58"
243225d"	Ag3280"	0.005	U	mg/L	0.005			-0.00014	06/15/04"	13:03"
243225d"	Al3082"	0.05	U	mg/L	0.05			-0.00843	06/15/04"	13:03"
243225d"	As1890"	0.005	U	mg/L	0.005			0.00085	06/15/04"	13:03"
243225d"	B_2496"	1.22		mg/L	0.05			1.21835	06/15/04"	13:03"
243225d"	Ba4934"	0.182		mg/L	0.005			0.18163	06/15/04"	13:03"
243225d"	Be3130"	0.005	U	mg/L	0.005			0.00003	06/15/04"	13:03"

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system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
243225d"	Bi2230"	0.01	U	mg/L	0.01			0.00118	06/15/04"	13:03"
243225d"	Ca3179"	0.242		mg/L	0.05			0.24219	06/15/04"	13:03"
243225d"	Cd2265"	0.005	U	mg/L	0.005			0.00047	06/15/04"	13:03"
243225d"	Co2286"	0.005	U	mg/L	0.005			0.00105	06/15/04"	13:03"
243225d"	Cr2677"	0.015	U	mg/L	0.015			0.00036	06/15/04"	13:03"
243225d"	Cu3247"	0.005	U	mg/L	0.005			-0.00053	06/15/04"	13:03"
243225d"	Fe2714"	0.1	U	mg/L	0.1			0.00182	06/15/04"	13:03"
243225d"	K_766	NA								
243225d"	La3988"	0.005	U	mg/L	0.005			0.00020	06/15/04"	13:03"
243225d"	Li670	NA								
243225d"	Mg2790"	0.05	U	mg/L	0.05			0.02957	06/15/04"	13:03"
243225d"	Mn2576"	0.005	U	mg/L	0.005			0.00102	06/15/04"	13:03"
243225d"	Mo2020"	0.01	U	mg/L	0.01			0.00030	06/15/04"	13:03"
243225d"	Na589	NA								
243225d"	Ni2316"	0.015		mg/L	0.01			0.01478	06/15/04"	13:03"
243225d"	P_1782"	0.02	U	mg/L	0.02			0.00196	06/15/04"	13:03"
243225d"	Pb220"	0.005	U	mg/L	0.005			-0.00177	06/15/04"	13:03"
243225d"	Pd3404"	0.005	U	mg/L	0.005			-0.00187	06/15/04"	13:03"
243225d"	S_1820"	0.419		mg/L	0.05			0.41930	06/15/04"	13:03"
243225d"	Sb2068"	0.02	U	mg/L	0.02			0.00243	06/15/04"	13:03"
243225d"	Se196"	0.015	U	mg/L	0.015			-0.00019	06/15/04"	13:03"
243225d"	Si2881"	0.456		mg/L	0.05			0.45600	06/15/04"	13:03"
243225d"	Sn1899"	0.01	U	mg/L	0.01			0.00194	06/15/04"	13:03"
243225d"	Sr4215"	0.005	U	mg/L	0.005			0.00137	06/15/04"	13:03"
243225d"	Th2837"	0.015	U	mg/L	0.015			-0.00183	06/15/04"	13:03"
243225d"	Ti3349"	0.005	U	mg/L	0.005			0.00022	06/15/04"	13:03"
243225d"	Tl1908"	0.02	U	mg/L	0.02			0.00119	06/15/04"	13:03"
243225d"	U_4090"	0.1	U	mg/L	0.1			0.00385	06/15/04"	13:03"
243225d"	V_2924"	0.005	U	mg/L	0.005			0.00058	06/15/04"	13:03"
243225d"	W_2079"	0.01	U	mg/L	0.01			-0.00072	06/15/04"	13:03"
243225d"	Y_3710"	0.005	U	mg/L	0.005			-0.00004	06/15/04"	13:03"
243225d"	Zn2062"	0.032		mg/L	0.005			0.03180	06/15/04"	13:03"
243225d"	Zr3496"	0.005	U	mg/L	0.005			0.00006	06/15/04"	13:03"
243226"	Ag3280"	0.005	U	mg/L	0.005			-0.00034	06/15/04"	13:07"
243226"	Al3082"	0.05	U	mg/L	0.05			0.00284	06/15/04"	13:07"
243226"	As1890"	0.005	U	mg/L	0.005			-0.00922	06/15/04"	13:07"
243226"	B_2496"	2.09		mg/L	0.05			2.09115	06/15/04"	13:07"
243226"	Ba4934"	0.273		mg/L	0.005			0.27330	06/15/04"	13:07"
243226"	Be3130"	0.005	U	mg/L	0.005			0.00007	06/15/04"	13:07"
243226"	Bi2230"	0.01	U	mg/L	0.01			-0.00344	06/15/04"	13:07"
243226"	Ca3179"	0.202		mg/L	0.05			0.20178	06/15/04"	13:07"
243226"	Cd2265"	0.005	U	mg/L	0.005			0.00016	06/15/04"	13:07"
243226"	Co2286"	0.005	U	mg/L	0.005			0.00078	06/15/04"	13:07"
243226"	Cr2677"	0.015	U	mg/L	0.015			-0.00023	06/15/04"	13:07"
243226"	Cu3247"	0.005	U	mg/L	0.005			-0.00033	06/15/04"	13:07"
243226"	Fe2714"	0.1	U	mg/L	0.1			-0.00830	06/15/04"	13:07"
243226"	K_766	0.316		mg/L	0.2			0.3161	06/15/04	13:31:11
243226"	La3988"	0.005	U	mg/L	0.005			-0.00032	06/15/04"	13:07"
243226"	Li670	0.01	U	mg/L	0.01			0.0033	06/15/04	13:31:11
243226"	Mg2790"	0.05	U	mg/L	0.05			0.02926	06/15/04"	13:07"
243226"	Mn2576"	0.005	U	mg/L	0.005			0.00111	06/15/04"	13:07"
243226"	Mo2020"	0.01	U	mg/L	0.01			-0.00119	06/15/04"	13:07"
243226"	Na589	4.49		mg/L	0.2			4.4891	06/15/04	13:31:11
243226"	Ni2316"	0.036		mg/L	0.01			0.03557	06/15/04"	13:07"

system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
243226"	P_1782"	0.059		mg/L	0.02			0.05896	06/15/04"	13:07"
243226"	Pb220"	0.005	U	mg/L	0.005			0.00438	06/15/04"	13:07"
243226"	Pd3404"	0.005	U	mg/L	0.005			-0.00188	06/15/04"	13:07"
243226"	S_1820"	0.395		mg/L	0.05			0.39494	06/15/04"	13:07"
243226"	Sb2068"	0.02	U	mg/L	0.02			0.01296	06/15/04"	13:07"
243226"	Se196"	0.05	U	mg/L	0.05			0.03007	06/15/04"	13:07"
243226"	Si2881"	1.57		mg/L	0.05			1.57164	06/15/04"	13:07"
243226"	Sn1899"	0.079		mg/L	0.01			0.07918	06/15/04"	13:07"
243226"	Sr4215"	0.005	U	mg/L	0.005			0.00157	06/15/04"	13:07"
243226"	Th2837"	0.015	U	mg/L	0.015			-0.00050	06/15/04"	13:07"
243226"	Ti3349"	0.005	U	mg/L	0.005			0.00124	06/15/04"	13:07"
243226"	Tl1908"	0.075	U	mg/L	0.075			-0.07278	06/15/04"	13:07"
243226"	U_4090"	0.1	U	mg/L	0.1			-0.00010	06/15/04"	13:07"
243226"	V_2924"	0.005	U	mg/L	0.005			0.00034	06/15/04"	13:07"
243226"	W_2079"	0.01	U	mg/L	0.01			-0.00817	06/15/04"	13:07"
243226"	Y_3710"	0.005	U	mg/L	0.005			-0.00001	06/15/04"	13:07"
243226"	Zn2062"	0.077		mg/L	0.005			0.07729	06/15/04"	13:07"
243226"	Zr3496"	0.005	U	mg/L	0.005			0.00058	06/15/04"	13:07"
243227"	Ag3280"	0.005	U	mg/L	0.005			-0.00038	06/15/04"	13:12"
243227"	Al3082"	0.05	U	mg/L	0.05			0.04515	06/15/04"	13:12"
243227"	As1890"	0.005	U	mg/L	0.005			-0.00135	06/15/04"	13:12"
243227"	B_2496"	2.01		mg/L	0.05			2.01249	06/15/04"	13:12"
243227"	Ba4934"	0.765		mg/L	0.005			0.76532	06/15/04"	13:12"
243227"	Be3130"	0.005	U	mg/L	0.005			0.00005	06/15/04"	13:12"
243227"	Bi2230"	0.01	U	mg/L	0.01			0.00714	06/15/04"	13:12"
243227"	Ca3179"	2.62		mg/L	0.05			2.62002	06/15/04"	13:12"
243227"	Cd2265"	0.005	U	mg/L	0.005			0.00034	06/15/04"	13:12"
243227"	Co2286"	0.005	U	mg/L	0.005			0.00194	06/15/04"	13:12"
243227"	Cr2677"	0.015	U	mg/L	0.015			0.00184	06/15/04"	13:12"
243227"	Cu3247"	0.008		mg/L	0.005			0.00836	06/15/04"	13:12"
243227"	Fe2714"	0.1	U	mg/L	0.1			0.03388	06/15/04"	13:12"
243227"	K_766	9.80		mg/L	0.2			9.8033	06/15/04	13:34:15
243227"	La3988"	0.005	U	mg/L	0.005			0.00002	06/15/04"	13:12"
243227"	Li670	0.01	U	mg/L	0.01			0.0020	06/15/04	13:34:15
243227"	Mg2790"	0.537		mg/L	0.05			0.53739	06/15/04"	13:12"
243227"	Mn2576"	0.049		mg/L	0.005			0.04853	06/15/04"	13:12"
243227"	Mo2020"	0.01	U	mg/L	0.01			0.00114	06/15/04"	13:12"
243227"	Na589	20.1		mg/L	0.2			20.1192	06/15/04	13:34:15
243227"	Ni2316"	0.024		mg/L	0.01			0.02380	06/15/04"	13:12"
243227"	P_1782"	0.02	U	mg/L	0.02			0.00776	06/15/04"	13:12"
243227"	Pb220"	0.005	U	mg/L	0.005			0.00103	06/15/04"	13:12"
243227"	Pd3404"	0.005	U	mg/L	0.005			-0.00160	06/15/04"	13:12"
243227"	S_1820"	1.04		mg/L	0.05			1.03629	06/15/04"	13:12"
243227"	Sb2068"	0.02	U	mg/L	0.02			0.00148	06/15/04"	13:12"
243227"	Se196"	0.015	U	mg/L	0.015			0.00317	06/15/04"	13:12"
243227"	Si2881"	1.54		mg/L	0.05			1.53548	06/15/04"	13:12"
243227"	Sn1899"	0.01	U	mg/L	0.01			0.00687	06/15/04"	13:12"
243227"	Sr4215"	0.014		mg/L	0.005			0.01441	06/15/04"	13:12"
243227"	Th2837"	0.015	U	mg/L	0.015			-0.00089	06/15/04"	13:12"
243227"	Ti3349"	0.005	U	mg/L	0.005			0.00158	06/15/04"	13:12"
243227"	Tl1908"	0.02	U	mg/L	0.02			-0.00424	06/15/04"	13:12"
243227"	U_4090"	0.1	U	mg/L	0.1			0.01053	06/15/04"	13:12"
243227"	V_2924"	0.005	U	mg/L	0.005			0.00091	06/15/04"	13:12"
243227"	W_2079"	0.01	U	mg/L	0.01			-0.00258	06/15/04"	13:12"

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243227"	Y_3710"	0.005	U	mg/L	0.005			0.00000	06/15/04"	13:12"
243227"	Zn2062"	0.268		mg/L	0.005			0.26835	06/15/04"	13:12"
243227"	Zr3496"	0.005	U	mg/L	0.005			0.00054	06/15/04"	13:12"
243228"	Ag3280"	0.005	U	mg/L	0.005			-0.00017	06/15/04"	13:17"
243228"	Al3082"	0.194		mg/L	0.05			0.19406	06/15/04"	13:17"
243228"	As1890"	0.005	U	mg/L	0.005			0.00020	06/15/04"	13:17"
243228"	B_2496"	2.47		mg/L	0.05			2.46841	06/15/04"	13:17"
243228"	Ba4934"	0.464		mg/L	0.005			0.46418	06/15/04"	13:17"
243228"	Be3130"	0.005	U	mg/L	0.005			0.00002	06/15/04"	13:17"
243228"	Bi2230"	0.01	U	mg/L	0.01			0.00398	06/15/04"	13:17"
243228"	Ca3179"	1.31		mg/L	0.05			1.30829	06/15/04"	13:17"
243228"	Cd2265"	0.005	U	mg/L	0.005			0.00029	06/15/04"	13:17"
243228"	Co2286"	0.005	U	mg/L	0.005			0.00091	06/15/04"	13:17"
243228"	Cr2677"	0.015	U	mg/L	0.015			0.00050	06/15/04"	13:17"
243228"	Cu3247"	0.005	U	mg/L	0.005			0.00096	06/15/04"	13:17"
243228"	Fe2714"	0.1	U	mg/L	0.1			0.06261	06/15/04"	13:17"
243228"	K_766	1.26		mg/L	0.2			1.2577	06/15/04	13:37:20
243228"	La3988"	0.005	U	mg/L	0.005			-0.00035	06/15/04"	13:17"
243228"	Li670	0.01	U	mg/L	0.01			0.0029	06/15/04	13:37:20
243228"	Mg2790"	0.364		mg/L	0.05			0.36424	06/15/04"	13:17"
243228"	Mn2576"	0.005	U	mg/L	0.005			0.00037	06/15/04"	13:17"
243228"	Mo2020"	0.01	U	mg/L	0.01			-0.00015	06/15/04"	13:17"
243228"	Na589	7.47		mg/L	0.2			7.4679	06/15/04	13:37:20
243228"	Ni2316"	0.01	U	mg/L	0.01			0.00023	06/15/04"	13:17"
243228"	P_1782"	0.037		mg/L	0.02			0.03730	06/15/04"	13:17"
243228"	Pb220"	0.005	U	mg/L	0.005			0.00135	06/15/04"	13:17"
243228"	Pd3404"	0.005	U	mg/L	0.005			-0.00217	06/15/04"	13:17"
243228"	S_1820"	0.987		mg/L	0.05			0.98693	06/15/04"	13:17"
243228"	Sb2068"	0.02	U	mg/L	0.02			-0.00365	06/15/04"	13:17"
243228"	Se196"	0.015	U	mg/L	0.015			0.00387	06/15/04"	13:17"
243228"	Si2881"	2.97		mg/L	0.05			2.97323	06/15/04"	13:17"
243228"	Sn1899"	0.01	U	mg/L	0.01			0.00405	06/15/04"	13:17"
243228"	Sr4215"	0.008		mg/L	0.005			0.00811	06/15/04"	13:17"
243228"	Th2837"	0.015	U	mg/L	0.015			-0.00379	06/15/04"	13:17"
243228"	Ti3349"	0.007		mg/L	0.005			0.00745	06/15/04"	13:17"
243228"	Tl1908"	0.02	U	mg/L	0.02			0.00098	06/15/04"	13:17"
243228"	U_4090"	0.1	U	mg/L	0.1			0.00440	06/15/04"	13:17"
243228"	V_2924"	0.005	U	mg/L	0.005			0.00107	06/15/04"	13:17"
243228"	W_2079"	0.01	U	mg/L	0.01			-0.00154	06/15/04"	13:17"
243228"	Y_3710"	0.005	U	mg/L	0.005			0.00001	06/15/04"	13:17"
243228"	Zn2062"	0.119		mg/L	0.005			0.11888	06/15/04"	13:17"
243228"	Zr3496"	0.005	U	mg/L	0.005			0.00051	06/15/04"	13:17"
243229"	Ag3280"	0.005	U	mg/L	0.005			-0.00011	06/15/04"	13:37"
243229"	Al3082"	0.05	U	mg/L	0.05			-0.02060	06/15/04"	13:37"
243229"	As1890"	0.005	U	mg/L	0.005			0.00370	06/15/04"	13:37"
243229"	B_2496"	0.142		mg/L	0.05			0.14166	06/15/04"	13:37"
243229"	Ba4934"	0.012		mg/L	0.005			0.01211	06/15/04"	13:37"
243229"	Be3130"	0.005	U	mg/L	0.005			0.00008	06/15/04"	13:37"
243229"	Bi2230"	0.01	U	mg/L	0.01			0.00280	06/15/04"	13:37"
243229"	Ca3179"	24.7		mg/L	0.05			24.72039	06/15/04"	13:37"
243229"	Cd2265"	0.005	U	mg/L	0.005			0.00036	06/15/04"	13:37"
243229"	Co2286"	0.005	U	mg/L	0.005			0.00076	06/15/04"	13:37"
243229"	Cr2677"	0.015	U	mg/L	0.015			0.00000	06/15/04"	13:37"
243229"	Cu3247"	0.005	U	mg/L	0.005			-0.00012	06/15/04"	13:37"

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243229"	Fe2714"	0.1	U	mg/L	0.1			-0.00319	06/15/04"	13:37"
243229"	K_766	5.53		mg/L	0.2			5.5317	06/15/04	13:40:24
243229"	La3988"	0.005	U	mg/L	0.005			-0.00012	06/15/04"	13:37"
243229"	Li670	0.035		mg/L	0.01			0.0352	06/15/04	13:40:24
243229"	Mg2790"	3.29		mg/L	0.05			3.28619	06/15/04"	13:37"
243229"	Mn2576"	0.005	U	mg/L	0.005			0.00000	06/15/04"	13:37"
243229"	Mo2020"	0.01	U	mg/L	0.01			0.00588	06/15/04"	13:37"
243229"	Na589	37.3		mg/L	0.2			37.2965	06/15/04	13:40:24
243229"	Ni2316"	0.01	U	mg/L	0.01			-0.00131	06/15/04"	13:37"
243229"	P_1782"	0.025		mg/L	0.02			0.02484	06/15/04"	13:37"
243229"	Pb220"	0.005	U	mg/L	0.005			-0.00043	06/15/04"	13:37"
243229"	Pd3404"	0.005	U	mg/L	0.005			-0.00257	06/15/04"	13:37"
243229"	S_1820"	8.52		mg/L	0.05			8.52205	06/15/04"	13:37"
243229"	Sb2068"	0.02	U	mg/L	0.02			-0.00008	06/15/04"	13:37"
243229"	Se196"	0.015	U	mg/L	0.015			0.00546	06/15/04"	13:37"
243229"	Si2881"	24.3		mg/L	0.05			24.29212	06/15/04"	13:37"
243229"	Sn1899"	0.016		mg/L	0.01			0.01595	06/15/04"	13:37"
243229"	Sr4215"	0.100		mg/L	0.005			0.10041	06/15/04"	13:37"
243229"	Th2837"	0.015	U	mg/L	0.015			-0.00517	06/15/04"	13:37"
243229"	Ti3349"	0.005	U	mg/L	0.005			-0.00031	06/15/04"	13:37"
243229"	Tl1908"	0.02	U	mg/L	0.02			0.00521	06/15/04"	13:37"
243229"	U_4090"	0.1	U	mg/L	0.1			0.00043	06/15/04"	13:37"
243229"	V_2924"	0.005	U	mg/L	0.005			0.00326	06/15/04"	13:37"
243229"	W_2079"	0.01	U	mg/L	0.01			-0.00160	06/15/04"	13:37"
243229"	Y_3710"	0.005	U	mg/L	0.005			-0.00009	06/15/04"	13:37"
243229"	Zn2062"	0.005	U	mg/L	0.005			0.00221	06/15/04"	13:37"
243229"	Zr3496"	0.005	U	mg/L	0.005			-0.00001	06/15/04"	13:37"
243230"	Ag3280"	0.005	U	mg/L	0.005			0.00013	06/15/04"	13:41"
243230"	Al3082"	0.05	U	mg/L	0.05			0.01895	06/15/04"	13:41"
243230"	As1890"	0.005	U	mg/L	0.005			-0.00265	06/15/04"	13:41"
243230"	B_2496"	0.258		mg/L	0.05			0.25843	06/15/04"	13:41"
243230"	Ba4934"	0.005	U	mg/L	0.005			0.00279	06/15/04"	13:41"
243230"	Be3130"	0.005	U	mg/L	0.005			0.00002	06/15/04"	13:41"
243230"	Bi2230"	0.01	U	mg/L	0.01			-0.00302	06/15/04"	13:41"
243230"	Ca3179"	2.49		mg/L	0.05			2.49218	06/15/04"	13:41"
243230"	Cd2265"	0.005	U	mg/L	0.005			0.00034	06/15/04"	13:41"
243230"	Co2286"	0.005	U	mg/L	0.005			0.00005	06/15/04"	13:41"
243230"	Cr2677"	0.015	U	mg/L	0.015			-0.00056	06/15/04"	13:41"
243230"	Cu3247"	0.005	U	mg/L	0.005			0.00153	06/15/04"	13:41"
243230"	Fe2714"	0.136		mg/L	0.1			0.13575	06/15/04"	13:41"
243230"	K_766	3.81		mg/L	0.2			3.8069	06/15/04	13:53:15
243230"	La3988"	0.005	U	mg/L	0.005			0.00030	06/15/04"	13:41"
243230"	Li670	0.270		mg/L	0.01			0.2696	06/15/04	13:53:15
243230"	Mg2790"	0.112		mg/L	0.05			0.11207	06/15/04"	13:41"
243230"	Mn2576"	0.005	U	mg/L	0.005			0.00367	06/15/04"	13:41"
243230"	Mo2020"	0.046		mg/L	0.01			0.04588	06/15/04"	13:41"
243230"	Na589	206		mg/L	0.2			205.8112	06/15/04	13:53:15
243230"	Ni2316"	0.01	U	mg/L	0.01			-0.00082	06/15/04"	13:41"
243230"	P_1782"	0.057		mg/L	0.02			0.05706	06/15/04"	13:41"
243230"	Pb220"	0.005	U	mg/L	0.005			0.00388	06/15/04"	13:41"
243230"	Pd3404"	0.005	U	mg/L	0.005			-0.00002	06/15/04"	13:41"
243230"	S_1820"	10.4		mg/L	0.05			10.40335	06/15/04"	13:41"
243230"	Sb2068"	0.02	U	mg/L	0.02			0.01376	06/15/04"	13:41"
243230"	Se196"	0.05	U	mg/L	0.05			0.02561	06/15/04"	13:41"

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243230"	Si2881"	7.88		mg/L	0.05			7.88349	06/15/04"	13:41"
243230"	Sn1899"	0.062		mg/L	0.01			0.06231	06/15/04"	13:41"
243230"	Sr4215"	0.007		mg/L	0.005			0.00696	06/15/04"	13:41"
243230"	Th2837"	0.015	U	mg/L	0.015			-0.00020	06/15/04"	13:41"
243230"	Ti3349"	0.005	U	mg/L	0.005			-0.00013	06/15/04"	13:41"
243230"	Tl1908"	0.075	U	mg/L	0.075			-0.07505	06/15/04"	13:41"
243230"	U_4090"	0.1	U	mg/L	0.1			-0.00299	06/15/04"	13:41"
243230"	V_2924"	0.005	U	mg/L	0.005			-0.00034	06/15/04"	13:41"
243230"	W_2079"	0.01	U	mg/L	0.01			0.00136	06/15/04"	13:41"
243230"	Y_3710"	0.005	U	mg/L	0.005			-0.00001	06/15/04"	13:41"
243230"	Zn2062"	0.005	U	mg/L	0.005			0.00008	06/15/04"	13:41"
243230"	Zr3496"	0.005	U	mg/L	0.005			0.00010	06/15/04"	13:41"
243230d	K_766	3.82		mg/L	0.2			3.8217	06/15/04	13:56:19
243230d	Li670	0.265		mg/L	0.01			0.2654	06/15/04	13:56:19
243230d	Na589	203		mg/L	0.2			202.7277	06/15/04	13:56:19
243231"	Ag3280"	0.005	U	mg/L	0.005			-0.00044	06/15/04"	13:46"
243231"	Al3082"	0.05	U	mg/L	0.05			-0.01994	06/15/04"	13:46"
243231"	As1890"	0.010		mg/L	0.005			0.00960	06/15/04"	13:46"
243231"	B_2496"	0.136		mg/L	0.05			0.13600	06/15/04"	13:46"
243231"	Ba4934"	0.008		mg/L	0.005			0.00813	06/15/04"	13:46"
243231"	Be3130"	0.005	U	mg/L	0.005			0.00011	06/15/04"	13:46"
243231"	Bi2230"	0.01	U	mg/L	0.01			0.00182	06/15/04"	13:46"
243231"	Ca3179"	13.3		mg/L	0.05			13.29359	06/15/04"	13:46"
243231"	Cd2265"	0.005	U	mg/L	0.005			0.00015	06/15/04"	13:46"
243231"	Co2286"	0.005	U	mg/L	0.005			0.00094	06/15/04"	13:46"
243231"	Cr2677"	0.015	U	mg/L	0.015			-0.00012	06/15/04"	13:46"
243231"	Cu3247"	0.005	U	mg/L	0.005			-0.00056	06/15/04"	13:46"
243231"	Fe2714"	0.1	U	mg/L	0.1			0.01436	06/15/04"	13:46"
243231"	K_766	5.68		mg/L	0.2			5.6802	06/15/04	13:59:23
243231"	La3988"	0.005	U	mg/L	0.005			0.00002	06/15/04"	13:46"
243231"	Li670	0.038		mg/L	0.01			0.0381	06/15/04	13:59:23
243231"	Mg2790"	2.05		mg/L	0.05			2.05341	06/15/04"	13:46"
243231"	Mn2576"	0.006		mg/L	0.005			0.00565	06/15/04"	13:46"
243231"	Mo2020"	0.01	U	mg/L	0.01			0.00976	06/15/04"	13:46"
243231"	Na589	41.9		mg/L	0.2			41.9194	06/15/04	13:59:23
243231"	Ni2316"	0.01	U	mg/L	0.01			0.00021	06/15/04"	13:46"
243231"	P_1782"	0.02	U	mg/L	0.02			0.01870	06/15/04"	13:46"
243231"	Pb220"	0.005	U	mg/L	0.005			-0.00014	06/15/04"	13:46"
243231"	Pd3404"	0.005	U	mg/L	0.005			0.00176	06/15/04"	13:46"
243231"	S_1820"	6.96		mg/L	0.05			6.95732	06/15/04"	13:46"
243231"	Sb2068"	0.02	U	mg/L	0.02			0.00281	06/15/04"	13:46"
243231"	Se196"	0.015	U	mg/L	0.015			0.00352	06/15/04"	13:46"
243231"	Si2881"	25.7		mg/L	0.05			25.68427	06/15/04"	13:46"
243231"	Sn1899"	0.013		mg/L	0.01			0.01292	06/15/04"	13:46"
243231"	Sr4215"	0.067		mg/L	0.005			0.06656	06/15/04"	13:46"
243231"	Th2837"	0.015	U	mg/L	0.015			-0.00306	06/15/04"	13:46"
243231"	Ti3349"	0.005	U	mg/L	0.005			-0.00031	06/15/04"	13:46"
243231"	Tl1908"	0.02	U	mg/L	0.02			-0.00893	06/15/04"	13:46"
243231"	U_4090"	0.1	U	mg/L	0.1			0.01220	06/15/04"	13:46"
243231"	V_2924"	0.006		mg/L	0.005			0.00562	06/15/04"	13:46"
243231"	W_2079"	0.01	U	mg/L	0.01			0.00058	06/15/04"	13:46"
243231"	Y_3710"	0.005	U	mg/L	0.005			-0.00007	06/15/04"	13:46"
243231"	Zn2062"	0.005	U	mg/L	0.005			0.00162	06/15/04"	13:46"
243231"	Zr3496"	0.005	U	mg/L	0.005			0.00023	06/15/04"	13:46"

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243231s"	Ag3280"	0.051		mg/L	0.005	0.05	102.5%	0.05126	06/15/04"	13:51"
243231s"	Al3082"	1.95		mg/L	0.05	2	97.3%	1.94636	06/15/04"	13:51"
243231s"	As1890"	2.04		mg/L	0.005	2	101.7%	2.04387	06/15/04"	13:51"
243231s"	B_2496"	0.141		mg/L	0.05			0.14074	06/15/04"	13:51"
243231s"	Ba4934"	2.03		mg/L	0.005	2	100.9%	2.02688	06/15/04"	13:51"
243231s"	Be3130"	0.049		mg/L	0.005	0.05	98.7%	0.04937	06/15/04"	13:51"
243231s"	Bi2230"	0.01	U	mg/L	0.01			0.00819	06/15/04"	13:51"
243231s"	Ca3179"	33.7		mg/L	0.05	20	101.9%	33.68361	06/15/04"	13:51"
243231s"	Cd2265"	0.050		mg/L	0.005	0.05	99.5%	0.04974	06/15/04"	13:51"
243231s"	Co2286"	0.501		mg/L	0.005	0.5	100.2%	0.50096	06/15/04"	13:51"
243231s"	Cr2677"	0.197		mg/L	0.015	0.2	98.5%	0.19705	06/15/04"	13:51"
243231s"	Cu3247"	0.252		mg/L	0.005	0.25	100.8%	0.25190	06/15/04"	13:51"
243231s"	Fe2714"	1.08		mg/L	0.1	1	108.4%	1.08374	06/15/04"	13:51"
243231s"	K_766	NA								
243231s"	La3988"	0.005	U	mg/L	0.005			0.00010	06/15/04"	13:51"
243231s"	Li670	NA								
243231s"	Mg2790"	22.4		mg/L	0.05	20	101.5%	22.35152	06/15/04"	13:51"
243231s"	Mn2576"	0.509		mg/L	0.005	0.5	100.6%	0.50902	06/15/04"	13:51"
243231s"	Mo2020"	0.011		mg/L	0.01			0.01103	06/15/04"	13:51"
243231s"	Na589	NA								
243231s"	Ni2316"	0.490		mg/L	0.01	0.5	98.0%	0.48997	06/15/04"	13:51"
243231s"	P_1782"	0.029		mg/L	0.02			0.02887	06/15/04"	13:51"
243231s"	Pb220"	0.497		mg/L	0.005	0.5	99.3%	0.49663	06/15/04"	13:51"
243231s"	Pd3404"	0.005	U	mg/L	0.005			0.00004	06/15/04"	13:51"
243231s"	S_1820"	7.04		mg/L	0.05			7.03781	06/15/04"	13:51"
243231s"	Sb2068"	0.505		mg/L	0.02	0.5	101.1%	0.50545	06/15/04"	13:51"
243231s"	Se196"	2.23		mg/L	0.015	2	111.6%	2.23159	06/15/04"	13:51"
243231s"	Si2881"	25.9		mg/L	0.05			25.88962	06/15/04"	13:51"
243231s"	Sn1899"	0.013		mg/L	0.01			0.01266	06/15/04"	13:51"
243231s"	Sr4215"	0.067		mg/L	0.005			0.06747	06/15/04"	13:51"
243231s"	Th2837"	0.015	U	mg/L	0.015			-0.01570	06/15/04"	13:51"
243231s"	Ti3349"	0.005	U	mg/L	0.005			-0.00019	06/15/04"	13:51"
243231s"	Tl1908"	2.08		mg/L	0.02	2	103.8%	2.07547	06/15/04"	13:51"
243231s"	U_4090"	0.1	U	mg/L	0.1			0.00811	06/15/04"	13:51"
243231s"	V_2924"	0.505		mg/L	0.005	0.5	99.8%	0.50501	06/15/04"	13:51"
243231s"	W_2079"	0.01	U	mg/L	0.01			0.00070	06/15/04"	13:51"
243231s"	Y_3710"	0.005	U	mg/L	0.005			-0.00008	06/15/04"	13:51"
243231s"	Zn2062"	0.509		mg/L	0.005	0.5	101.8%	0.50897	06/15/04"	13:51"
243231s"	Zr3496"	0.005	U	mg/L	0.005			0.00014	06/15/04"	13:51"
243232"	Ag3280"	0.005	U	mg/L	0.005			-0.00015	06/15/04"	13:56"
243232"	Al3082"	0.05	U	mg/L	0.05			0.00710	06/15/04"	13:56"
243232"	As1890"	0.008		mg/L	0.005			0.00778	06/15/04"	13:56"
243232"	B_2496"	0.142		mg/L	0.05			0.14230	06/15/04"	13:56"
243232"	Ba4934"	0.014		mg/L	0.005			0.01383	06/15/04"	13:56"
243232"	Be3130"	0.005	U	mg/L	0.005			0.00014	06/15/04"	13:56"
243232"	Bi2230"	0.01	U	mg/L	0.01			0.00387	06/15/04"	13:56"
243232"	Ca3179"	12.8		mg/L	0.05			12.79881	06/15/04"	13:56"
243232"	Cd2265"	0.005	U	mg/L	0.005			0.00023	06/15/04"	13:56"
243232"	Co2286"	0.005	U	mg/L	0.005			0.00000	06/15/04"	13:56"
243232"	Cr2677"	0.015	U	mg/L	0.015			0.00032	06/15/04"	13:56"
243232"	Cu3247"	0.005	U	mg/L	0.005			-0.00028	06/15/04"	13:56"
243232"	Fe2714"	0.1	U	mg/L	0.1			0.00607	06/15/04"	13:56"
243232"	K_766	3.82		mg/L	0.2			3.8210	06/15/04	14:02:28
243232"	La3988"	0.005	U	mg/L	0.005			-0.00007	06/15/04"	13:56"

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243232"	Li670	0.045		mg/L	0.01			0.0448	06/15/04	14:02:28
243232"	Mg2790"	1.07		mg/L	0.05			1.06501	06/15/04"	13:56"
243232"	Mn2576"	0.005	U	mg/L	0.005			0.00023	06/15/04"	13:56"
243232"	Mo2020"	0.01	U	mg/L	0.01			0.00428	06/15/04"	13:56"
243232"	Na589	48.6		mg/L	0.2			48.5507	06/15/04	14:02:28
243232"	Ni2316"	0.01	U	mg/L	0.01			-0.00068	06/15/04"	13:56"
243232"	P_1782"	0.02	U	mg/L	0.02			0.00877	06/15/04"	13:56"
243232"	Pb220"	0.005	U	mg/L	0.005			-0.00057	06/15/04"	13:56"
243232"	Pd3404"	0.005	U	mg/L	0.005			-0.00137	06/15/04"	13:56"
243232"	S_1820"	8.09		mg/L	0.05			8.09277	06/15/04"	13:56"
243232"	Sb2068"	0.02	U	mg/L	0.02			0.00151	06/15/04"	13:56"
243232"	Se196"	0.015	U	mg/L	0.015			0.00391	06/15/04"	13:56"
243232"	Si2881"	26.2		mg/L	0.05			26.22082	06/15/04"	13:56"
243232"	Sn1899"	0.012		mg/L	0.01			0.01230	06/15/04"	13:56"
243232"	Sr4215"	0.071		mg/L	0.005			0.07071	06/15/04"	13:56"
243232"	Th2837"	0.015	U	mg/L	0.015			-0.00233	06/15/04"	13:56"
243232"	Ti3349"	0.005	U	mg/L	0.005			-0.00012	06/15/04"	13:56"
243232"	Tl1908"	0.02	U	mg/L	0.02			-0.00938	06/15/04"	13:56"
243232"	U_4090"	0.1	U	mg/L	0.1			0.02237	06/15/04"	13:56"
243232"	V_2924"	0.007		mg/L	0.005			0.00667	06/15/04"	13:56"
243232"	W_2079"	0.01	U	mg/L	0.01			0.00052	06/15/04"	13:56"
243232"	Y_3710"	0.005	U	mg/L	0.005			-0.00009	06/15/04"	13:56"
243232"	Zn2062"	0.005	U	mg/L	0.005			-0.00096	06/15/04"	13:56"
243232"	Zr3496"	0.005	U	mg/L	0.005			-0.00014	06/15/04"	13:56"
243232s	K_766	24.1		mg/L	0.2	20	101.3%	24.0845	06/15/04	14:06:02
243232s	Li670	0.046		mg/L	0.01			0.0462	06/15/04	14:06:02
243232s	Na589	68.6		mg/L	0.2	20	99.8%	68.5664	06/15/04	14:06:02
245108"	Ag3280"	0.005	U	mg/L	0.005			-0.00012	06/15/04"	14:00"
245108"	Al3082"	0.05	U	mg/L	0.05			-0.01246	06/15/04"	14:00"
245108"	As1890"	0.006		mg/L	0.005			0.00613	06/15/04"	14:00"
245108"	B_2496"	0.145		mg/L	0.05			0.14501	06/15/04"	14:00"
245108"	Ba4934"	0.011		mg/L	0.005			0.01058	06/15/04"	14:00"
245108"	Be3130"	0.005	U	mg/L	0.005			0.00017	06/15/04"	14:00"
245108"	Bi2230"	0.01	U	mg/L	0.01			0.00215	06/15/04"	14:00"
245108"	Ca3179"	13.6		mg/L	0.05			13.58609	06/15/04"	14:00"
245108"	Cd2265"	0.005	U	mg/L	0.005			0.00004	06/15/04"	14:00"
245108"	Co2286"	0.005	U	mg/L	0.005			0.00120	06/15/04"	14:00"
245108"	Cr2677"	0.015	U	mg/L	0.015			0.00032	06/15/04"	14:00"
245108"	Cu3247"	0.005	U	mg/L	0.005			0.00053	06/15/04"	14:00"
245108"	Fe2714"	0.1	U	mg/L	0.1			0.01202	06/15/04"	14:00"
245108"	K_766	3.59		mg/L	0.2			3.5922	06/15/04	14:09:07
245108"	La3988"	0.005	U	mg/L	0.005			0.00013	06/15/04"	14:00"
245108"	Li670	0.042		mg/L	0.01			0.0417	06/15/04	14:09:07
245108"	Mg2790"	1.34		mg/L	0.05			1.34495	06/15/04"	14:00"
245108"	Mn2576"	0.005	U	mg/L	0.005			0.00174	06/15/04"	14:00"
245108"	Mo2020"	0.01	U	mg/L	0.01			0.00819	06/15/04"	14:00"
245108"	Na589	51.7		mg/L	0.2			51.6882	06/15/04	14:09:07
245108"	Ni2316"	0.01	U	mg/L	0.01			0.00000	06/15/04"	14:00"
245108"	P_1782"	0.02	U	mg/L	0.02			0.01716	06/15/04"	14:00"
245108"	Pb220"	0.005	U	mg/L	0.005			-0.00151	06/15/04"	14:00"
245108"	Pd3404"	0.005	U	mg/L	0.005			0.00060	06/15/04"	14:00"
245108"	S_1820"	9.43		mg/L	0.05			9.42693	06/15/04"	14:00"
245108"	Sb2068"	0.02	U	mg/L	0.02			-0.00049	06/15/04"	14:00"
245108"	Se196"	0.015	U	mg/L	0.015			0.00025	06/15/04"	14:00"

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245108"	Si2881"	19.7		mg/L	0.05			19.70862	06/15/04"	14:00"
245108"	Sn1899"	0.01	U	mg/L	0.01			0.00415	06/15/04"	14:00"
245108"	Sr4215"	0.075		mg/L	0.005			0.07474	06/15/04"	14:00"
245108"	Th2837"	0.015	U	mg/L	0.015			-0.00297	06/15/04"	14:00"
245108"	Ti3349"	0.005	U	mg/L	0.005			-0.00026	06/15/04"	14:00"
245108"	Tl1908"	0.02	U	mg/L	0.02			-0.00225	06/15/04"	14:00"
245108"	U_4090"	0.1	U	mg/L	0.1			0.01539	06/15/04"	14:00"
245108"	V_2924"	0.013		mg/L	0.005			0.01334	06/15/04"	14:00"
245108"	W_2079"	0.01	U	mg/L	0.01			0.00567	06/15/04"	14:00"
245108"	Y_3710"	0.005	U	mg/L	0.005			-0.00013	06/15/04"	14:00"
245108"	Zn2062"	0.005	U	mg/L	0.005			0.00154	06/15/04"	14:00"
245108"	Zr3496"	0.005	U	mg/L	0.005			0.00061	06/15/04"	14:00"
245108d"	Ag3280"	0.005	U	mg/L	0.005			-0.00002	06/15/04"	14:05"
245108d"	Al3082"	0.05	U	mg/L	0.05			-0.02038	06/15/04"	14:05"
245108d"	As1890"	0.009		mg/L	0.005			0.00854	06/15/04"	14:05"
245108d"	B_2496"	0.140		mg/L	0.05			0.13992	06/15/04"	14:05"
245108d"	Ba4934"	0.010		mg/L	0.005			0.01033	06/15/04"	14:05"
245108d"	Be3130"	0.005	U	mg/L	0.005			0.00020	06/15/04"	14:05"
245108d"	Bi2230"	0.01	U	mg/L	0.01			0.00460	06/15/04"	14:05"
245108d"	Ca3179"	13.2		mg/L	0.05			13.20116	06/15/04"	14:05"
245108d"	Cd2265"	0.005	U	mg/L	0.005			0.00044	06/15/04"	14:05"
245108d"	Co2286"	0.005	U	mg/L	0.005			0.00004	06/15/04"	14:05"
245108d"	Cr2677"	0.015	U	mg/L	0.015			-0.00036	06/15/04"	14:05"
245108d"	Cu3247"	0.005	U	mg/L	0.005			0.00058	06/15/04"	14:05"
245108d"	Fe2714"	0.1	U	mg/L	0.1			0.00315	06/15/04"	14:05"
245108d"	K_766	3.58		mg/L	0.2			3.5812	06/15/04	14:12:11
245108d"	La3988"	0.005	U	mg/L	0.005			0.00000	06/15/04"	14:05"
245108d"	Li670	0.043		mg/L	0.01			0.0425	06/15/04	14:12:11
245108d"	Mg2790"	1.31		mg/L	0.05			1.30866	06/15/04"	14:05"
245108d"	Mn2576"	0.005	U	mg/L	0.005			0.00158	06/15/04"	14:05"
245108d"	Mo2020"	0.01	U	mg/L	0.01			0.00826	06/15/04"	14:05"
245108d"	Na589	51.8		mg/L	0.2			51.7678	06/15/04	14:12:11
245108d"	Ni2316"	0.01	U	mg/L	0.01			0.00068	06/15/04"	14:05"
245108d"	P_1782"	0.02	U	mg/L	0.02			0.01283	06/15/04"	14:05"
245108d"	Pb220"	0.005	U	mg/L	0.005			-0.00035	06/15/04"	14:05"
245108d"	Pd3404"	0.005	U	mg/L	0.005			-0.00075	06/15/04"	14:05"
245108d"	S_1820"	9.20		mg/L	0.05			9.20236	06/15/04"	14:05"
245108d"	Sb2068"	0.02	U	mg/L	0.02			0.00174	06/15/04"	14:05"
245108d"	Se196"	0.015	U	mg/L	0.015			0.00108	06/15/04"	14:05"
245108d"	Si2881"	19.1		mg/L	0.05			19.13470	06/15/04"	14:05"
245108d"	Sn1899"	0.01	U	mg/L	0.01			0.00501	06/15/04"	14:05"
245108d"	Sr4215"	0.073		mg/L	0.005			0.07274	06/15/04"	14:05"
245108d"	Th2837"	0.015	U	mg/L	0.015			-0.00187	06/15/04"	14:05"
245108d"	Ti3349"	0.005	U	mg/L	0.005			-0.00013	06/15/04"	14:05"
245108d"	Tl1908"	0.02	U	mg/L	0.02			-0.00342	06/15/04"	14:05"
245108d"	U_4090"	0.1	U	mg/L	0.1			0.01616	06/15/04"	14:05"
245108d"	V_2924"	0.013		mg/L	0.005			0.01314	06/15/04"	14:05"
245108d"	W_2079"	0.01	U	mg/L	0.01			0.00355	06/15/04"	14:05"
245108d"	Y_3710"	0.005	U	mg/L	0.005			-0.00004	06/15/04"	14:05"
245108d"	Zn2062"	0.005	U	mg/L	0.005			0.00277	06/15/04"	14:05"
245108d"	Zr3496"	0.005	U	mg/L	0.005			0.00043	06/15/04"	14:05"
245108s"	Ag3280"	0.050		mg/L	0.005	0.05	100.9%	0.05043	06/15/04"	14:10"
245108s"	Al3082"	1.94		mg/L	0.05	2	97.0%	1.93996	06/15/04"	14:10"
245108s"	As1890"	2.03		mg/L	0.005	2	101.1%	2.02830	06/15/04"	14:10"

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system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
245108s"	B_2496"	0.142		mg/L	0.05			0.14203	06/15/04"	14:10"
245108s"	Ba4934"	2.01		mg/L	0.005	2	99.8%	2.00761	06/15/04"	14:10"
245108s"	Be3130"	0.049		mg/L	0.005	0.05	97.8%	0.04892	06/15/04"	14:10"
245108s"	Bi2230"	0.01	U	mg/L	0.01			0.00733	06/15/04"	14:10"
245108s"	Ca3179"	33.8		mg/L	0.05	20	100.9%	33.77074	06/15/04"	14:10"
245108s"	Cd2265"	0.049		mg/L	0.005	0.05	98.4%	0.04920	06/15/04"	14:10"
245108s"	Co2286"	0.498		mg/L	0.005	0.5	99.6%	0.49792	06/15/04"	14:10"
245108s"	Cr2677"	0.195		mg/L	0.015	0.2	97.6%	0.19523	06/15/04"	14:10"
245108s"	Cu3247"	0.251		mg/L	0.005	0.25	100.5%	0.25133	06/15/04"	14:10"
245108s"	Fe2714"	1.06		mg/L	0.1	1	106.0%	1.06004	06/15/04"	14:10"
245108s"	K_766	24.1		mg/L	0.2	20	102.8%	24.1459	06/15/04	14:15:15
245108s"	La3988"	0.005	U	mg/L	0.005			-0.00017	06/15/04"	14:10"
245108s"	Li670	0.042		mg/L	0.01			0.0422	06/15/04	14:15:15
245108s"	Mg2790"	21.8		mg/L	0.05	20	102.1%	21.75639	06/15/04"	14:10"
245108s"	Mn2576"	0.501		mg/L	0.005	0.5	100.1%	0.50070	06/15/04"	14:10"
245108s"	Mo2020"	0.01	U	mg/L	0.01			0.00901	06/15/04"	14:10"
245108s"	Na589	72.1		mg/L	0.2	20	101.9%	72.0863	06/15/04	14:15:15
245108s"	Ni2316"	0.482		mg/L	0.01	0.5	96.5%	0.48245	06/15/04"	14:10"
245108s"	P_1782"	0.023		mg/L	0.02			0.02298	06/15/04"	14:10"
245108s"	Pb220"	0.494		mg/L	0.005	0.5	98.8%	0.49408	06/15/04"	14:10"
245108s"	Pd3404"	0.005	U	mg/L	0.005			-0.00092	06/15/04"	14:10"
245108s"	S_1820"	9.31		mg/L	0.05			9.31152	06/15/04"	14:10"
245108s"	Sb2068"	0.501		mg/L	0.02	0.5	100.3%	0.50131	06/15/04"	14:10"
245108s"	Se196"	2.17		mg/L	0.015	2	108.6%	2.17253	06/15/04"	14:10"
245108s"	Si2881"	19.4		mg/L	0.05			19.42317	06/15/04"	14:10"
245108s"	Sn1899"	0.01	U	mg/L	0.01			0.00309	06/15/04"	14:10"
245108s"	Sr4215"	0.074		mg/L	0.005			0.07378	06/15/04"	14:10"
245108s"	Th2837"	0.015	U	mg/L	0.015			-0.01507	06/15/04"	14:10"
245108s"	Ti3349"	0.005	U	mg/L	0.005			-0.00026	06/15/04"	14:10"
245108s"	Tl1908"	2.08		mg/L	0.02	2	104.0%	2.07903	06/15/04"	14:10"
245108s"	U_4090"	0.1	U	mg/L	0.1			0.00060	06/15/04"	14:10"
245108s"	V_2924"	0.507		mg/L	0.005	0.5	98.8%	0.50713	06/15/04"	14:10"
245108s"	W_2079"	0.01	U	mg/L	0.01			0.00700	06/15/04"	14:10"
245108s"	Y_3710"	0.005	U	mg/L	0.005			-0.00018	06/15/04"	14:10"
245108s"	Zn2062"	0.508		mg/L	0.005	0.5	101.7%	0.50840	06/15/04"	14:10"
245108s"	Zr3496"	0.005	U	mg/L	0.005			0.00003	06/15/04"	14:10"
245109"	Ag3280"	0.005	U	mg/L	0.005			-0.00010	06/15/04"	14:15"
245109"	Al3082"	0.084		mg/L	0.05			0.08377	06/15/04"	14:15"
245109"	As1890"	0.017		mg/L	0.005			0.01671	06/15/04"	14:15"
245109"	B_2496"	0.167		mg/L	0.05			0.16706	06/15/04"	14:15"
245109"	Ba4934"	0.007		mg/L	0.005			0.00741	06/15/04"	14:15"
245109"	Be3130"	0.005	U	mg/L	0.005			0.00024	06/15/04"	14:15"
245109"	Bi2230"	0.01	U	mg/L	0.01			0.00180	06/15/04"	14:15"
245109"	Ca3179"	6.69		mg/L	0.05			6.69064	06/15/04"	14:15"
245109"	Cd2265"	0.005	U	mg/L	0.005			0.00069	06/15/04"	14:15"
245109"	Co2286"	0.005	U	mg/L	0.005			0.00079	06/15/04"	14:15"
245109"	Cr2677"	0.015	U	mg/L	0.015			0.00088	06/15/04"	14:15"
245109"	Cu3247"	0.005	U	mg/L	0.005			0.00096	06/15/04"	14:15"
245109"	Fe2714"	0.1	U	mg/L	0.1			0.03502	06/15/04"	14:15"
245109"	K_766	2.76		mg/L	0.2			2.7615	06/15/04	14:18:19
245109"	La3988"	0.005	U	mg/L	0.005			-0.00002	06/15/04"	14:15"
245109"	Li670	0.089		mg/L	0.01			0.0889	06/15/04	14:18:19
245109"	Mg2790"	0.550		mg/L	0.05			0.54993	06/15/04"	14:15"
245109"	Mn2576"	0.005	U	mg/L	0.005			0.00061	06/15/04"	14:15"

system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
245109"	Mo2020"	0.01	U	mg/L	0.01			0.00646	06/15/04"	14:15"
245109"	Na589	77.2		mg/L	0.2			77.1561	06/15/04	14:18:19
245109"	Ni2316"	0.01	U	mg/L	0.01			-0.00032	06/15/04"	14:15"
245109"	P_1782"	0.033		mg/L	0.02			0.03319	06/15/04"	14:15"
245109"	Pb220"	0.005	U	mg/L	0.005			0.00076	06/15/04"	14:15"
245109"	Pd3404"	0.005	U	mg/L	0.005			0.00015	06/15/04"	14:15"
245109"	S_1820"	7.36		mg/L	0.05			7.35884	06/15/04"	14:15"
245109"	Sb2068"	0.02	U	mg/L	0.02			0.00200	06/15/04"	14:15"
245109"	Se196"	0.015	U	mg/L	0.015			0.00585	06/15/04"	14:15"
245109"	Si2881"	25.6		mg/L	0.05			25.62435	06/15/04"	14:15"
245109"	Sn1899"	0.01	U	mg/L	0.01			0.00801	06/15/04"	14:15"
245109"	Sr4215"	0.031		mg/L	0.005			0.03147	06/15/04"	14:15"
245109"	Th2837"	0.015	U	mg/L	0.015			-0.00032	06/15/04"	14:15"
245109"	Ti3349"	0.005	U	mg/L	0.005			0.00056	06/15/04"	14:15"
245109"	Ti1908"	0.02	U	mg/L	0.02			-0.00642	06/15/04"	14:15"
245109"	U_4090"	0.1	U	mg/L	0.1			0.00299	06/15/04"	14:15"
245109"	V_2924"	0.005	U	mg/L	0.005			0.00473	06/15/04"	14:15"
245109"	W_2079"	0.01	U	mg/L	0.01			0.00064	06/15/04"	14:15"
245109"	Y_3710"	0.005	U	mg/L	0.005			0.00006	06/15/04"	14:15"
245109"	Zn2062"	0.005	U	mg/L	0.005			0.00279	06/15/04"	14:15"
245109"	Zr3496"	0.005	U	mg/L	0.005			0.00085	06/15/04"	14:15"
245110"	Ag3280"	0.005	U	mg/L	0.005			-0.00048	06/15/04"	14:20"
245110"	Al3082"	0.05	U	mg/L	0.05			-0.02370	06/15/04"	14:20"
245110"	As1890"	0.007		mg/L	0.005			0.00737	06/15/04"	14:20"
245110"	B_2496"	0.141		mg/L	0.05			0.14082	06/15/04"	14:20"
245110"	Ba4934"	0.011		mg/L	0.005			0.01066	06/15/04"	14:20"
245110"	Be3130"	0.005	U	mg/L	0.005			0.00022	06/15/04"	14:20"
245110"	Bi2230"	0.01	U	mg/L	0.01			0.00246	06/15/04"	14:20"
245110"	Ca3179"	13.6		mg/L	0.05			13.63298	06/15/04"	14:20"
245110"	Cd2265"	0.005	U	mg/L	0.005			0.00000	06/15/04"	14:20"
245110"	Co2286"	0.005	U	mg/L	0.005			0.00091	06/15/04"	14:20"
245110"	Cr2677"	0.015	U	mg/L	0.015			-0.00106	06/15/04"	14:20"
245110"	Cu3247"	0.005	U	mg/L	0.005			-0.00037	06/15/04"	14:20"
245110"	Fe2714"	0.1	U	mg/L	0.1			0.00296	06/15/04"	14:20"
245110"	K_766	3.71		mg/L	0.2			3.7062	06/15/04	14:21:23
245110"	La3988"	0.005	U	mg/L	0.005			-0.00042	06/15/04"	14:20"
245110"	Li670	0.044		mg/L	0.01			0.0436	06/15/04	14:21:23
245110"	Mg2790"	1.34		mg/L	0.05			1.34392	06/15/04"	14:20"
245110"	Mn2576"	0.005	U	mg/L	0.005			0.00163	06/15/04"	14:20"
245110"	Mo2020"	0.01	U	mg/L	0.01			0.00798	06/15/04"	14:20"
245110"	Na589	52.8		mg/L	0.2			52.7663	06/15/04	14:21:23
245110"	Ni2316"	0.01	U	mg/L	0.01			0.00093	06/15/04"	14:20"
245110"	P_1782"	0.027		mg/L	0.02			0.02714	06/15/04"	14:20"
245110"	Pb220"	0.005	U	mg/L	0.005			-0.00082	06/15/04"	14:20"
245110"	Pd3404"	0.005	U	mg/L	0.005			-0.00164	06/15/04"	14:20"
245110"	S_1820"	9.46		mg/L	0.05			9.45732	06/15/04"	14:20"
245110"	Sb2068"	0.02	U	mg/L	0.02			0.00397	06/15/04"	14:20"
245110"	Se196"	0.015	U	mg/L	0.015			0.00383	06/15/04"	14:20"
245110"	Si2881"	19.6		mg/L	0.05			19.64123	06/15/04"	14:20"
245110"	Sn1899"	0.017		mg/L	0.01			0.01658	06/15/04"	14:20"
245110"	Sr4215"	0.075		mg/L	0.005			0.07517	06/15/04"	14:20"
245110"	Th2837"	0.015	U	mg/L	0.015			-0.00175	06/15/04"	14:20"
245110"	Ti3349"	0.005	U	mg/L	0.005			-0.00029	06/15/04"	14:20"
245110"	Ti1908"	0.02	U	mg/L	0.02			-0.01743	06/15/04"	14:20"

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system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
245110"	U_4090"	0.1	U	mg/L	0.1			0.00769	06/15/04"	14:20"
245110"	V_2924"	0.013		mg/L	0.005			0.01326	06/15/04"	14:20"
245110"	W_2079"	0.01	U	mg/L	0.01			-0.00068	06/15/04"	14:20"
245110"	Y_3710"	0.005	U	mg/L	0.005			-0.00014	06/15/04"	14:20"
245110"	Zn2062"	0.005	U	mg/L	0.005			-0.00016	06/15/04"	14:20"
245110"	Zr3496"	0.005	U	mg/L	0.005			0.00020	06/15/04"	14:20"
245111"	Ag3280"	0.005	U	mg/L	0.005			0.00000	06/15/04"	14:39"
245111"	Al3082"	0.396		mg/L	0.05			0.39623	06/15/04"	14:39"
245111"	As1890"	0.010		mg/L	0.005			0.00993	06/15/04"	14:39"
245111"	B_2496"	0.171		mg/L	0.05			0.17053	06/15/04"	14:39"
245111"	Ba4934"	0.008		mg/L	0.005			0.00812	06/15/04"	14:39"
245111"	Be3130"	0.005	U	mg/L	0.005			0.00029	06/15/04"	14:39"
245111"	Bi2230"	0.01	U	mg/L	0.01			0.00311	06/15/04"	14:39"
245111"	Ca3179"	6.97		mg/L	0.05			6.96974	06/15/04"	14:39"
245111"	Cd2265"	0.005	U	mg/L	0.005			0.00009	06/15/04"	14:39"
245111"	Co2286"	0.005	U	mg/L	0.005			0.00077	06/15/04"	14:39"
245111"	Cr2677"	0.015	U	mg/L	0.015			0.00064	06/15/04"	14:39"
245111"	Cu3247"	0.005	U	mg/L	0.005			0.00052	06/15/04"	14:39"
245111"	Fe2714"	0.138		mg/L	0.1			0.13786	06/15/04"	14:39"
245111"	K_766	2.89		mg/L	0.2			2.8883	06/15/04	14:34:14
245111"	La3988"	0.005	U	mg/L	0.005			0.00075	06/15/04"	14:39"
245111"	Li670	0.093		mg/L	0.01			0.0932	06/15/04	14:34:14
245111"	Mg2790"	0.604		mg/L	0.05			0.60413	06/15/04"	14:39"
245111"	Mn2576"	0.005	U	mg/L	0.005			0.00083	06/15/04"	14:39"
245111"	Mo2020"	0.01	U	mg/L	0.01			0.00923	06/15/04"	14:39"
245111"	Na589	80.3		mg/L	0.2			80.2902	06/15/04	14:34:14
245111"	Ni2316"	0.01	U	mg/L	0.01			0.00093	06/15/04"	14:39"
245111"	P_1782"	0.039		mg/L	0.02			0.03884	06/15/04"	14:39"
245111"	Pb220"	0.005	U	mg/L	0.005			0.00260	06/15/04"	14:39"
245111"	Pd3404"	0.005	U	mg/L	0.005			0.00034	06/15/04"	14:39"
245111"	S_1820"	7.42		mg/L	0.05			7.42317	06/15/04"	14:39"
245111"	Sb2068"	0.02	U	mg/L	0.02			0.00097	06/15/04"	14:39"
245111"	Se196"	0.015	U	mg/L	0.015			0.00800	06/15/04"	14:39"
245111"	Si2881"	27.0		mg/L	0.05			26.99124	06/15/04"	14:39"
245111"	Sn1899"	0.023		mg/L	0.01			0.02337	06/15/04"	14:39"
245111"	Sr4215"	0.033		mg/L	0.005			0.03319	06/15/04"	14:39"
245111"	Th2837"	0.015	U	mg/L	0.015			-0.00114	06/15/04"	14:39"
245111"	Ti3349"	0.005	U	mg/L	0.005			0.00363	06/15/04"	14:39"
245111"	Tl1908"	0.02	U	mg/L	0.02			-0.00486	06/15/04"	14:39"
245111"	U_4090"	0.1	U	mg/L	0.1			0.02911	06/15/04"	14:39"
245111"	V_2924"	0.005	U	mg/L	0.005			0.00495	06/15/04"	14:39"
245111"	W_2079"	0.01	U	mg/L	0.01			0.00000	06/15/04"	14:39"
245111"	Y_3710"	0.005	U	mg/L	0.005			0.00017	06/15/04"	14:39"
245111"	Zn2062"	0.005	U	mg/L	0.005			0.00171	06/15/04"	14:39"
245111"	Zr3496"	0.005	U	mg/L	0.005			0.00129	06/15/04"	14:39"
245112"	Ag3280"	0.005	U	mg/L	0.005			-0.00030	06/15/04"	14:44"
245112"	Al3082"	0.05	U	mg/L	0.05			-0.01757	06/15/04"	14:44"
245112"	As1890"	0.005	U	mg/L	0.005			-0.00103	06/15/04"	14:44"
245112"	B_2496"	0.05	U	mg/L	0.05			-0.00168	06/15/04"	14:44"
245112"	Ba4934"	0.005	U	mg/L	0.005			0.00014	06/15/04"	14:44"
245112"	Be3130"	0.005	U	mg/L	0.005			0.00029	06/15/04"	14:44"
245112"	Bi2230"	0.01	U	mg/L	0.01			0.00554	06/15/04"	14:44"
245112"	Ca3179"	10.0		mg/L	0.05			10.01406	06/15/04"	14:44"
245112"	Cd2265"	0.005	U	mg/L	0.005			0.00102	06/15/04"	14:44"

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system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
245112"	Co2286"	0.005	U	mg/L	0.005			0.00085	06/15/04"	14:44"
245112"	Cr2677"	0.015	U	mg/L	0.015			-0.00022	06/15/04"	14:44"
245112"	Cu3247"	0.005	U	mg/L	0.005			0.00006	06/15/04"	14:44"
245112"	Fe2714"	10.1		mg/L	0.1			10.13740	06/15/04"	14:44"
245112"	K_766	9.08		mg/L	0.2			9.0834	06/15/04	14:37:18
245112"	La3988"	0.005	U	mg/L	0.005			-0.00030	06/15/04"	14:44"
245112"	Li670	0.01	U	mg/L	0.01			0.0015	06/15/04	14:37:18
245112"	Mg2790"	9.84		mg/L	0.05			9.83796	06/15/04"	14:44"
245112"	Mn2576"	0.005	U	mg/L	0.005			-0.00003	06/15/04"	14:44"
245112"	Mo2020"	0.01	U	mg/L	0.01			0.00182	06/15/04"	14:44"
245112"	Na589	8.94		mg/L	0.2			8.9422	06/15/04	14:37:18
245112"	Ni2316"	0.01	U	mg/L	0.01			-0.00030	06/15/04"	14:44"
245112"	P_1782"	0.02	U	mg/L	0.02			0.00779	06/15/04"	14:44"
245112"	Pb220"	0.005	U	mg/L	0.005			0.00174	06/15/04"	14:44"
245112"	Pd3404"	0.005	U	mg/L	0.005			-0.00138	06/15/04"	14:44"
245112"	S_1820"	0.05	U	mg/L	0.05			-0.02917	06/15/04"	14:44"
245112"	Sb2068"	0.02	U	mg/L	0.02			-0.00127	06/15/04"	14:44"
245112"	Se196"	0.015	U	mg/L	0.015			-0.00280	06/15/04"	14:44"
245112"	Si2881"	0.05	U	mg/L	0.05			0.00677	06/15/04"	14:44"
245112"	Sn1899"	0.01	U	mg/L	0.01			0.00041	06/15/04"	14:44"
245112"	Sr4215"	0.005	U	mg/L	0.005			0.00021	06/15/04"	14:44"
245112"	Th2837"	0.015	U	mg/L	0.015			-0.00970	06/15/04"	14:44"
245112"	Ti3349"	0.005	U	mg/L	0.005			0.00029	06/15/04"	14:44"
245112"	Tl1908"	0.02	U	mg/L	0.02			0.00765	06/15/04"	14:44"
245112"	U_4090"	0.1	U	mg/L	0.1			0.01455	06/15/04"	14:44"
245112"	V_2924"	0.005	U	mg/L	0.005			-0.00039	06/15/04"	14:44"
245112"	W_2079"	0.01	U	mg/L	0.01			-0.00232	06/15/04"	14:44"
245112"	Y_3710"	0.005	U	mg/L	0.005			-0.00012	06/15/04"	14:44"
245112"	Zn2062"	0.005	U	mg/L	0.005			0.00039	06/15/04"	14:44"
245112"	Zr3496"	0.005	U	mg/L	0.005			0.00011	06/15/04"	14:44"
245113"	Ag3280"	0.100		mg/L	0.005			0.10009	06/15/04"	14:49"
245113"	Al3082"	0.075		mg/L	0.05			0.07520	06/15/04"	14:49"
245113"	As1890"	0.092		mg/L	0.005			0.09205	06/15/04"	14:49"
245113"	B_2496"	0.05	U	mg/L	0.05			-0.00325	06/15/04"	14:49"
245113"	Ba4934"	0.101		mg/L	0.005			0.10052	06/15/04"	14:49"
245113"	Be3130"	0.097		mg/L	0.005			0.09660	06/15/04"	14:49"
245113"	Bi2230"	0.01	U	mg/L	0.01			-0.00116	06/15/04"	14:49"
245113"	Ca3179"	9.96		mg/L	0.05			9.95879	06/15/04"	14:49"
245113"	Cd2265"	0.100		mg/L	0.005			0.09956	06/15/04"	14:49"
245113"	Co2286"	0.099		mg/L	0.005			0.09875	06/15/04"	14:49"
245113"	Cr2677"	0.097		mg/L	0.015			0.09681	06/15/04"	14:49"
245113"	Cu3247"	0.096		mg/L	0.005			0.09593	06/15/04"	14:49"
245113"	Fe2714"	10.1		mg/L	0.1			10.11630	06/15/04"	14:49"
245113"	K_766	8.99		mg/L	0.2			8.9893	06/15/04	14:40:22
245113"	La3988"	0.005	U	mg/L	0.005			-0.00027	06/15/04"	14:49"
245113"	Li670	0.01	U	mg/L	0.01			0.0020	06/15/04	14:40:22
245113"	Mg2790"	9.77		mg/L	0.05			9.77278	06/15/04"	14:49"
245113"	Mn2576"	0.101		mg/L	0.005			0.10069	06/15/04"	14:49"
245113"	Mo2020"	0.092		mg/L	0.01			0.09239	06/15/04"	14:49"
245113"	Na589	8.91		mg/L	0.2			8.9059	06/15/04	14:40:22
245113"	Ni2316"	0.098		mg/L	0.01			0.09824	06/15/04"	14:49"
245113"	P_1782"	0.02	U	mg/L	0.02			0.00441	06/15/04"	14:49"
245113"	Pb220"	0.099		mg/L	0.005			0.09874	06/15/04"	14:49"
245113"	Pd3404"	0.005	U	mg/L	0.005			-0.00129	06/15/04"	14:49"

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245113"	S_1820"	0.05	U	mg/L	0.05			-0.04056	06/15/04"	14:49"
245113"	Sb2068"	0.096		mg/L	0.02			0.09574	06/15/04"	14:49"
245113"	Se196"	0.094		mg/L	0.015			0.09388	06/15/04"	14:49"
245113"	Si2881"	0.05	U	mg/L	0.05			0.00695	06/15/04"	14:49"
245113"	Sn1899"	0.01	U	mg/L	0.01			-0.00094	06/15/04"	14:49"
245113"	Sr4215"	9.91		mg/L	0.005			9.91195	06/15/04"	14:49"
245113"	Th2837"	0.091		mg/L	0.015			0.09090	06/15/04"	14:49"
245113"	Ti3349"	0.005	U	mg/L	0.005			0.00005	06/15/04"	14:49"
245113"	Tl1908"	0.103		mg/L	0.02			0.10306	06/15/04"	14:49"
245113"	U_4090"	0.1	U	mg/L	0.1			0.03286	06/15/04"	14:49"
245113"	V_2924"	0.098		mg/L	0.005			0.09802	06/15/04"	14:49"
245113"	W_2079"	0.01	U	mg/L	0.01			-0.00022	06/15/04"	14:49"
245113"	Y_3710"	0.005	U	mg/L	0.005			-0.00009	06/15/04"	14:49"
245113"	Zn2062"	0.099		mg/L	0.005			0.09861	06/15/04"	14:49"
245113"	Zr3496"	0.005	U	mg/L	0.005			-0.00027	06/15/04"	14:49"
245114"	Ag3280"	0.005	U	mg/L	0.005			-0.00012	06/15/04"	14:54"
245114"	Al3082"	0.05	U	mg/L	0.05			-0.02662	06/15/04"	14:54"
245114"	As1890"	0.005	U	mg/L	0.005			-0.00248	06/15/04"	14:54"
245114"	B_2496"	0.05	U	mg/L	0.05			-0.00238	06/15/04"	14:54"
245114"	Ba4934"	0.005	U	mg/L	0.005			0.00007	06/15/04"	14:54"
245114"	Be3130"	0.005	U	mg/L	0.005			0.00028	06/15/04"	14:54"
245114"	Bi2230"	0.01	U	mg/L	0.01			0.00532	06/15/04"	14:54"
245114"	Ca3179"	0.05	U	mg/L	0.05			-0.00018	06/15/04"	14:54"
245114"	Cd2265"	0.005	U	mg/L	0.005			0.00031	06/15/04"	14:54"
245114"	Co2286"	0.005	U	mg/L	0.005			0.00056	06/15/04"	14:54"
245114"	Cr2677"	0.015	U	mg/L	0.015			-0.00043	06/15/04"	14:54"
245114"	Cu3247"	0.005	U	mg/L	0.005			-0.00027	06/15/04"	14:54"
245114"	Fe2714"	0.1	U	mg/L	0.1			-0.00667	06/15/04"	14:54"
245114"	K_766	0.2	U	mg/L	0.2			0.0893	06/15/04	14:43:26
245114"	La3988"	0.005	U	mg/L	0.005			0.00042	06/15/04"	14:54"
245114"	Li670	0.01	U	mg/L	0.01			0.0016	06/15/04	14:43:26
245114"	Mg2790"	0.05	U	mg/L	0.05			0.00030	06/15/04"	14:54"
245114"	Mn2576"	0.005	U	mg/L	0.005			0.00000	06/15/04"	14:54"
245114"	Mo2020"	0.01	U	mg/L	0.01			0.00091	06/15/04"	14:54"
245114"	Na589	0.2	U	mg/L	0.2			-0.0468	06/15/04	14:43:26
245114"	Ni2316"	0.01	U	mg/L	0.01			0.00030	06/15/04"	14:54"
245114"	P_1782"	0.02	U	mg/L	0.02			0.00610	06/15/04"	14:54"
245114"	Pb220"	0.005	U	mg/L	0.005			-0.00056	06/15/04"	14:54"
245114"	Pd3404"	0.005	U	mg/L	0.005			0.00044	06/15/04"	14:54"
245114"	S_1820"	0.05	U	mg/L	0.05			-0.03566	06/15/04"	14:54"
245114"	Sb2068"	0.02	U	mg/L	0.02			-0.00493	06/15/04"	14:54"
245114"	Se196"	0.015	U	mg/L	0.015			-0.00115	06/15/04"	14:54"
245114"	Si2881"	0.05	U	mg/L	0.05			0.00611	06/15/04"	14:54"
245114"	Sn1899"	0.01	U	mg/L	0.01			-0.00165	06/15/04"	14:54"
245114"	Sr4215"	0.005	U	mg/L	0.005			0.00011	06/15/04"	14:54"
245114"	Th2837"	0.015	U	mg/L	0.015			-0.00182	06/15/04"	14:54"
245114"	Ti3349"	0.005	U	mg/L	0.005			0.00001	06/15/04"	14:54"
245114"	Tl1908"	0.02	U	mg/L	0.02			0.00043	06/15/04"	14:54"
245114"	U_4090"	0.1	U	mg/L	0.1			0.00701	06/15/04"	14:54"
245114"	V_2924"	0.005	U	mg/L	0.005			-0.00010	06/15/04"	14:54"
245114"	W_2079"	0.01	U	mg/L	0.01			-0.00148	06/15/04"	14:54"
245114"	Y_3710"	0.005	U	mg/L	0.005			-0.00003	06/15/04"	14:54"
245114"	Zn2062"	0.005	U	mg/L	0.005			-0.00144	06/15/04"	14:54"
245114"	Zr3496"	0.005	U	mg/L	0.005			0.00005	06/15/04"	14:54"

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245115"	Ag3280"	0.005	U	mg/L	0.005			0.00025	06/15/04"	14:58"
245115"	Al3082"	0.336		mg/L	0.05			0.33616	06/15/04"	14:58"
245115"	As1890"	0.005		mg/L	0.005			0.00522	06/15/04"	14:58"
245115"	B_2496"	0.142		mg/L	0.05			0.14155	06/15/04"	14:58"
245115"	Ba4934"	0.012		mg/L	0.005			0.01175	06/15/04"	14:58"
245115"	Be3130"	0.005	U	mg/L	0.005			0.00029	06/15/04"	14:58"
245115"	Bi2230"	0.01	U	mg/L	0.01			-0.00036	06/15/04"	14:58"
245115"	Ca3179"	14.0		mg/L	0.05			13.97375	06/15/04"	14:58"
245115"	Cd2265"	0.005	U	mg/L	0.005			0.00048	06/15/04"	14:58"
245115"	Co2286"	0.005	U	mg/L	0.005			0.00067	06/15/04"	14:58"
245115"	Cr2677"	0.015	U	mg/L	0.015			-0.00023	06/15/04"	14:58"
245115"	Cu3247"	0.005	U	mg/L	0.005			0.00074	06/15/04"	14:58"
245115"	Fe2714"	0.182		mg/L	0.1			0.18186	06/15/04"	14:58"
245115"	K_766	3.69		mg/L	0.2			3.6892	06/15/04	14:47:00
245115"	La3988"	0.005	U	mg/L	0.005			0.00027	06/15/04"	14:58"
245115"	Li670	0.043		mg/L	0.01			0.0434	06/15/04	14:47:00
245115"	Mg2790"	1.42		mg/L	0.05			1.41956	06/15/04"	14:58"
245115"	Mn2576"	0.005	U	mg/L	0.005			0.00452	06/15/04"	14:58"
245115"	Mo2020"	0.01	U	mg/L	0.01			0.00790	06/15/04"	14:58"
245115"	Na589	52.3		mg/L	0.2			52.2764	06/15/04	14:47:00
245115"	Ni2316"	0.01	U	mg/L	0.01			0.00012	06/15/04"	14:58"
245115"	P_1782"	0.037		mg/L	0.02			0.03718	06/15/04"	14:58"
245115"	Pb220"	0.005	U	mg/L	0.005			-0.00030	06/15/04"	14:58"
245115"	Pd3404"	0.005	U	mg/L	0.005			-0.00215	06/15/04"	14:58"
245115"	S_1820"	9.50		mg/L	0.05			9.50225	06/15/04"	14:58"
245115"	Sb2068"	0.02	U	mg/L	0.02			0.00236	06/15/04"	14:58"
245115"	Se196"	0.015	U	mg/L	0.015			0.00503	06/15/04"	14:58"
245115"	Si2881"	20.7		mg/L	0.05			20.73791	06/15/04"	14:58"
245115"	Sn1899"	0.01	U	mg/L	0.01			0.00891	06/15/04"	14:58"
245115"	Sr4215"	0.077		mg/L	0.005			0.07695	06/15/04"	14:58"
245115"	Th2837"	0.015	U	mg/L	0.015			-0.00073	06/15/04"	14:58"
245115"	Ti3349"	0.005	U	mg/L	0.005			0.00379	06/15/04"	14:58"
245115"	Tl1908"	0.02	U	mg/L	0.02			-0.00902	06/15/04"	14:58"
245115"	U_4090"	0.1	U	mg/L	0.1			0.00985	06/15/04"	14:58"
245115"	V_2924"	0.014		mg/L	0.005			0.01362	06/15/04"	14:58"
245115"	W_2079"	0.01	U	mg/L	0.01			-0.00187	06/15/04"	14:58"
245115"	Y_3710"	0.005	U	mg/L	0.005			0.00009	06/15/04"	14:58"
245115"	Zn2062"	0.005	U	mg/L	0.005			0.00114	06/15/04"	14:58"
245115"	Zr3496"	0.005	U	mg/L	0.005			0.00113	06/15/04"	14:58"
245116"	Ag3280"	0.005	U	mg/L	0.005			-0.00031	06/15/04"	15:03"
245116"	Al3082"	0.498		mg/L	0.05			0.49776	06/15/04"	15:03"
245116"	As1890"	0.005	U	mg/L	0.005			0.00188	06/15/04"	15:03"
245116"	B_2496"	0.172		mg/L	0.05			0.17214	06/15/04"	15:03"
245116"	Ba4934"	0.008		mg/L	0.005			0.00835	06/15/04"	15:03"
245116"	Be3130"	0.005	U	mg/L	0.005			0.00035	06/15/04"	15:03"
245116"	Bi2230"	0.01	U	mg/L	0.01			0.00210	06/15/04"	15:03"
245116"	Ca3179"	7.31		mg/L	0.05			7.31458	06/15/04"	15:03"
245116"	Cd2265"	0.005	U	mg/L	0.005			0.00019	06/15/04"	15:03"
245116"	Co2286"	0.005	U	mg/L	0.005			0.00125	06/15/04"	15:03"
245116"	Cr2677"	0.015	U	mg/L	0.015			0.00020	06/15/04"	15:03"
245116"	Cu3247"	0.005	U	mg/L	0.005			0.00049	06/15/04"	15:03"
245116"	Fe2714"	0.167		mg/L	0.1			0.16654	06/15/04"	15:03"
245116"	K_766	2.96		mg/L	0.2			2.9600	06/15/04	14:50:04
245116"	La3988"	0.005	U	mg/L	0.005			0.00050	06/15/04"	15:03"

Div 20
to#040415-2, 040521-6
06002.01.141

010073

system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
245116"	Li670	0.100		mg/L	0.01			0.0995	06/15/04	14:50:04
245116"	Mg2790"	0.640		mg/L	0.05			0.64045	06/15/04"	15:03"
245116"	Mn2576"	0.005	U	mg/L	0.005			0.00119	06/15/04"	15:03"
245116"	Mo2020"	0.01	U	mg/L	0.01			0.00519	06/15/04"	15:03"
245116"	Na589	85.3		mg/L	0.2			85.3419	06/15/04	14:50:04
245116"	Ni2316"	0.01	U	mg/L	0.01			0.00020	06/15/04"	15:03"
245116"	P_1782"	0.039		mg/L	0.02			0.03913	06/15/04"	15:03"
245116"	Pb220"	0.005	U	mg/L	0.005			0.00125	06/15/04"	15:03"
245116"	Pd3404"	0.005	U	mg/L	0.005			0.00003	06/15/04"	15:03"
245116"	S_1820"	7.57		mg/L	0.05			7.56595	06/15/04"	15:03"
245116"	Sb2068"	0.02	U	mg/L	0.02			0.00438	06/15/04"	15:03"
245116"	Se196"	0.015	U	mg/L	0.015			0.00833	06/15/04"	15:03"
245116"	Si2881"	27.8		mg/L	0.05			27.83803	06/15/04"	15:03"
245116"	Sn1899"	0.027		mg/L	0.01			0.02658	06/15/04"	15:03"
245116"	Sr4215"	0.036		mg/L	0.005			0.03553	06/15/04"	15:03"
245116"	Th2837"	0.015	U	mg/L	0.015			0.00044	06/15/04"	15:03"
245116"	Ti3349"	0.005	U	mg/L	0.005			0.00430	06/15/04"	15:03"
245116"	Ti1908"	0.02	U	mg/L	0.02			-0.02628	06/15/04"	15:03"
245116"	U_4090"	0.1	U	mg/L	0.1			0.01155	06/15/04"	15:03"
245116"	V_2924"	0.005	U	mg/L	0.005			0.00360	06/15/04"	15:03"
245116"	W_2079"	0.01	U	mg/L	0.01			-0.00520	06/15/04"	15:03"
245116"	Y_3710"	0.005	U	mg/L	0.005			0.00011	06/15/04"	15:03"
245116"	Zn2062"	0.005	U	mg/L	0.005			0.00210	06/15/04"	15:03"
245116"	Zr3496"	0.005	U	mg/L	0.005			0.00120	06/15/04"	15:03"
lcsW-F15W1"	Ag3280"	0.050		mg/L	0.005	0.05	101.0%	0.05048	06/15/04"	12:39"
lcsW-F15W1"	Al3082"	1.91		mg/L	0.05	2	95.4%	1.90805	06/15/04"	12:39"
lcsW-F15W1"	As1890"	1.99		mg/L	0.005	2	99.7%	1.99471	06/15/04"	12:39"
lcsW-F15W1"	B_2496"	0.05	U	mg/L	0.05			0.00225	06/15/04"	12:39"
lcsW-F15W1"	Ba4934"	2.01		mg/L	0.005	2	100.6%	2.01247	06/15/04"	12:39"
lcsW-F15W1"	Be3130"	0.049		mg/L	0.005	0.05	98.8%	0.04939	06/15/04"	12:39"
lcsW-F15W1"	Bi2230"	0.01	U	mg/L	0.01			0.00485	06/15/04"	12:39"
lcsW-F15W1"	Ca3179"	21.0		mg/L	0.05	20	104.8%	20.95761	06/15/04"	12:39"
lcsW-F15W1"	Cd2265"	0.050		mg/L	0.005	0.05	99.3%	0.04966	06/15/04"	12:39"
lcsW-F15W1"	Co2286"	0.499		mg/L	0.005	0.5	99.8%	0.49923	06/15/04"	12:39"
lcsW-F15W1"	Cr2677"	0.208		mg/L	0.015	0.2	104.2%	0.20842	06/15/04"	12:39"
lcsW-F15W1"	Cu3247"	0.252		mg/L	0.005	0.25	100.8%	0.25189	06/15/04"	12:39"
lcsW-F15W1"	Fe2714"	1.14		mg/L	0.1	1	114.1%	1.14084	06/15/04"	12:39"
lcsW-F15E2	K_766	19.2		mg/L	0.2	20	95.8%	19.1528	06/15/04	13:15:21
lcsW-F15W1"	La3988"	0.005	U	mg/L	0.005			0.00026	06/15/04"	12:39"
lcsW-F15E2	Li670	0.01	U	mg/L	0.01			-0.0006	06/15/04	13:15:21
lcsW-F15W1"	Mg2790"	20.7		mg/L	0.05	20	103.4%	20.68613	06/15/04"	12:39"
lcsW-F15W1"	Mn2576"	0.504		mg/L	0.005	0.5	100.7%	0.50362	06/15/04"	12:39"
lcsW-F15W1"	Mo2020"	0.01	U	mg/L	0.01			0.00089	06/15/04"	12:39"
lcsW-F15E2	Na589	19.1		mg/L	0.2	20	95.3%	19.0508	06/15/04	13:15:21
lcsW-F15W1"	Ni2316"	0.498		mg/L	0.01	0.5	99.6%	0.49792	06/15/04"	12:39"
lcsW-F15W1"	P_1782"	0.02	U	mg/L	0.02			-0.00113	06/15/04"	12:39"
lcsW-F15W1"	Pb220"	0.497		mg/L	0.005	0.5	99.4%	0.49702	06/15/04"	12:39"
lcsW-F15W1"	Pd3404"	0.005	U	mg/L	0.005			0.00077	06/15/04"	12:39"
lcsW-F15W1"	S_1820"	0.05	U	mg/L	0.05			0.00167	06/15/04"	12:39"
lcsW-F15W1"	Sb2068"	0.490		mg/L	0.02	0.5	97.9%	0.48964	06/15/04"	12:39"
lcsW-F15W1"	Se196"	2.04		mg/L	0.015	2	101.8%	2.03529	06/15/04"	12:39"
lcsW-F15W1"	Si2881"	0.050	U	mg/L	0.05			0.02767	06/15/04"	12:39"
lcsW-F15W1"	Sn1899"	0.01	U	mg/L	0.01			-0.00142	06/15/04"	12:39"
lcsW-F15W1"	Sr4215"	0.005	U	mg/L	0.005			0.00074	06/15/04"	12:39"

system id	elem	result	qual	units	rl	tv	rec	ug/ml	date	time
lcsW-F15W1"	Th2837"	0.015	U	mg/L	0.015			-0.01280	06/15/04"	12:39"
lcsW-F15W1"	Ti3349"	0.005	U	mg/L	0.005			0.00015	06/15/04"	12:39"
lcsW-F15W1"	Ti1908"	2.06		mg/L	0.02	2	102.9%	2.05851	06/15/04"	12:39"
lcsW-F15W1"	U_4090"	0.1	U	mg/L	0.1			-0.00082	06/15/04"	12:39"
lcsW-F15W1"	V_2924"	0.498		mg/L	0.005	0.5	99.6%	0.49807	06/15/04"	12:39"
lcsW-F15W1"	W_2079"	0.01	U	mg/L	0.01			-0.00013	06/15/04"	12:39"
lcsW-F15W1"	Y_3710"	0.005	U	mg/L	0.005			-0.00012	06/15/04"	12:39"
lcsW-F15W1"	Zn2062"	0.497		mg/L	0.005	0.5	99.4%	0.49694	06/15/04"	12:39"
lcsW-F15W1"	Zr3496"	0.005	U	mg/L	0.005			0.00027	06/15/04"	12:39"
pbw-F15E1	Ag3280"	0.005	U	mg/L	0.005			0.00078	06/15/04"	12:34"
pbw-F15E1	Al3082"	0.05	U	mg/L	0.05			0.00668	06/15/04"	12:34"
pbw-F15E1	As1890"	0.005	U	mg/L	0.005			-0.00197	06/15/04"	12:34"
pbw-F15E1	B_2496"	0.05	U	mg/L	0.05			0.00335	06/15/04"	12:34"
pbw-F15E1	Ba4934"	0.005	U	mg/L	0.005			0.00005	06/15/04"	12:34"
pbw-F15E1	Be3130"	0.005	U	mg/L	0.005			0.00000	06/15/04"	12:34"
pbw-F15E1	Bi2230"	0.01	U	mg/L	0.01			0.00318	06/15/04"	12:34"
pbw-F15E1	Ca3179"	0.05	U	mg/L	0.05			0.01301	06/15/04"	12:34"
pbw-F15E1	Cd2265"	0.005	U	mg/L	0.005			0.00051	06/15/04"	12:34"
pbw-F15E1	Co2286"	0.005	U	mg/L	0.005			0.00090	06/15/04"	12:34"
pbw-F15E1	Cr2677"	0.015	U	mg/L	0.015			0.01298	06/15/04"	12:34"
pbw-F15E1	Cu3247"	0.005	U	mg/L	0.005			0.00011	06/15/04"	12:34"
pbw-F15E1	Fe2714"	0.1	U	mg/L	0.1			0.09873	06/15/04"	12:34"
pbw-F15E2	K_766	0.2	U	mg/L	0.2			-0.0828	06/15/04	13:12:17
pbw-F15E1	La3988"	0.005	U	mg/L	0.005			0.00112	06/15/04"	12:34"
pbw-F15E2	Li670	0.01	U	mg/L	0.01			0.0006	06/15/04	13:12:17
pbw-F15E1	Mg2790"	0.05	U	mg/L	0.05			0.00807	06/15/04"	12:34"
pbw-F15E1	Mn2576"	0.005	U	mg/L	0.005			0.00133	06/15/04"	12:34"
pbw-F15E1	Mo2020"	0.01	U	mg/L	0.01			0.00206	06/15/04"	12:34"
pbw-F15E2	Na589	0.2	U	mg/L	0.2			-0.0511	06/15/04	13:12:17
pbw-F15E1	Ni2316"	0.01	U	mg/L	0.01			0.00815	06/15/04"	12:34"
pbw-F15E1	P_1782"	0.02	U	mg/L	0.02			0.00398	06/15/04"	12:34"
pbw-F15E1	Pb220"	0.005	U	mg/L	0.005			0.00006	06/15/04"	12:34"
pbw-F15E1	Pd3404"	0.005	U	mg/L	0.005			0.00414	06/15/04"	12:34"
pbw-F15E1	S_1820"	0.05	U	mg/L	0.05			0.00535	06/15/04"	12:34"
pbw-F15E1	Sb2068"	0.02	U	mg/L	0.02			0.00509	06/15/04"	12:34"
pbw-F15E1	Se196"	0.015	U	mg/L	0.015			-0.00115	06/15/04"	12:34"
pbw-F15E1	Si2881"	0.050	U	mg/L	0.05			0.02544	06/15/04"	12:34"
pbw-F15E1	Sn1899"	0.01	U	mg/L	0.01			-0.00098	06/15/04"	12:34"
pbw-F15E1	Sr4215"	0.005	U	mg/L	0.005			0.00005	06/15/04"	12:34"
pbw-F15E1	Th2837"	0.015	U	mg/L	0.015			-0.00158	06/15/04"	12:34"
pbw-F15E1	Ti3349"	0.005	U	mg/L	0.005			-0.00003	06/15/04"	12:34"
pbw-F15E1	Ti1908"	0.02	U	mg/L	0.02			0.00076	06/15/04"	12:34"
pbw-F15E1	U_4090"	0.1	U	mg/L	0.1			0.04867	06/15/04"	12:34"
pbw-F15E1	V_2924"	0.005	U	mg/L	0.005			0.00034	06/15/04"	12:34"
pbw-F15E1	W_2079"	0.01	U	mg/L	0.01			0.00027	06/15/04"	12:34"
pbw-F15E1	Y_3710"	0.005	U	mg/L	0.005			0.00000	06/15/04"	12:34"
pbw-F15E1	Zn2062"	0.005	U	mg/L	0.005			0.00047	06/15/04"	12:34"
pbw-F15E1	Zr3496"	0.005	U	mg/L	0.005			0.00077	06/15/04"	12:34"

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228BOOK / PAGE: 56 214

CLIENT(S): Div. 20 010075
 TASK ORDER(S): 040415-21040521-6 SDG(S): 243222 / 245108
 PROJECT NO(S): 0600201-141
 METHOD: 3005A 3050B 3050B-7.5 3010A 3020A 7760A 7740A HClO₄ H₂SO₄ Sb
Microwave Fusion Teflon Rock OTHER Str. Aliquot (Trace #2)
 MATRIX: Water ✓ Soil Biota Solid Liquid TCLP Ext OTHER
 INSTRUMENT: GFAA ICP ICP-MS IC FLAA HYDRIDE OTHER
 ACID INORG #: HNO₃# ** HCl# ** H₂SO₄# 155 HClO₄# HF#
 INTERNAL STD: Sc @ 10 PPM ✓ Be @ 10 PPM ✓ SOURCE: ✓ INORG# 02-101-02 EXP: 7-15-04 AMT: 50µl
 Oven/Hotplate ID: N/A Temperature (°C):

SAMPLE IDENTIFICATION	pH	WT (g)	I.V. (mL)	F.V. (mL)	
PBW-F15E1			5	5	
LCSW-F15E1 *			↓	↓	
KE 4/15/04 243222			↓	↓	
23r			↓	↓	
23r KE 4/15/04			↓	↓	
24r			5	5	
25r			↓	↓	
25dr			↓	↓	
26r			↓	↓	
27r			↓	↓	
28r			↓	↓	
29r			↓	↓	
30r			↓	↓	
31r			↓	↓	
31 Sr *			↓	↓	
↓ 32r			↓	↓	
245108r			↓	↓	
dr			↓	↓	
Sr *			↓	↓	
109r			↓	↓	
110r			↓	↓	
111r			↓	↓	
112r			↓	↓	
113r			↓	↓	
114r			↓	↓	
115r			↓	↓	
↓ 116r			↓	↓	
*50µl spike - 1 (Spec, # 4306, exp. 10/04)					
20µl ICA6-11 Spec, # 4514, exp. 3/05)					
*RLB 02-042-02 190 HNO ₃ , 590 HCl.					
(PBW/LCSW only)					LOCATION: N/A

PREPARED BY: KEP
 REVIEWED BY: John Walker
 DISPOSAL INT/DATE/LOC:

DATE: 6-15-04
 DATE: 6-15-04

TRACE METALS PREPARATORY LABORATORY DIGESTION LOG

SOUTHWEST RESEARCH INSTITUTE
SAN ANTONIO, TEXAS 78228

BOOK / PAGE: 56 215

CLIENT(S): Div. 20 (Spectro) 010076
 TASK ORDER(S): 040415-2 / 040521-6 SDG(S): 24 3222 / 245108
 PROJECT NO(S): 06002.01.141
 METHOD: 3005A 3050B 3050B-7.5 3010A 3020A 7760A 7740A HClO₄ H₂SO₄ Sb
 Microwave Fusion Teflon Rock OTHER Str. aliquot
 MATRIX: Water ✓ Soil Biota Solid Liquid TCLP Ext OTHER
 INSTRUMENT: GFAA ICP ✓ICP-MS IC FLAA HYDRIDE OTHER
 ACID INORG #: HNO₃# ** HCl# ** H₂SO₄# HClO₄# HF#
 INTERNAL STD: Sc @ 10 PPM ✓ Be @ 10 PPM SOURCE: ✓ INORG# 02-101-02 EXP: 7/15/04 AMT: 50µl
 Oven/Hotplate ID: N/A Temperature (°C):

SAMPLE IDENTIFICATION	pH	WT (g)	I.V. (mL)	F.V. (mL)	
PPW - FISEL			5	5	
LCSW - FISEL *					
243222					
23					
24					
25					
26					
27					
28					
29					
30					
30d					
31					
32					
32d S * RE 6/15/04					
245108					
d					
S *					
109					
110					
111					
112					
113					
114					
115					
116					
* 50µl Spike - 1 (Spx, # 4306, exp. 10/04)					
20µl CAL-1 (Spx, # 4514, exp. 3/05)					
** RLB 02-042-02 1% HNO ₃ , 5% HCL (PPW/LCSW)					
LOCATION: N/A					

PREPARED BY: John Wilkes DATE: 6-15-04
 REVIEWED BY: John Wilkes DATE: 6-15-04
 DISPOSAL INT/DATE/LOC:

ISS-02-101-01

CLP SPK SOLN @ ILMO 4.1 GFAA LVL
 JWILKS 6-14-04
 CLP Spiking Solution @ GFAA LVL ILMO 4.1

Elem.	Source	Inorg #	Exp. Date	Init. Conc. (ppm)	Amt. Added (uL)	Final Conc. (ppm)	FV (mL)
As	IV	4433	02/01/05	1000	400	4	100
Cd	IV	4467	03/01/05	1000	50	0.5	100
Pb	IV	4313	11/01/04	1000	200	2	100
Sb	IV	4464	03/01/05	1000	1000	10	100
Se	IV	4152	07/01/04	1000	100	1	100
Tl	IV	4435	02/01/05	1000	500	5	100

Prepped by: JWILKS

ISS prepped in 1% HNO₃, Fisher, Inorg # 4580

Date: 06/14/04 Exp Date: 07/01/04

ISS-02-101-02 1000ppm Scandium Solution

IV Inorg # 4262 Exp: 10-1-04 Initial Conc 10000ppm
 Amount Added 10mL / Final Conc. 1000ppm / FV 100mL
 Prepped in 1% HNO₃ Fisher, Inorg # 4580 DL 6-14-04

1/Range
 7/6/04

ISS-02-101-03 1ppm M&E #3 for Mentor Corp. MDL. 1% HNO₃ # 4582

elem.	Source	IO#	exp.	FC	Amt. added	FC	F.V.
M&E #3	Spec	# 4366	12/30/04	10ppm	1mL	1.0ppm	10mL
prep. date	6-22-04		exp.	9-22-04.			

KE of EQ 6/22/04

ISS-02-101-04 1ppm TE prep'd 6/18/04

Added 100uL of 1000ppm TE #4435 exp 2/05
 to 100mL vol flask & brought up to mark
 w/ 1% HNO₃ #4582 Corduna 6/22/04

ISS-02-101-05 10ppb TE prep'd 6/18/04 exp 2/05

Added 1mL 1ppm TE (ISS-02-101-04) to 100mL
 vol flask & brought up to mark w/ 1% HNO₃ #4582.
 Corduna 6/22/04

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010079

SOUTHWEST RESEARCH INSTITUTE®

6220 Culebra Rd
San Antonio, Texas 78228

TJA_2 TRACE ICP DAILY LOG

ANALYST JDDATE 6-15-04

As 189.042 Profile Line

As Intensity: 387.914PEAK POSITION .013764VERNIER POSITION 753

QC PREP DATE:	
CCV/ICV	04E21
CRI	04F02
ICSA	1
ICSAB	1

STDs PREP DATE:	
CLP_STD1_SC	04E25
CLP_STD2_SC	04F02
CLP_STD3_SC	04E25
CLP_STD4_SC	04E25
CLP_STD5_SC	04F02
CLP_STD6_SC	04E25
BLK_SC	04E21

COMMENTS	FILE	CLIENT	TO#	PROJECT NO.	METHOD	
B40A152	Y04 JUN	DIV 20	04015-2 200521-6	06002.01.141	SWR1 S6	214
B4061010	1	SAFEL	040610-10	06355.24.006	601013 S7	111
B406111	1	WESTON	040611-1	05827.04.006	1 S7	110
JD 6-15-04						

COMMENTS: _____

MAINTENANCE:

REVIEWED BY:

Corduna

DATE:

6/22/04

SOUTHWEST RESEARCH INSTITUTE

6220 Culebra Rd
San Antonio, Texas 78228

010080

SPECTRO ICP DAILY LOG

ANALYST DLDATE 6-15-04POWER: 1200

FLOWS:

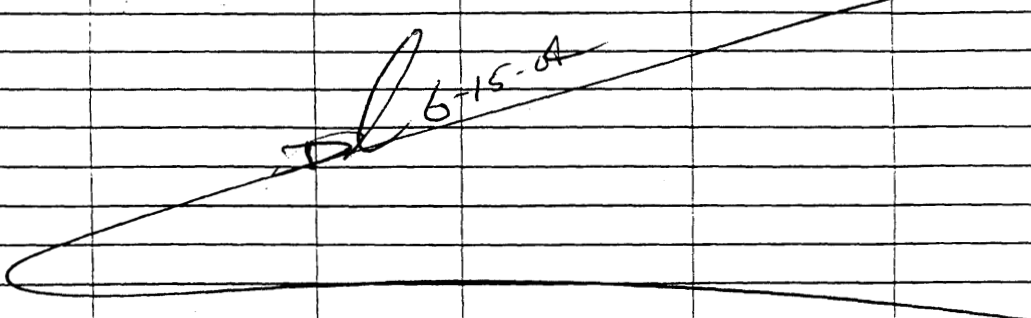
Aux 40
Coolant 60
Mass Flow Controller 1054

CURRENT	PROPOSED	
4991	4997	Na
4765	4765	Fe
4907	4909	Sr

QC PREP DATE:	
CCV/ICV	64621
CRI	
ICSA	
ICSAB	

CLP STD1 SC	64621
CLP STD2 SC	64621
CLP STD3 SC	64621
CLP STD4 SC	64621
CLP STD5 SC	64621
BLK SC	64621

E25
at 675-04

FILE	CLIENT	TO#	PROJECT NO.	METHOD	PREP PAGE
040615	Div 20	040415-2 640521-6	66062.01.141	Li RNA	56215
					

COMMENTS: _____

MAINTENANCE:

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

_____REVIEWED BY: DLDATE: 7/2/04

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- CAEZ1

Date Prepared: 5-21-04

Prepared By: DL

010081

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO₃ INORG #: 4561

Added ✓ 50 ml HCL INORG #: 4554

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

ICP Calibration Blank/ICB/CCB Solution

ID: BLK- CAF21

Date Prepared: 6-21-04

Prepared By: DH

Make up as needed in 1000ml volumetric flask.

Added ✓ 10 ml HNO₃ INORG #: 4582

Added ✓ 50 ml HCL INORG #: 4556

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

ICP Calibration Blank/ICB/CCB Solution

ID: BLK-

Date Prepared: _____

Prepared By: _____

Make up as needed in 1000ml volumetric flask.

Added _____ 10 ml HNO₃ INORG #: _____

Added _____ 50 ml HCL INORG #: _____

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

ICP Calibration Blank/ICB/CCB Solution

ID: BLK-

Date Prepared: _____

Prepared By: _____

Make up as needed in 1000ml volumetric flask.

Added _____ 10 ml HNO₃ INORG #: _____

Added _____ 50 ml HCL INORG #: _____

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

ICP ICV/CCV SOLUTION

010082

CCV-04E21

Date Prepared: 5-21-04

Prepared By: D.L.

HNO3 INORG #: 4561

HCl INORG #: 4554

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

Element	Std Conc (ppm)	Amt added	Check	Source	Inorg #	Stock Conc (ppm)	Exp Date
Sc	10	1ml	✓	INORGVENT	4262	10000	10-1-04
B	5	5ml	✓	SPEX	4564	1000	4-30-05
Li	5	5ml	✓	SPEX	4439	1000	1-30-05
Mo	5	5ml	✓	SPEX	4440	1000	1-30-05
P	5	5ml	✓	SPEX	4307	1000	10-30-04
Si	5	5ml	✓	SPEX	4232	1000	8-30-04
Ti	5	5ml	✓	SPEX	4234	1000	8-30-04
Sr	5	5ml	✓	SPEX	4308	1000	10-30-04
Sn	5	5ml	✓	SPEX	4565	1000	4-30-05
Bi	5	5ml	✓	SPEX	4475	1000	2-28-05
La	5	5ml	✓	SPEX	4438	1000	1-30-05
Y	5	5ml	✓	SPEX	4441	1000	11-30-05
Pd	1	1ml	✓	SPEX	4417	1000	1-15-05
S	1	1ml	✓	SPEX	4140	1000	6-30-04
Th	1	1ml	✓	SPEX	4233	1000	8-30-04
U	1	1ml	✓	SPEX	4142	1000	6-30-04
W	1	1ml	✓	SPEX	4212	1000	8-15-04
Zr	5	5ml	✓	SPEX	4566	1000	4-30-05
Na	10	1ml	✓	SPEX	4443	10000	1-30-05
ICV-2A	vary	10ml	✓	SPEX	4328	mix	11-30-04
ICV-2B	vary	1ml	✓	SPEX	4329	mix	11-30-04
ICV-2C	vary	10ml	✓	SPEX	4330	mix	11-30-04

Expiration Date: 6-30-04

ICP Calibration Standards

010083

Date Prepared: 5-25-04

Prepared By: JD

HNO3 INORG #: 4561

HCl INORG #: 4555

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

Prepared	Standard Name	Element	Std Conc (ppm)	Added ml	Check	Source	INORG #	Stock Conc (ppm)	Exp Date
04E25- 5-24-04 5-25-04	STD1-	Al	50	2.50	✓	INORVENT	4220	10000	9-1-04
		Ca	50	2.50	✓	INORVENT	4436	10000	2-1-05
		Fe	50	2.50	✓	INORVENT	4470	10000	3-1-05
		K	50	2.50	✓	INORVENT	4320	10000	12-1-04
		Mg	25	1.25	✓	INORVENT	4204	10000	8-1-04
		Na	50	2.50	✓	INORVENT	4205	10000	8-1-04
		Li	10	5.00	✓	INORVENT	4149	1000	7-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
04E25- 5-24-04 5-25-04	STD2-	Ba	10	5.00	✓	INORVENT	4465	1000	3-1-05
		Be	5	2.50	✓	INORVENT	4062	1000	6-1-05
		Cr	10	5.00	✓	INORVENT	4318	1000	12-1-04
		Cu	10	5.00	✓	INORVENT	4469	1000	5-1-05
		Ni	10	5.00	✓	INORVENT	4472	1000	3-1-05
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
04E25- 5-24-04 5-25-04	STD3-	Cd	10	5.00	✓	INORVENT	4467	1000	3-1-05
		Co	10	5.00	✓	INORVENT	4468	1000	3-1-05
		Mn	10	5.00	✓	INORVENT	4434	1000	2-1-05
		V	10	5.00	✓	INORVENT	4321	1000	12-1-04
		Zn	10	5.00	✓	INORVENT	4319	1000	12-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
04E25- 5-24-04 5-25-04	STD4-	Ag	2	1.00	✓	INORVENT	4222	1000	9-1-04
		As	10	5.00	✓	INORVENT	4433	1000	2-1-05
		Pb	10	5.00	✓	INORVENT	4313	1000	11-1-04
		Sb	10	5.00	✓	INORVENT	4464	1000	3-1-05
		Se	10	5.00	✓	INORVENT	4152	1000	7-1-04
		TL	10	5.00	✓	INORVENT	4435	1000	2-1-05
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
04E25- 5-24-04 5-25-04	STD5-	B	10	5.00	✓	INORVENT	4201	1000	8-1-04
		Mo	10	5.00	✓	INORVENT	4471	1000	3-1-05
		P	10	5.00	✓	INORVENT	4049	1000	6-1-05
		Si	10	5.00	✓	INORVENT	4437	1000	2-1-05
		Ti	10	5.00	✓	INORVENT	4332	1000	12-1-04
		Sr	10	5.00	✓	INORVENT	4154	1000	7-1-04
		Sn	10	5.00	✓	INORVENT	4512	1000	4-1-05
		Bi	5	2.50	✓	INORVENT	4200	1000	8-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
04E25- 5-24-04 5-25-04	STD6-	La	10	5.00	✓	INORVENT	4221	1000	9-1-04
		Na	1	0.05	✓	INORVENT	4205	10000	8-1-04
		Pd	10	5.00	✓	INORVENT	4477	1000	3-1-05
		S	10	5.00	✓	INORVENT	4377	1000	12-1-04
		Th	10	5.00	✓	INORVENT	4283	1000	11-1-04
		U	10	5.00	✓	INORVENT	4473	1000	3-1-05
		W	5	2.50	✓	INORVENT	4203	1000	8-1-04
		Y	10	5.00	✓	INORVENT	4513	1000	4-1-05
		Zr	10	5.00	✓	INORVENT	4442	1000	8-1-05
		SC	10	0.500	✓	INORVENT	4262	10000	10-1-04

Expiration Dates:

STD1: 7-1-04

STD4: 7-1-04

STD2: 6-1-04

STD5: 6-1-04

STD3: 8-24-04

STD6: 8-1-04

ICP Calibration Standards

010084

Date Prepared: 6-2-04

Prepared By: JS

HNO3 INORG #: 4562

HCl INORG #: 4557

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

Prepared	Standard Name	Element	Std Conc (ppm)	Added ml	Check	Source	INORG #	Stock Conc (ppm)	Exp Date
	STD1-	Al	50	2.50		INORVENT		10000	
		Ca	50	2.50		INORVENT		10000	
		Fe	50	2.50		INORVENT		10000	
		K	50	2.50		INORVENT		10000	
		Mg	25	1.25		INORVENT		10000	
		Na	50	2.50		INORVENT		10000	
		Li	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
6-2-04	STD2- AF02	Ba	10	5.00		INORVENT	4465	1000	3-1-05
		Be	5	2.50	✓	INORVENT	4542	1000	6-1-05
		Cr	10	5.00	✓	INORVENT	4318	1000	12-1-04
		Cu	10	5.00	✓	INORVENT	4469	1000	3-1-05
		Ni	10	5.00	✓	INORVENT	4472	1000	3-1-05
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
	STD3-	Cd	10	5.00		INORVENT		1000	
		Co	10	5.00		INORVENT		1000	
		Mn	10	5.00		INORVENT		1000	
		V	10	5.00		INORVENT		1000	
		Zn	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
	STD4-	Ag	10	1.00		INORVENT		1000	
		As	10	5.00		INORVENT		1000	
		Pb	10	5.00		INORVENT		1000	
		Sb	10	5.00		INORVENT		1000	
		Se	10	5.00		INORVENT		1000	
		Tl	10	5.00		INORVENT		1000	
		Sc	10	0.500		INORVENT		10000	
6-2-04	STD5- AF02	B	10	5.00	✓	INORVENT	4201	1000	8-1-04
		Mo	10	5.00	✓	INORVENT	4471	1000	3-1-05
		P	10	5.00	✓	INORVENT	4543	1000	6-1-05
		Si	10	5.00	✓	INORVENT	4437	1000	2-1-05
		Ti	10	5.00	✓	INORVENT	4332	1000	12-1-04
		Sr	10	5.00	✓	INORVENT	4154	1000	7-1-04
		Sn	10	5.00	✓	INORVENT	4512	1000	4-1-04
		Bi	5	2.50	✓	INORVENT	4200	1000	8-1-04
		Sc	10	0.500	✓	INORVENT	4262	10000	10-1-04
	STD6-	La	10	5.00		INORVENT		1000	
		Na	1	0.05		INORVENT		10000	
		Pd	10	5.00		INORVENT		1000	
		S	10	5.00		INORVENT		1000	
		Th	10	5.00		INORVENT		1000	
		U	10	5.00		INORVENT		1000	
		W	5	2.50		INORVENT		1000	
		Y	10	5.00		INORVENT		1000	
		Zr	10	5.00		INORVENT		1000	
		SC	10	0.500		INORVENT		10000	

Expiration Dates:

STD1: —

STD4: —

STD2: 8-1-04

STD5: 7-1-04

STD3: —

STD6: —

010085

ICP ANALYSIS

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
0606201.141	Div 20	040415-2 040521-6	6-15-04	Water	56 215

INSTRUMENT: Spectro FILENAME: 040615

INSTRUMENT DL: _____

sep last result visible enabled ...

tarting run ...

reating high priority queue entries ...

ACKGROUND CORRECTED INTENSITIES

identity 1 : BLK_SC Identity 2 : Type : STD

eight : 1.0000 Volume : 1.00 Printed : 12:45:32 PM June 15, 2004

010086

	K_756	Li670	Na589	Sc361
# 1	14.0	-9.5	46.5	4298.0
# 2	1.0	-12.5	37.5	4246.0
ean	7.5	-11.0	42.0	4272.0
D	9.2	2.1	6.4	36.8
RSD	122.6	19.3	15.2	0.9

NTENSITIES

identity 1 : BLK_SC Identity 2 : Type : STD

eight : 1.0000 Volume : 1.00 Printed : 12:45:32 PM June 15, 2004

	K_756	Li670	Na589	Sc361
# 1	0.0	-0.0	0.0	4298.0
# 2	0.0	-0.0	0.0	4246.0
ean	0.0	-0.0	0.0	4272.0
D	0.0	0.0	0.0	36.8
RSD	122.3	20.1	14.3	0.9

Shang
6/24/04

6-15-04



105/104

BACKGROUND CORRECTED INTENSITIES

Identity 1 : CLP_STD1_SC Identity 2 : Type : STD

Height : 1.0000 Volume : 1.00 Printed : 12:48:40 PM June 15, 2004

010087

	K_766	Li670	Na589
# 1	4829.5	49728.0	28336.5
# 2	4825.5	49500.0	28229.5
Mean	4827.5	49614.0	28283.0
D	2.8	161.2	75.7
RSD	0.1	0.3	0.3

INTENSITIES

Identity 1 : CLP_STD1_SC Identity 2 : Type : STD

Height : 1.0000 Volume : 1.00 Printed : 12:48:40 PM June 15, 2004

	K_766	Li670	Na589
# 1	1.1	11.6	6.6
# 2	1.1	11.6	6.6
Mean	1.1	11.6	6.6
D	0.0	0.0	0.0
RSD	0.1	0.1	0.1

BACKGROUND CORRECTED INTENSITIES

Identity 1 : CLP_CCV_SC Identity 2 : Type : CV

Height : 1.0000 Volume : 1.00 Printed : 12:51:48 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1881.0	23766.0	16334.5	4316.5	4316.5
# 2	1863.0	23661.0	16333.5	4267.5	4267.5
Mean	1872.0	23713.5	16334.0	4292.0	4292.0
D	12.7	74.2	0.7	34.6	34.6
RSD	0.7	0.3	0.0	0.8	0.8

PPARENT CONCENTRATIONS

Identity 1 : CLP_CCV_SC Identity 2 : Type : CV

Height : 1.0000 Volume : 1.00 Printed : 12:51:48 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	19.2673	4.7503	28.5975	4316.500 H	101.0433
# 2	19.3022	4.7836	28.9250	4267.500	99.8945
Mean	19.2847	4.7669	28.7612	4292.000 H	100.4689
D	0.0247	0.0235	0.2315	34.648	0.8123
RSD	0.1279	0.4940	0.8050	0.807	0.8085

Checking calibration verification ...

Identity 1 : CLP_CCV_SC Identity 2 :

Report name	Low limit	Value	High limit
_766	18.000	19.285	22.000
1670	4.500	4.767	5.500
a589	27.000	28.761	33.000

BACKGROUND CORRECTED INTENSITIES

Identity 1 : Calibration blank Identity 2 : Type : CB

Height : 1.0000 Volume : 1.00 Printed : 12:56:04 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	16.0	-2.0	23.5	4319.0	4319.0
# 2	16.0	-2.0	23.5	4319.0	4319.0

ean	12.0	-1.0	22.0	4294.5	4294.5
D	5.7	1.4	2.1	34.6	34.6
RSD	47.1	141.4	9.6	0.8	0.8

010088

PPARENT CONCENTRATIONS

identity 1 : Calibration blank Identity 2 : Type : CB
 eight : 1.0000 Volume : 1.00 Printed : 12:56:04 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc36i ppm
# 1	0.0865	0.0018 L	-0.0333	4319.000 H	101.1019
# 2	0.0052	0.0022 L	-0.0381	4270.000	99.9531
ean	0.0459	0.0020 L	-0.0357	4294.500 H	100.5275
D	0.0575	0.0003	0.0034	34.648	0.8123
RSD	125.2847	13.9730	9.6094	0.807	0.8080

hecking calibration blank ...

identity 1 : Calibration blank Identity 2 :

port name	CRDL	Value
_766	0.100	0.046
i670	0.010	0.002
a589	0.050	-0.036
c36i	0.000	100.527

BACKGROUND CORRECTED INTENSITIES

identity 1 : pbw-F15E2 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 12:59:12 PM June 15, 2004

010089

	K_766	Li670	Na589	Sc	Sc361
# 1	8.0	-21.0	20.0	4.0	4.0
# 2	4.0	-11.0	8.0	1.0	1.0
ean	6.0	-16.0	14.0	2.5	2.5
D	2.8	7.1	8.5	2.1	2.1
RSD	47.1	44.2	80.6	84.9	84.9

PPARENT CONCENTRATIONS

identity 1 : pbw-F15E2 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 12:59:12 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1 H	88.7086 L	-4.5252	37.8094	4.000 L	-0.0586
# 2 H	177.4352 L	-9.4838 H	60.5397	1.000 L	-0.1289
ean H	133.1019 L	7.0045	49.1745	2.500 L	-0.0938
D	62.7816	3.5063	16.0728	2.121	0.0497
RSD	47.1681	50.0573	32.6851	84.853	53.0330

tarting run ...

reating high priority queue entries ...

BACKGROUND CORRECTED INTENSITIES

identity 1 : CLP_CCY_SC Identity 2 : Type : CV
 eight : 1.0000 Volume : 1.00 Printed : 1:05:44 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1874.5	23414.5	16144.0	4287.5	4287.5
# 2	1852.5	23237.5	15993.0	4245.5	4245.5
ean	1863.5	23326.0	16068.5	4266.5	4266.5
D	15.6	125.2	106.8	29.7	29.7
RSD	0.8	0.5	0.7	0.7	0.7

PPARENT CONCENTRATIONS

identity 1 : CLP_CCY_SC Identity 2 : Type : CV
 eight : 1.0000 Volume : 1.00 Printed : 1:05:44 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.3309	4.7117	28.4548	4287.500 H	100.3634
# 2	19.2928	4.7223	28.4676	4245.500	99.3787
ean	19.3118	4.7170	28.4612	4266.500	99.8711
D	0.0269	0.0075	0.0090	29.698	0.6962
RSD	0.1393	0.1595	0.0317	0.696	0.6971

hecking calibration verification ...

identity 1 : CLP_CCY_SC Identity 2 :

report name	Low limit	Value	High limit
_766	18.000	19.312	22.000
i670	4.500	4.717	5.500
a589	27.000	28.461	33.000

BACKGROUND CORRECTED INTENSITIES

Identity 1 : Calibration blank Identity 2 : Type : CB
 Weight : 1.0000 Volume : 1.00 Printed : 1:09:58 PM June 15, 2004

010090

	K_766	Li670	Na589	Sc	Sc361
# 1	8.5	-5.0	28.5	4359.0	4359.0
# 2	18.5	-4.0	22.5	4340.0	4340.0
mean	13.5	-4.5	25.5	4349.5	4349.5
D	7.1	0.7	4.2	13.4	13.4
RSD	52.4	15.7	16.6	0.3	0.3

PPARENT CONCENTRATIONS

Identity 1 : Calibration blank Identity 2 : Type : CB
 Weight : 1.0000 Volume : 1.00 Printed : 1:09:58 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.0086	0.0012 L	-0.0250	4359.000 H	102.0396
# 2	0.1113	0.0014 L	-0.0352	4340.000 H	101.5942
mean	0.0600	0.0013 L	-0.0301	4349.500 H	101.8169
D	0.0726	0.0001	0.0073	13.435	0.3150
RSD	121.0705	10.3455	24.1128	0.309	0.3093

checking calibration blank ...

Identity 1 : Calibration blank Identity 2 :

Report name	CRDL	Value
_766	0.100	0.060
i670	0.010	0.001
a589	0.050	-0.030
c361	0.000	101.817

BACKGROUND CORRECTED INTENSITIES

Identity 1 : pbw-F15E2 Identity 2 : pg56-215 Type : SAMPLE
 Weight : 1.0000 Volume : 1.00 Printed : 1:12:32 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	-5.0	-11.0	8.0	4269.5	4269.5
# 2	4.0	-5.0	18.0	4197.5	4197.5
mean	-0.5	-8.0	13.0	4233.5	4233.5
D	6.4	4.2	7.1	50.9	50.9
RSD	1272.8	53.0	54.4	1.2	1.2

PPARENT CONCENTRATIONS

Identity 1 : pbw-F15E2 Identity 2 : pg56-215 Type : SAMPLE
 Weight : 1.0000 Volume : 1.00 Printed : 1:12:34 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1 L	-0.1299 L	-0.0000 L	-0.0603	4269.500	99.9414
# 2 L	-0.0356	0.0012 L	-0.0420	4197.500	98.2534
mean L	-0.0828	0.0006 L	-0.0511	4233.500	99.0974
D	0.0667	0.0008	0.0129	50.912	1.1936
RSD	80.5456	141.7299	25.2919	1.203	1.2044

BACKGROUND CORRECTED INTENSITIES

Identity 1 : lcsu-F15E2 Identity 2 : pg56-215 Type : SAMPLE
 Weight : 1.0000 Volume : 1.00 Printed : 1:15:42 PM June 15, 2004

K_766	Li670	Na589	Sc	Sc361
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# 2	1845.0	-12.0	10753.0	4247.0	4247.0
Mean	1852.5	-14.0	10794.5	4276.5	4276.5
SD	10.6	2.8	58.7	41.7	41.7
RSD	0.6	20.2	0.5	1.0	1.0

010091

PPARENT CONCENTRATIONS

Identity 1 : lcsW-F15E2 Identity 2 : pg56-215 Type : SAMPLE

Height : 1.0000 Volume : 1.00 Printed : 1:15:42 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	19.0980 L	-0.0010	18.9924	4306.000 H	100.7971
# 2	19.2076 L	-0.0002	19.1092	4247.000	99.4139
Mean	19.1528 L	-0.0006	19.0508	4276.500 H	100.1055
SD	0.0775	0.0005	0.0826	41.719	0.9781
RSD	0.4046	90.4781	0.4335	0.976	0.9770

BACKGROUND CORRECTED INTENSITIES

Identity 1 : 243222 Identity 2 : pg56-215 Type : SAMPLE

Height : 1.0000 Volume : 1.00 Printed : 1:18:50 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	55.5	-0.5	2437.5	5012.5	5012.5
# 2	55.5	-2.5	2471.5	5007.5	5007.5
Mean	55.5	-1.5	2454.5	5010.0	5010.0
SD	0.0	1.4	24.0	3.5	3.5
RSD	0.0	94.3	1.0	0.1	0.1

PPARENT CONCENTRATIONS

Identity 1 : 243222 Identity 2 : pg56-215 Type : SAMPLE

Height : 1.0000 Volume : 1.00 Printed : 1:18:50 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	0.4136	0.0021	3.6100	5012.500 H	117.3602
# 2	0.4141	0.0018	3.6651	5007.500 H	117.2430
Mean	0.4138	0.0020	3.6375	5010.000 H	117.3016
SD	0.0003	0.0002	0.0390	3.536	0.0829
RSD	0.0839	12.4149	1.0716	0.071	0.0707

BACKGROUND CORRECTED INTENSITIES

Identity 1 : 243223 Identity 2 : pg56-215 Type : SAMPLE

Height : 1.0000 Volume : 1.00 Printed : 1:21:58 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	572.0	188.0	22666.5	4929.5	4929.5
# 2	572.0	189.0	22705.5	4909.5	4909.5
Mean	572.0	188.5	22686.0	4919.5	4919.5
SD	0.0	0.7	27.6	14.1	14.1
RSD	0.0	0.4	0.1	0.3	0.3

PPARENT CONCENTRATIONS

Identity 1 : 243223 Identity 2 : pg56-215 Type : SAMPLE

Height : 1.0000 Volume : 1.00 Printed : 1:21:58 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	5.0773	0.0035	34.7645	4929.500 H	115.4144

010092

ean	5.0838	0.0353	34.8656	4919.500 H	115.1799
D	0.0148	0.0002	0.1429	14.142	0.3315
RSD	0.2919	0.6209	0.4099	0.287	0.2879

ACKGROUND CORRECTED INTENSITIES

identity 1 : 243224 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 1:25:04 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	13.5	-11.0	5793.5	4915.0	4915.0
# 2	4.5	-6.0	5805.5	4924.0	4924.0
ean	9.0	-8.5	5799.5	4919.5	4919.5
D	6.4	3.5	8.5	6.4	6.4
RSD	70.7	41.6	0.1	0.1	0.1

PPARENT CONCENTRATIONS

identity 1 : 243224 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 1:25:06 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	0.0440	0.0003	8.8565	4915.000 H	115.0744
# 2 L	-0.0374	0.0012	8.8587	4924.000 H	115.2854
ean	0.0033	0.0007	8.8576	4919.500 H	115.1799
D	0.0575	0.0006	0.0015	6.364	0.1452
RSD	1735.5152	85.1517	0.0171	0.129	0.1295

ACKGROUND CORRECTED INTENSITIES

identity 1 : 243225 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 1:28:14 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	21.0	-5.0	1950.5	4980.0	4980.0
# 2	27.0	-3.0	1953.5	5011.0	5011.0
ean	24.0	-4.0	1952.0	4995.5	4995.5
D	4.2	1.4	2.1	21.9	21.9
RSD	17.7	35.4	0.1	0.4	0.4

PPARENT CONCENTRATIONS

identity 1 : 243225 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 1:28:14 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	0.1093	0.0014	2.8931	4980.000 H	116.5983
# 2	0.1613	0.0017	2.8793	5011.000 H	117.3250
ean	0.1353	0.0015	2.8862	4995.500 H	116.9617
D	0.0368	0.0002	0.0098	21.920	0.5139
RSD	27.1825	16.1604	0.3386	0.439	0.4394

ACKGROUND CORRECTED INTENSITIES

identity 1 : 243226 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 1:31:22 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	39.0	5.0	3010.0	4977.5	4977.5
# 2	50.0	7.0	3025.0	5042.5	5042.5

	7.8	1.4	10.6	46.0	46.0
D	17.5	23.6	0.4	0.9	0.9

PPARENT CONCENTRATIONS

identity 1 : 243226 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 1:31:22 PM June 15, 2004

010093

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	0.2699	0.0031	4.5073	4977.500 H	116.5397
# 2	0.3623	0.0034	4.4708	5042.500 H	118.0635
ean	0.3161	0.0033	4.4891	5010.000 H	117.3016
D	0.0653	0.0002	0.0258	45.962	1.0775
RSD	20.6620	7.1939	0.5753	0.917	0.9166

ACKGROUND CORRECTED INTENSITIES

identity 1 : 243227 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 1:34:30 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1100.5	-4.5	13115.0	4928.0	4928.0
# 2	1099.5	1.5	13228.0	4956.0	4956.0
ean	1100.0	-1.5	13171.5	4942.0	4942.0
D	0.7	4.2	79.9	19.8	19.8
RSD	0.1	282.8	0.6	0.4	0.4

PPARENT CONCENTRATIONS

identity 1 : 243227 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 1:34:30 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	9.8358	0.0014	20.0897	4928.000 H	115.3792
# 2	9.7708	0.0025	20.1486	4956.000 H	116.0356
ean	9.8033	0.0020	20.1192	4942.000 H	115.7074
D	0.0459	0.0007	0.0416	19.799	0.4642
RSD	0.4686	37.8783	0.2068	0.401	0.4012

ACKGROUND CORRECTED INTENSITIES

identity 1 : 243228 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 1:37:40 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	151.5	2.0	4930.5	4938.0	4938.0
# 2	146.5	6.0	4929.5	4967.0	4967.0
ean	149.0	4.0	4930.0	4952.5	4952.5
D	3.5	2.8	0.7	20.5	20.5
RSD	2.4	70.7	0.0	0.4	0.4

PPARENT CONCENTRATIONS

identity 1 : 243228 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 1:37:40 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	1.2841	0.0026	7.4908	4938.000 H	115.6136
# 2	1.2314	0.0033	7.4451	4967.000 H	116.2935
ean	1.2577	0.0029	7.4679	4952.500 H	115.9536

RSD	2.9594	16.7910	0.4327	0.414	0.4146
# 1	614.5	189.0	23946.5	4850.0	4850.0
# 2	615.5	183.0	24064.5	4884.0	4884.0
mean	615.0	186.0	24005.5	4867.0	4867.0
D	0.7	4.2	83.4	24.0	24.0
RSD	0.1	2.3	0.3	0.5	0.5

BACKGROUND CORRECTED INTENSITIES

Identity 1 : 243229 Identity 2 : pg56-215 Type : SAMPLE

Height : 1.0000 Volume : 1.00 Printed : 1:40:46 PM June 15, 2004

010094

	K_766	Li670	Na589	Sc	Sc361
# 1	614.5	189.0	23946.5	4850.0	4850.0
# 2	615.5	183.0	24064.5	4884.0	4884.0
mean	615.0	186.0	24005.5	4867.0	4867.0
D	0.7	4.2	83.4	24.0	24.0
RSD	0.1	2.3	0.3	0.5	0.5

PPARENT CONCENTRATIONS

Identity 1 : 243229 Identity 2 : pg56-215 Type : SAMPLE

Height : 1.0000 Volume : 1.00 Printed : 1:40:46 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	5.5467	0.0358	37.3352	4850.000 H	113.5506
# 2	5.5167	0.0345	37.2579	4884.000 H	114.3477
mean	5.5317	0.0352	37.2965	4867.000 H	113.9491
D	0.0213	0.0009	0.0547	24.042	0.5636
RSD	0.3843	2.5997	0.1467	0.494	0.4946

BACKGROUND CORRECTED INTENSITIES

Identity 1 : CLP_CCv_SC Identity 2 : Type : CV

Height : 1.0000 Volume : 1.00 Printed : 1:46:06 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1893.5	23696.0	16299.5	4382.0	4382.0
# 2	1898.5	23748.0	16364.5	4380.0	4380.0
mean	1896.0	23722.0	16332.0	4381.0	4381.0
D	3.5	36.8	46.0	1.4	1.4
RSD	0.2	0.2	0.3	0.0	0.0

PPARENT CONCENTRATIONS

Identity 1 : CLP_CCv_SC Identity 2 : Type : CV

Height : 1.0000 Volume : 1.00 Printed : 1:46:06 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	19.1048	4.6655	28.1084	4382.000 H	102.5788
# 2	19.1642	4.6779	28.2337	4380.000 H	102.5319
mean	19.1345	4.6717	28.1711	4381.000 H	102.5554
D	0.0420	0.0087	0.0886	1.414	0.0332
RSD	0.2196	0.1872	0.3145	0.032	0.0323

necking calibration verification ...

Identity 1 : CLP_CCv_SC Identity 2 :

Report name	Low limit	Value	High limit
_766	18.000	19.134	22.000
1670	4.500	4.672	5.500
589	27.000	28.171	33.000

BACKGROUND CORRECTED INTENSITIES

Identity 1 : Calibration blank Identity 2 : Type : CB
 eight : 1.0000 Volume : 1.00 Printed : 1:50:20 PM June 15, 2004

010095

	K_766	Li670	Na589	Sc	Sc361
# 1	17.0	-8.5	34.5	4450.0	4450.0
# 2	10.0	-11.5	27.5	4411.0	4411.0
ean	13.5	-10.0	31.0	4430.5	4430.5
D	4.9	2.1	4.9	27.6	27.6
RSD	36.7	21.2	16.0	0.6	0.6

PPARENT CONCENTRATIONS

Identity 1 : Calibration blank Identity 2 : Type : CB
 eight : 1.0000 Volume : 1.00 Printed : 1:50:22 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.0917	0.0006 L	-0.0157	4450.000 H	104.1730
# 2	0.0227 L	-0.0000 L	-0.0273	4411.000 H	103.2587
ean	0.0572	0.0003 L	-0.0215	4430.500 H	103.7159
D	0.0488	0.0004	0.0081	27.577	0.6465
RSD	85.2665	155.8242	37.8338	0.622	0.6234

checking calibration blank ...

Identity 1 : Calibration blank Identity 2 :

Report name	CRDL	Value
_766	0.100	0.057
i670	0.010	0.000
a589	0.050	-0.022
c361	0.000	103.716

BACKGROUND CORRECTED INTENSITIES

Identity 1 : 243230 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 1:53:30 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	351.5	1245.5	109227.0	4134.0	4134.0
# 2	352.5	1248.5	109382.0	3917.0	3917.0
ean	352.0	1247.0	109304.5	4025.5	4025.5
D	0.7	2.1	109.6	153.4	153.4
RSD	0.2	0.2	0.1	3.8	3.8

PPARENT CONCENTRATIONS

Identity 1 : 243230 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 1:53:30 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	3.6967	0.2620 H	200.1161	4134.000	96.7647
# 2	3.9171	0.2771 H	211.5064	3917.000	91.6774
ean	3.8069	0.2698 H	205.8112	4025.500	94.2211
D	0.1559	0.0106	8.0541	153.442	3.5973
RSD	4.0946	3.9489	3.9134	3.812	3.8179

BACKGROUND CORRECTED INTENSITIES

Identity 1 : 243230d Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 1:56:38 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 2	353.0	1237.0	108319.0	3942.0	3942.0
mean	354.5	1231.5	108001.0	4037.5	4037.5
D	2.1	7.8	449.7	135.1	135.1
RSD	0.6	0.6	0.4	3.3	3.3

010096

PPARENT CONCENTRATIONS

Identity 1 : 243230d Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 1:56:38 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	3.7459	0.2580 H	197.3340	4133.000	96.7413
# 2	3.8974	0.2728 H	208.1214	3942.000	92.2635
mean	3.8217	0.2654 H	202.7277	4037.500	94.5024
D	0.1071	0.0105	7.6278	135.057	3.1663
RSD	2.8030	3.9430	3.7626	3.345	3.3505

ACKGROUND CORRECTED INTENSITIES

Identity 1 : 243231 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 1:59:46 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	633.0	207.5	27212.5	4907.0	4907.0
# 2	641.0	201.5	27225.5	4915.0	4915.0
mean	637.0	204.5	27219.0	4911.0	4911.0
D	5.7	4.2	9.2	5.7	5.7
RSD	0.9	2.1	0.0	0.1	0.1

PPARENT CONCENTRATIONS

Identity 1 : 243231 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 1:59:46 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	5.6488	0.0387	41.9436	4907.000 H	114.8869
# 2	5.7117	0.0376	41.8953	4915.000 H	115.0744
mean	5.6802	0.0381	41.9194	4911.000 H	114.9807
D	0.0445	0.0008	0.0342	5.657	0.1326
RSD	0.7835	2.0623	0.0816	0.115	0.1153

ACKGROUND CORRECTED INTENSITIES

Identity 1 : 243232 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:02:56 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	428.0	242.0	31305.5	4887.5	4887.5
# 2	432.0	242.0	31536.5	4904.5	4904.5
mean	430.0	242.0	31421.0	4896.0	4896.0
D	2.8	0.0	163.3	12.0	12.0
RSD	0.7	0.0	0.5	0.2	0.2

PPARENT CONCENTRATIONS

Identity 1 : 243232 Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:02:56 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	3.8096	0.0449	48.4564	4887.500 H	114.4297

010097

ean	3.8210	0.0448	48.5507	4896.000 H	114.6290
D	0.0161	0.0001	0.1334	12.021	0.2818
RSD	0.4207	0.2334	0.2747	0.246	0.2458

BACKGROUND CORRECTED INTENSITIES

identity 1 : 243232s Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:06:04 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	2578.0	239.0	42935.0	4737.0	4737.0
# 2	2572.0	244.0	42785.0	4725.0	4725.0
ean	2575.0	241.5	42860.0	4731.0	4731.0
D	4.2	3.5	106.1	8.5	8.5
RSD	0.2	1.5	0.2	0.2	0.2

PPARENT CONCENTRATIONS

identity 1 : 243232s Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:06:04 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	24.0821	0.0457 H	68.5995	4737.000 H	110.9014
# 2	24.0870	0.0468 H	68.5334	4725.000 H	110.6201
ean	24.0845	0.0462 H	68.5664	4731.000 H	110.7608
D	0.0035	0.0007	0.0468	8.485	0.1989
RSD	0.0146	1.5644	0.0682	0.179	0.1796

BACKGROUND CORRECTED INTENSITIES 245108 CO 4/2A/04

identity 1 : ~~243232s~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:09:14 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	397.0	221.0	33186.0	4871.0	4871.0
# 2	409.0	225.0	33417.0	4878.0	4878.0
ean	403.0	223.0	33301.5	4874.5	4874.5
D	8.5	2.8	163.3	4.9	4.9
RSD	2.1	1.3	0.5	0.1	0.1

PPARENT CONCENTRATIONS 245108 CO 4/2A/04

identity 1 : ~~243232s~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:09:14 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	3.5402	0.0413 H	51.5459	4871.000 H	114.0429
# 2	3.6443	0.0420 H	51.8306	4878.000 H	114.2070
ean	3.5922	0.0417 H	51.6882	4874.500 H	114.1250
D	0.0736	0.0005	0.2013	4.950	0.1160
RSD	2.0475	1.1046	0.3895	0.102	0.1017

BACKGROUND CORRECTED INTENSITIES 245108d CO 4/2A/04

identity 1 : ~~243232s~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:12:20 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	406.0	224.0	33406.0	4890.0	4890.0
# 2	402.0	234.0	33669.0	4913.0	4913.0

	2.8	7.1	186.0	16.3	16.3
D	0.7	3.1	0.6	0.3	0.3

010098

PPARENT CONCENTRATIONS **245108d** **CO 6/24/04**
 identity 1 : ~~245108d~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:12:20 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	3.6079	0.0417 H	51.6862	4890.000 H	114.4683
# 2	3.5545	0.0433 H	51.8494	4913.000 H	115.0275
ean	3.5812	0.0425 H	51.7678	4901.500 H	114.7579
D	0.0378	0.0011	0.1155	16.263	0.3813
RSD	1.0544	2.6122	0.2230	0.332	0.3322

ACKGROUND CORRECTED INTENSITIES **245108s** **CO 6/24/04**
 identity 1 : ~~245108s~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:15:30 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	2569.0	219.5	44833.5	4724.0	4724.0
# 2	2593.0	219.5	45263.5	4736.0	4736.0
ean	2581.0	219.5	45048.5	4730.0	4730.0
D	17.0	0.0	304.1	8.5	8.5
RSD	0.7	0.0	0.7	0.2	0.2

PPARENT CONCENTRATIONS **245108s** **CO 6/24/04**
 identity 1 : ~~245108s~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:15:30 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	24.0640	0.0423 H	71.8335	4724.000 H	110.5966
# 2	24.2278	0.0422 H	72.3392	4736.000 H	110.8780
ean	24.1459	0.0422 H	72.0863	4730.000 H	110.7373
D	0.1158	0.0001	0.3576	8.485	0.1989
RSD	0.4797	0.1700	0.4961	0.179	0.1796

ACKGROUND CORRECTED INTENSITIES **245109** **CO 6/24/04**
 identity 1 : ~~245109~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:18:38 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	316.5	484.0	50107.0	4910.5	4910.5
# 2	309.5	500.0	49653.0	4876.5	4876.5
ean	313.0	492.0	49880.0	4893.5	4893.5
D	4.9	11.3	321.0	24.0	24.0
RSD	1.6	2.3	0.6	0.5	0.5

PPARENT CONCENTRATIONS **245109** **CO 6/24/04**
 identity 1 : ~~245109~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:18:38 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	2.7834	0.0872 H	77.2393	4910.500 H	114.9689
# 2	2.7396	0.0906 H	77.0729	4876.500 H	114.1718
ean	2.7615	0.0889 H	77.1561	4893.500 H	114.5704

RSD 1.1209 2.7210 0.1524 0.491 0.4920

ACKGROUND CORRECTED INTENSITIES 245110 CO 6/24/04
 identity 1 : ~~243110~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:21:46 PM June 15, 2004

010099

	K_766	Li670	Na589	Sc	Sc361
# 1	412.0	232.0	34412.0	4945.0	4945.0
# 2	434.0	244.0	34799.0	4979.0	4979.0
ean	423.0	238.0	34605.5	4962.0	4962.0
D	15.6	8.5	273.7	24.0	24.0
RSD	3.7	3.6	0.8	0.5	0.5

PPARENT CONCENTRATIONS 245110 CO 6/24/04
 identity 1 : ~~243110~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:21:46 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	3.6208	0.0427 H	52.6519	4945.000 H	115.7778
# 2	3.7917	0.0445 H	52.8807	4979.000 H	116.5748
ean	3.7062	0.0436 H	52.7663	4962.000 H	116.1763
D	0.1208	0.0013	0.1618	24.042	0.5636
RSD	3.2605	2.9240	0.3067	0.485	0.4852

ACKGROUND CORRECTED INTENSITIES
 identity 1 : CLP_CCV_SC Identity 2 : Type : CV
 eight : 1.0000 Volume : 1.00 Printed : 2:27:06 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	1912.5	23794.5	16328.0	4413.5	4413.5
# 2	1897.5	23756.5	16319.0	4383.5	4383.5
ean	1905.0	23775.5	16323.5	4398.5	4398.5
D	10.6	26.9	6.4	21.2	21.2
RSD	0.6	0.1	0.0	0.5	0.5

PPARENT CONCENTRATIONS
 identity 1 : CLP_CCV_SC Identity 2 : Type : CV
 eight : 1.0000 Volume : 1.00 Printed : 2:27:06 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	19.1590	4.6515	27.9562	4413.500 H	103.3173
# 2	19.1387	4.6758	28.1325	4383.500 H	102.6140
ean	19.1489	4.6637	28.0444	4398.500 H	102.9657
D	0.0143	0.0172	0.1246	21.213	0.4973
RSD	0.0748	0.3691	0.4445	0.482	0.4830

checking calibration verification ...

identity 1 : CLP_CCV_SC Identity 2 :

Report name	Low limit	Value	High limit
_766	18.000	19.149	22.000
670	4.500	4.664	5.500
589	27.000	28.044	33.000

BACKGROUND CORRECTED INTENSITIES

Identity 1 : Calibration blank Identity 2 : Type : CB
 eight : 1.0000 Volume : 1.00 Printed : 2:31:18 PM June 15, 2004

010100

	K_766	Li670	Na589	Sc	Sc361
# 1	16.0	-7.0	35.0	4428.0	4428.0
# 2	20.0	-3.0	35.0	4405.0	4405.0
ean	18.0	-5.0	35.0	4416.5	4416.5
D	2.8	2.8	0.0	16.3	16.3
RSD	15.7	56.6	0.0	0.4	0.4

PPARENT CONCENTRATIONS

Identity 1 : Calibration blank Identity 2 : Type : CB
 eight : 1.0000 Volume : 1.00 Printed : 2:31:18 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.0825	0.0009 L	-0.0146	4428.000 H	103.6573
# 2	0.1236	0.0016 L	-0.0143	4405.000 H	103.1180
ean	0.1030	0.0012 L	-0.0144	4416.500 H	103.3876
D	0.0291	0.0005	0.0002	16.263	0.3813
RSD	28.2367	44.0634	1.5306	0.368	0.3688

checking calibration blank ...

Report name	CRDL	Value	
_766	0.100	0.103	Contaminated
i670	0.010	0.001	
a589	0.050	-0.014	
c361	0.000	103.388	

BACKGROUND CORRECTED INTENSITIES

245111

CO 6/24/04

Identity 1 : ~~243111~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:34:28 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	328.0	511.0	51254.0	4885.0	4885.0
# 2	324.0	519.0	52245.0	4873.0	4873.0
ean	326.0	515.0	51749.5	4879.0	4879.0
D	2.8	5.7	700.7	8.5	8.5
RSD	0.9	1.1	1.4	0.2	0.2

PPARENT CONCENTRATIONS

245111 CO 6/24/04

Identity 1 : ~~243111~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:34:28 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	2.9028	0.0924 H	79.4219	4885.000 H	114.3711
# 2	2.8737	0.0941 H	81.1585	4873.000 H	114.0898
ean	2.8883	0.0932 H	80.2902	4879.000 H	114.2305
D	0.0206	0.0012	1.2280	8.485	0.1989
RSD	0.7124	1.2420	1.5294	0.174	0.1741

BACKGROUND CORRECTED INTENSITIES

245112

CO 6/24/04

Identity 1 : ~~243112~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:37:36 PM June 15, 2004

K_766	Li670	Na589	Sc	Sc361
-------	-------	-------	----	-------

# 2	1031.5	-8.5	5966.0	4993.0	4993.0
ean	1030.5	-4.0	5942.5	4993.5	4993.5
D	1.4	6.4	33.2	0.7	0.7
RSD	0.1	159.1	0.6	0.0	0.0

010101

PPARENT CONCENTRATIONS 245112 CO 6/24/04

Identity 1 : ~~245112~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:37:36 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	9.0736	0.0023	8.9057	4994.000 H	116.9265
# 2	9.0932	0.0006	8.9788	4993.000 H	116.9031
ean	9.0834	0.0015	8.9422	4993.500 H	116.9148
D	0.0139	0.0011	0.0517	0.707	0.0166
RSD	0.1527	71.8559	0.5782	0.014	0.0142

BACKGROUND CORRECTED INTENSITIES 245113 CO 6/24/04

Identity 1 : ~~245113~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:40:44 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	1018.5	-0.5	5908.0	4966.0	4966.0
# 2	1022.5	-2.5	5936.0	5027.0	5027.0
ean	1020.5	-1.5	5922.0	4996.5	4996.5
D	2.8	1.4	19.8	43.1	43.1
RSD	0.3	94.3	0.3	0.9	0.9

PPARENT CONCENTRATIONS 245113 CO 6/24/04

Identity 1 : ~~245113~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:40:44 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	9.0269	0.0021	8.9395	4966.000 H	116.2701
# 2	8.9517	0.0018	8.8723	5027.000 H	117.7002
ean	8.9893	0.0020	8.9059	4996.500 H	116.9851
D	0.0531	0.0002	0.0475	43.134	1.0112
RSD	0.5912	12.3230	0.5334	0.863	0.8644

BACKGROUND CORRECTED INTENSITIES 245114 CO 6/24/04

Identity 1 : ~~245114~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:43:50 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	25.0	-7.5	18.0	5021.0	5021.0
# 2	13.0	0.5	19.0	5085.0	5085.0
ean	19.0	-3.5	18.5	5053.0	5053.0
D	8.5	5.7	0.7	45.3	45.3
RSD	44.7	161.6	3.8	0.9	0.9

PPARENT CONCENTRATIONS 245114 CO 6/24/04

Identity 1 : ~~245114~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:43:52 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	0.1431	0.0009	0.0473	5021.000 H	117.5505

ean	0.0895	0.0016 L	-0.0468	5053.000 H	118.3097
D	0.0760	0.0010	0.0008	45.255	1.0610
RSD	85.1309	59.9695	1.7365	0.896	0.8968

010102

BACKGROUND CORRECTED INTENSITIES **245115** **CO 6/24/04**
 Identity 1 : ~~243115~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:47:00 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	416.0	236.5	34023.5	4940.0	4940.0
# 2	426.0	237.5	34532.5	4982.0	4982.0
ean	421.0	237.0	34278.0	4961.0	4961.0
D	7.1	0.7	359.9	29.7	29.7
RSD	1.7	0.3	1.0	0.6	0.6

PPARENT CONCENTRATIONS **245115** **CO 6/24/04**
 Identity 1 : ~~243115~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:47:00 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	3.6604	0.0435 H	52.1094	4940.000 H	115.6605
# 2	3.7180	0.0433 H	52.4435	4982.000 H	116.6452
ean	3.6892	0.0434 H	52.2764	4961.000 H	116.1529
D	0.0407	0.0001	0.2363	29.698	0.6962
RSD	1.1038	0.2849	0.4520	0.599	0.5994

BACKGROUND CORRECTED INTENSITIES **245116** **CO 6/24/04**
 Identity 1 : ~~243116~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:50:08 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	310.0	511.5	51026.5	4556.0	4556.0
# 2	313.0	515.5	51606.5	4548.0	4548.0
ean	311.5	513.5	51316.5	4552.0	4552.0
D	2.1	2.8	410.1	5.7	5.7
RSD	0.7	0.6	0.8	0.1	0.1

PPARENT CONCENTRATIONS **245116** **CO 6/24/04**
 Identity 1 : ~~243116~~ Identity 2 : pg56-215 Type : SAMPLE
 eight : 1.0000 Volume : 1.00 Printed : 2:50:08 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
	ppm	ppm	ppm		ppm
# 1	2.9427	0.0990 H	84.7842	4556.000 H	106.6581
# 2	2.9773	0.1000 H	85.8997	4548.000 H	106.4705
ean	2.9600	0.0995 H	85.3419	4552.000 H	106.5643
D	0.0245	0.0007	0.7888	5.657	0.1326
RSD	0.8265	0.6600	0.9243	0.124	0.1244

ACKGROUND CORRECTED INTENSITIES

identity 1 : CLP_CCV_SC Identity 2 : Type : CV
 eight : 1.0000 Volume : 1.00 Printed : 2:55:28 PM June 15, 2004

010103

	K_766	Li670	Na589	Sc	Sc361
# 1	1891.0	23773.5	16331.0	4413.0	4413.0
# 2	1924.0	23758.5	16348.0	4388.0	4388.0
ean	1907.5	23766.0	16339.5	4400.5	4400.5
D	23.3	10.6	12.0	17.7	17.7
RSD	1.2	0.0	0.1	0.4	0.4

PPARENT CONCENTRATIONS

identity 1 : CLP_CCV_SC Identity 2 : Type : CV
 eight : 1.0000 Volume : 1.00 Printed : 2:55:28 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	18.9449	4.6479	27.9645	4413.000 H	103.3056
# 2	19.3871	4.6714	28.1536	4388.000 H	102.7195
ean	19.1660	4.6597	28.0591	4400.500 H	103.0125
D	0.3127	0.0166	0.1337	17.678	0.4144
RSD	1.6316	0.3569	0.4765	0.402	0.4023

hecking calibration verification ...

identity 1 : CLP_CCV_SC Identity 2 :
 eport name Low limit Value High limit
 _766 18.000 19.166 22.000
 i670 4.500 4.660 5.500
 a589 27.000 28.059 33.000

ACKGROUND CORRECTED INTENSITIES

identity 1 : Calibration blank Identity 2 : Type : CB
 eight : 1.0000 Volume : 1.00 Printed : 2:59:42 PM June 15, 2004

	K_766	Li670	Na589	Sc	Sc361
# 1	8.0	-8.5	37.0	4420.0	4420.0
# 2	20.0	-5.5	30.0	4406.0	4406.0
ean	14.0	-7.0	33.5	4413.0	4413.0
D	8.5	2.1	4.9	9.9	9.9
RSD	60.6	30.3	14.8	0.2	0.2

PPARENT CONCENTRATIONS

identity 1 : Calibration blank Identity 2 : Type : CB
 eight : 1.0000 Volume : 1.00 Printed : 2:59:42 PM June 15, 2004

	K_766 ppm	Li670 ppm	Na589 ppm	Sc	Sc361 ppm
# 1	0.0024	0.0006 L	-0.0111	4420.000 H	103.4697
# 2	0.1236	0.0011 L	-0.0229	4406.000 H	103.1415
ean	0.0630	0.0005 L	-0.0170	4413.000 H	103.3056
D	0.0857	0.0004	0.0084	9.899	0.2321
RSD	136.0060	48.2341	49.2798	0.224	0.2247

hecking calibration blank ...

identity 1 : Calibration blank Identity 2 :
 eport name CRDL Value
 _766 0.100 0.063
 i670 0.010 0.001
 a589 0.010 0.001

EVOLUTION by Micro-Active Australia Pty Ltd

3:07:30 PM June 15, 2004

c361

0.000

103.306

010104

010105

ICP ANALYSIS

PROJ. NO.	PROJECT	TO#	DATE	MATRIX	LOGBK PG
06002.01.141	Div 20	040415-2 040521-6	6-15-8	WATER	56214

INSTRUMENT: TRACE 2 FILENAME: B 404152

INSTRUMENT DL: _____

Method: DATLY2 Standard: blk

Run Time: 06/15/04 11:40:18

010106

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Avg	-.0000	.0005	-.0000	.0002	-.0000	-.0001	-.0000
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	8.243	.3134	42.50	16.08	11.71	1.761	115.7

#1	-.0000	.0005	-.0001	.0002	-.0000	-.0001	-.0000
#2	-.0000	.0005	-.0000	.0001	-.0000	-.0001	-.0000

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Avg	.0000	-.0000	-.0000	.0000	.0004	.0000	.0003
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	2.744	25.03	56.50	175.4	1.208	22.40	7.967

#1	.0000	-.0000	-.0000	-.0000	.0004	.0000	.0003
#2	.0000	-.0000	-.0000	.0000	.0004	.0000	.0003

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Avg	-.0000	.0000	.0000	.0000	-.0000	-.0002	-.0104
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	424.9	16.15	47.07	141.4	75.48	6.810	.1181

#1	.0000	.0000	.0000	.0000	-.0000	-.0002	-.0104
#2	-.0000	.0001	.0000	.0000	-.0000	-.0002	-.0103

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Avg	-.0000	.0000	.0001	-.0000	.0001	.0008	-.0012
SDev	.0000	.0000	.0000	.0000	.0000	.0000	.0000
%RSD	358.6	.0758	16.39	47.21	31.82	2.561	.6705

#1	-.0000	.0000	.0001	-.0000	.0001	.0008	-.0012
#2	.0000	.0000	.0001	-.0000	.0001	.0008	-.0012

Elem	Sc3613	1960/1	1960/2	Si2881	Sn1899	Sr4215	Th2837
Avg	64.50	-.0002	.0001	.0020	.0000	.0000	.0000
SDev	.05	.0001	.0001	.0000	.0001	.0000	.0000
%RSD	.0760	32.56	77.01	.9194	321.7	7.368	34.21

#1	64.47	-.0001	.0001	.0020	-.0000	.0000	.0001
#2	64.53	-.0002	.0002	.0020	.0001	.0000	.0000

Elem	Ti3349	Tl1908	U_4090	V_2924	W_2079	Y_3710	Zn2062
Avg	-.0001	-.0002	-.0004	-.0000	.0002	.0000	.0001
SDev	.0000	.0001	.0000	.0000	.0000	.0000	.0000
%RSD	15.59	51.12	5.313	5.313	16.60	28.21	11.75

#1	-.0001	-.0001	-.0004	-.0000	.0002	.0000	.0001
#2	-.0001	-.0002	-.0003	-.0000	.0002	.0000	.0001

Elem	Zr3496
Avg	.0001
SDev	.0000
%RSD	31.47

#1	.0001
#2	.0001



1054404
6-15-04
6/24/04

010107

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	644924	10000	--	--	--	--	--
SDev	488.6108	.00000000	--	--	--	--	--
%RSD	.0757625	.00000000	--	--	--	--	--
#1	644579	10000	--	--	--	--	--
#2	645270	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std4

Run Time: 06/15/04 11:45:03

010108

Elem	Ag3280	As1890	2P03/1	2P03/2	Sb2068	1960/1	1960/2
Avge	.0830	.1171	.3023	.2612	.1806	.2615	.2682
SDev	.0000	.0000	.0003	.0000	.0006	.0002	.0006
%RSD	.0341	.0350	.1009	.0096	.3068	.0842	.2399

#1	.0830	.1171	.3025	.2611	.1802	.2613	.2677
#2	.0830	.1172	.3021	.2612	.1810	.2617	.2687

Elem	Tl1908
Avge	.2216
SDev	.0006
%RSD	.2874

#1	.2221
#2	.2212

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	648023	10000	--	--	--	--	--
SDev	630.7393	.0000000	--	--	--	--	--
%RSD	.0973328	.0000000	--	--	--	--	--
#1	647577	10000	--	--	--	--	--
#2	648469	10000	--	--	--	--	--

Method: DAILY2 Standard: clp_std1

Run Time: 06/15/04 11:49:27

010109

Elem	Al3082	Ca3179	Fe2714	K_7664	Li6707	Mg2790	Na3302
Avge	.1122	.1878	.0984	.2078	3.220	.0852	.0089
SDev	.0000	.0001	.0000	.0006	.015	.0000	.0000
%RSD	.0257	.0303	.0126	.2753	.4586	.0288	.0786
#1	.1122	.1877	.0984	.2074	3.231	.0852	.0089
#2	.1122	.1878	.0984	.2082	3.210	.0852	.0089
IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	643217	10000	--	--	--	--	--
SDev	127.2792	.00000000	--	--	--	--	--
%RSD	.0197879	.00000000	--	--	--	--	--
#1	643307	10000	--	--	--	--	--
#2	643127	10000	--	--	--	--	--

010110

Standardization Rpt.

06/15/04 11:56:36 AM

page 1

Method: DAILY2 Standard: clp_std5
 Run Time: 06/15/04 11:53:07

Elem	B_2496	Bi2230	Mo2020	P_1782	Si2881	Sn1899	Sr4215
Avg	.1685	.0342	.3294	.0161	.1754	.1511	2.610
SDev	.0004	.0001	.0017	.0001	.0005	.0002	.004
%RSD	.2399	.3288	.5112	.9211	.2989	.1114	.1543

#1	.1682	.0343	.3282	.0162	.1758	.1513	2.607
#2	.1688	.0341	.3306	.0160	.1751	.1510	2.613

Elem	Ti3349
Avg	2.598
SDev	.002
%RSD	.0605

#1	2.597
#2	2.599

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---	---
Wavlen	361.384	---	---	---	---	---	---
Avg	647130	10000	---	---	---	---	---
SDev	2438.104	.0000000	---	---	---	---	---
%RSD	.3767565	.0000000	---	---	---	---	---
#1	645406	10000	---	---	---	---	---
#2	648854	10000	---	---	---	---	---

Method: DAILY2 Standard: clp_std2

Run Time: 06/15/04 11:56:47

010111

Elem	Ra4934	Be3130	Cr2677	Cu3247	Ni2316
Avgc	1.155	1.300	.3989	.3194	.3348
SDev	.001	.002	.0001	.0005	.0004
%RSD	.0538	.1635	.0372	.1563	.1122

#1	1.156	1.299	.3988	.3198	.3346
#2	1.155	1.302	.3990	.3191	.3351

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---	---
Wavlen	361.384	---	---	---	---	---	---
Avgc	646431	10000	---	---	---	---	---
SDev	2026.568	.0000000	---	---	---	---	---
%RSD	.3135011	.0000000	---	---	---	---	---
#1	644998	10000	---	---	---	---	---
#2	647864	10000	---	---	---	---	---

Method: DAILY2 Standard: clp_std3

Run Time: 06/15/04 12:00:06

Elem	Cd2265	Co2286	Mn2576	V_2924	Zn2062
Avge	.9303	.2052	.8268	.1886	.2732
SDev	.0006	.0003	.0001	.0002	.0000
%RSD	.0669	.1358	.0137	.1138	.0139

010112

#1	.9307	.2054	.8269	.1888	.2731
#2	.9298	.2050	.8267	.1885	.2732

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---	---
Wavlen	361.384	---	---	---	---	---	---
Avge	649341	10000	---	---	---	---	---
SDev	1798.880	.00000000	---	---	---	---	---
%RSD	.2770316	.00000000	---	---	---	---	---

#1	650613	10000	---	---	---	---	---
#2	648069	10000	---	---	---	---	---

Method: DAILY2 Standard: clp_std6

Run Time: 06/15/04 12:03:46

010113

Elem	La3988	Na5889	Pd3404	S_1820	Th2837	U_4090	W_2079
Avgc	.4844	.1160	.2106	.0357	.1124	.0759	.2004
SDev	.0001	.0008	.0003	.0002	.0003	.0003	.0008
%RSD	.0296	.6760	.1664	.5491	.2734	.3942	.4195

#1	.4845	.1155	.2109	.0356	.1126	.0761	.2010
#2	.4843	.1166	.2104	.0359	.1122	.0757	.1998

Elem	Y_3710	Zr3496
Avgc	.7869	1.935
SDev	.0016	.002
%RSD	.2007	.0942

#1	.7881	1.936
#2	.7858	1.933

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avgc	641001	10000	--	--	--	--	--
SDev	2815.699	.0000000	--	--	--	--	--
%RSD	.4392660	.0000000	--	--	--	--	--
#1	639010	10000	--	--	--	--	--
#2	642992	10000	--	--	--	--	--

Method: DAILY2

Slope = Conc(SIR)/IR

010114

Element	Wavelength	High std	Low std	Slope	Y-intercept	Date Standardized
Ag3280	328.068	clp_std4	blk	24.0914	.000635	06/15/04 12:03:46
Al3082	308.215	clp_std1	blk	447.553	-.206454	06/15/04 12:03:46
As1890	189.042	clp_std4	blk	85.3400	.003970	06/15/04 12:03:46
B_2496	249.678	clp_std5	blk	59.4010	-.009764	06/15/04 12:03:46
Ba4934	493.409	clp_std2	blk	8.65696	.000161	06/15/04 12:03:46
Be3130	313.042	clp_std2	blk	3.84438	.000459	06/15/04 12:03:46
Bi2230	223.061	clp_std5	blk	144.922	.002471	06/15/04 12:03:46
Ca3179	317.933	clp_std1	blk	266.390	-.010946	06/15/04 12:03:46
Cd2265	226.502	clp_std3	blk	10.7460	.000283	06/15/04 12:03:46
Co2286	228.616	clp_std3	blk	48.7321	.000378	06/15/04 12:03:46
Cr2677	267.716	clp_std2	blk	25.0695	-.000486	06/15/04 12:03:46
Cu3247	324.753	clp_std2	blk	31.3491	-.013392	06/15/04 12:03:46
Fe2714	271.441	clp_std1	blk	508.561	-.014984	06/15/04 12:03:46
K_7664	766.491	clp_std1	blk	240.995	-.078844	06/15/04 12:03:46
La3988	398.853	clp_std6	blk	20.6605	.000080	06/15/04 12:03:46
Li6707	670.784	clp_std1	blk	3.10552	-.000147	06/15/04 12:03:46
Mg2790	279.078	clp_std1	blk	293.428	-.000682	06/15/04 12:03:46
Mn2576	257.610	clp_std3	blk	12.0959	-.000075	06/15/04 12:03:46
Mo2020	202.030	clp_std5	blk	30.3568	.000706	06/15/04 12:03:46
Na3302	330.232	clp_std1	blk	5451.53	1.24262	06/15/04 12:03:46
Na5889	588.991	clp_std6	blk	7.95428	.082377	06/15/04 12:03:46
Ni2316	231.604	clp_std2	blk	29.8645	.000301	06/15/04 12:03:46
P_1782	178.287	clp_std5	blk	623.130	-.006763	06/15/04 12:03:46
2203/1	220.351	clp_std4	blk	33.0945	-.004003	06/15/04 12:03:46
2203/2	220.352	clp_std4	blk	38.2847	.001425	06/15/04 12:03:46
Pd3404	340.458	clp_std6	blk	48.7631	-.003705	06/15/04 12:03:46
S_1820	182.040	clp_std6	blk	286.042	-.225976	06/15/04 12:03:46
Sb2068	206.838	clp_std4	blk	55.0063	.064650	06/15/04 12:03:46
Sc3613	361.384	blk	dark	1.55038	.000000	06/15/04 12:03:46
1960/1	196.021	clp_std4	blk	38.2202	.006933	06/15/04 12:03:46
1960/2	196.022	clp_std4	blk	37.3048	-.004829	06/15/04 12:03:46
Si2881	288.158	clp_std5	blk	57.4359	-.113905	06/15/04 12:03:46
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	66.2107	-.001128	06/15/04 12:03:46
Sr4215	421.552	clp_std5	blk	3.83124	-.000056	06/15/04 12:03:46
Th2837	283.730	clp_std6	blk	92.8931	-.004178	06/15/04 12:03:46
Ti3349	334.941	clp_std5	blk	3.84891	.000463	06/15/04 12:03:46
Tl1908	190.864	clp_std4	blk	45.0821	.007338	06/15/04 12:03:46
U_4090	409.014	clp_std6	blk	138.641	.049337	06/15/04 12:03:46
V_2924	292.402	clp_std3	blk	53.0046	.002219	06/15/04 12:03:46
W_2079	207.914	clp_std6	blk	24.9624	-.004432	06/15/04 12:03:46
Y_3710	371.030	clp_std6	blk	12.7050	-.000049	06/15/04 12:03:46
Zn2062	206.200	clp_std3	blk	36.6208	-.003095	06/15/04 12:03:46
Zr3496	349.621	clp_std6	blk	5.65061	-.000609	06/15/04 12:03:46

Method: DAILY2 Sample Name: icv/ccv

Operator:

Run Time: 06/15/04 12:07:49

Comment:

Mode: CONC Corr. Factor: 1

010115

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.9907	9.691	4.953	4.793	10.01	.9737	5.000
SD	.0010	.005	.003	.000	.01	.0006	.007
%RSD	.1057	.0502	.0647	.0027	.1025	.0669	.1379

#1	.9900	9.688	4.955	4.793	10.01	.9742	5.005
#2	.9914	9.694	4.950	4.793	9.999	.9733	4.995

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
Avg	20.20	.9977	4.968	1.947	2.018	10.17	18.20
SD	.21	.0006	.006	.004	.002	.04	.04
%RSD	1.060	.0596	.1306	.1889	.0935	.3727	.2353

#1	20.05	.9973	4.972	1.950	2.016	10.19	18.17
#2	20.35	.9982	4.963	1.945	2.019	10.14	18.23

Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	20.00	1.000	5.000	2.000	2.000	10.00	20.00
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mn2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	4.935	04.471	19.89	1.008	4.942	026.90	018.98
SD	.000	.011	.02	.000	.017	.10	.04
%RSD	.0075	.2390	.1075	.0165	.3371	.3538	.1993

#1	4.935	04.479	19.90	1.009	4.930	026.96	018.95
#2	4.935	04.464	19.87	1.008	4.953	026.83	019.00

Errors	QC Pass	QC Fail	QC Pass	QC Pass	QC Pass	QC Fail	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
Avg	4.873	4.928	4.985	4.986	1.022	.9916	.9843
SD	.012	.333	.000	.023	.001	.0244	.0058
%RSD	.2506	6.748	.0018	.4564	.0751	2.462	.5897

#1	4.881	4.693	4.985	5.002	1.022	.9743	.9802
#2	4.864	5.163	4.985	4.970	1.023	1.009	.9884

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
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Analysis Report

QC Standard

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Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avg	100.6	5.184	5.170	4.932	4.986	5.175	4.908
SDev	.3	.003	.007	.006	.015	.005	.001
%RSD	.2747	.0597	.1295	.1158	.3049	.1062	.0232
#1	100.4	5.186	5.175	4.928	4.996	5.178	4.907
#2	100.8	5.182	5.165	4.937	4.975	5.171	4.909
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
Avg	5.048	.9715	4.870	5.167	.9821	4.941	.9934
SDev	.002	.0021	.003	.032	.0132	.002	.0021
%RSD	.0401	.2169	.0656	.6166	1.343	.0307	.2148
#1	5.050	.9730	4.872	5.145	.9728	4.940	.9919
#2	5.047	.9700	4.868	5.190	.9914	4.942	.9949
Errors	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass	QC Pass
Value	5.000	1.000	5.000	5.000	1.000	5.000	1.000
Range	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Elem	Y_3710	Zn2062	Zr3496				
Units	ppm	ppm	ppm				
Avg	4.969	1.004	4.805				
SDev	.002	.012	.019				
%RSD	.0302	1.158	.4035				
#1	4.970	.9961	4.792				
#2	4.968	1.012	4.819				
Errors	QC Pass	QC Pass	QC Pass				
Value	5.000	1.000	5.000				
Range	10.00	10.00	10.00				

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---	---
Wavlen	361.384	---	---	---	---	---	---
Avge	648851	10000	---	---	---	---	---
SDev	1808.779	.00000000	---	---	---	---	---
%RSD	.2787665	.00000000	---	---	---	---	---
#1	647572	10000	---	---	---	---	---
#2	650130	10000	---	---	---	---	---

010118

Analysis Report

Blank Sample

06/15/04 12:14:59 PM

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Method: DAILY2

Sample Name: ICR/CCR

Operator:

Run Time: 06/15/04 12:14:25

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0003	-.0027	.0015	.0048	.0001	.0000	.0009
SDev	.0004	.0050	.0016	.0008	.0000	.0000	.0038
%RSD	119.3	183.1	109.8	16.52	.0925	156.8	416.5
#1	.0006	-.0063	.0026	.0054	.0001	-.0000	.0036
#2	.0001	.0008	.0003	.0043	.0001	.0000	-.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
Avgc	.0021	.0005	-.0003	.0004	.0002	.0121	.0013
SDev	.0009	.0003	.0003	.0002	.0001	.0036	.0043
%RSD	43.14	58.66	100.1	43.53	44.21	29.54	332.0
#1	.0028	.0007	-.0005	.0003	.0001	.0146	.0043
#2	.0015	.0003	-.0001	.0005	.0002	.0095	-.0017
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
Avgc	.0005	.0001	.0012	.0001	H.0070	.0001	.0014
SDev	.0002	.0000	.0026	.0000	.0003	.0319	.0003
%RSD	49.18	14.31	216.7	69.53	4.352	23820.	24.46
#1	.0006	.0001	-.0006	.0000	H.0072	-.0224	.0012
#2	.0003	.0001	.0031	.0001	H.0068	.0227	.0016
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC High	LC Pass	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500
Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0000	-.0005	-.0000	.0004	.0014	-.0062	-.0026
SDev	.0003	.0103	.0008	.0005	.0017	.0080	.0049
%RSD	1151.	2142.	2374.	125.8	116.5	129.6	188.8
#1	-.0003	.0068	-.0006	.0008	.0003	-.0005	.0009
#2	.0002	-.0077	.0005	.0000	.0026	L-.0118	-.0061
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	Pb2220	Se196	Sn1899

Analysis Report

Blank Sample

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Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avg	99.78	-.0000	-.0026	.0020	.0003	-.0017	-.0001
SDev	.08	.0009	.0030	.0009	.0001	.0017	.0018
%RSD	.0795	2920.	117.2	47.52	33.16	100.2	3356.
#1	99.72	-.0007	-.0004	.0013	.0003	-.0005	.0012
#2	99.84	.0006	-.0047	.0026	.0002	-.0029	-.0013
Errors	NOCHECK	NOCHECK	NOCHECK	LC Pass	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050
Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.0000	-.0014	.0001	H.0100	.0066	.0005	.0029
SDev	.0000	.0002	.0000	.0076	.0181	.0003	.0011
%RSD	50.25	10.87	23.35	76.26	68.04	62.16	36.81
#1	.0001	-.0015	.0001	H.0154	.0394	.0003	.0037
#2	.0000	-.0013	.0001	.0046	.0138	.0007	.0022
Errors	LC Pass	LC Pass	LC Pass	LC High	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				
Avg	.0001	-.0002	.0006				
SDev	.0000	.0001	.0003				
%RSD	70.86	54.72	44.08				
#1	.0001	-.0001	.0008				
#2	.0000	-.0003	.0004				
Errors	LC Pass	LC Pass	LC Pass				
High	.0050	.0050	.0050				
Low	-.0050	-.0050	-.0050				

Analysis Report

Blank Sample

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IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	643561	10000	--	--	--	--	--
SDev	489.3179	.00000000	--	--	--	--	--
%RSD	.0760329	.00000000	--	--	--	--	--
#1	643215	10000	--	--	--	--	--
#2	643907	10000	--	--	--	--	--

Analysis Report

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page 1

Method: DAILY2 Sample Name: pbw-F15E1 pg56-214 Operator:
 Run Time: 06/15/04 12:34:34
 Comment:
 Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.0008	.0067	-.0020	.0034	.0001	-.0000	.0032
SD	.0006	.0005	.0002	.0007	.0001	.0000	.0016
%RSD	78.69	7.159	11.46	19.76	82.86	40.43	51.80
#1	.0012	.0070	-.0021	.0038	.0001	-.0000	.0043
#2	.0003	.0063	-.0018	.0029	.0000	-.0000	.0020
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
Avg	.0130	.0005	.0009	H.0130	.0001	H.0987	.0311
SD	.0035	.0003	.0003	.0003	.0002	.0247	.0356
%RSD	27.06	61.56	34.83	2.158	173.5	24.97	114.4
#1	.0155	.0007	.0011	H.0128	.0003	H.1162	.0563
#2	.0105	.0003	.0007	H.0132	-.0000	H.0813	.0059
Errors	LC Pass	LC Pass	LC Pass	LC High	LC Pass	LC High	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
Avg	.0011	.0001	.0081	.0013	.0021	H.2533	.0021
SD	.0006	.0001	.0047	.0000	.0003	.4154	.0048
%RSD	52.19	83.02	58.63	2.032	15.11	164.0	225.2
#1	.0015	.0002	.0114	.0013	.0018	H.5470	.0055
#2	.0007	.0000	.0047	.0014	.0023	-.0405	-.0013
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	LC High	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500
Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	H.0082	.0040	.0003	-.0001	.0041	.0054	.0051
SD	.0007	.0015	.0011	.0013	.0076	.0028	.0035
%RSD	8.806	36.71	373.7	1556.	183.5	51.96	68.66
#1	H.0087	.0030	-.0005	-.0010	H.0095	.0034	.0076
#2	H.0076	.0050	.0011	.0008	-.0012	.0073	.0026
Errors	LC High	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

Analysis Report

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Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	98.64	.0021	-.0028	H.0254	.0001	-.0012	-.0010
SDev	.51	.0056	.0013	.0022	.0013	.0010	.0018
%RSD	.5121	263.5	47.86	8.709	2025.	32.75	184.9
#1	99.00	.0060	-.0038	H.0270	-.0008	-.0005	.0003
#2	98.28	-.0018	-.0019	H.0239	.0009	-.0018	-.0023
Errors	NOCHECK	NOCHECK	NOCHECK	LC High	LC Pass	LC Pass	LC Pass
High				.0100	.0030	.0050	.0050
Low				-.0100	-.0030	-.0050	-.0050
Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	-.0016	-.0000	.0008	.0487	.0003	.0003
SDev	.0000	.0007	.0000	.0003	.0390	.0004	.0023
%RSD	42.28	45.54	7.343	32.66	80.08	130.1	822.9
#1	.0001	-.0021	-.0000	.0009	.0762	.0000	.0019
#2	.0000	-.0011	-.0000	.0006	.0211	.0007	-.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	-.0000	.0005	.0008				
SDev	.0001	.0001	.0003				
%RSD	590.4	29.94	37.83				
#1	.0000	.0006	.0010				
#2	-.0000	.0004	.0006				
Errors	LC Pass	LC Pass	LC Pass				
High	.0050	.0050	.0050				
Low	-.0050	-.0050	-.0050				

010123

Analysis Report

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IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	636165	10000	--	--	--	--	--
SDev	3252.691	.00000000	--	--	--	--	--
%RSD	.5112968	.00000000	--	--	--	--	--
#1	638465	10000	--	--	--	--	--
#2	633865	10000	--	--	--	--	--

Analysis Report

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page 1

Method: DAILY2 Sample Name: lcsW-F15W1

Operator:

Run Time: 06/15/04 12:39:19

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.0505	1.908	1.995	.0023	2.012	.0494	.0049
SDev	.0005	.003	.002	.0000	.001	.0000	.0085
%RSD	.9734	.1466	.1003	1.971	.0410	.0390	174.6
#1	.0508	1.910	1.993	.0022	2.013	.0494	.0108
#2	.0501	1.906	1.996	.0023	2.012	.0494	-.0011
Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	20.96	.0497	.4992	.2084	.2519	1.141	17.05
SDev	.01	.0003	.0001	.0011	.0005	.019	.00
%RSD	.0293	.6727	.0145	.5297	.2099	1.626	.0236
#1	20.96	.0499	.4993	.2092	.2523	1.154	17.04
#2	20.95	.0494	.4992	.2076	.2515	1.128	17.05
Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.0003	.0001	20.69	.5036	.0009	17.78	12.28
SDev	.0001	.0001	.03	.0001	.0007	.00	.01
%RSD	55.05	47.95	.1689	.0105	79.64	.0174	.1080
#1	.0004	.0001	20.71	.5037	.0014	17.78	12.29
#2	.0002	.0001	20.66	.5036	.0004	17.79	12.27
Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.4979	-.0011	.4981	.4965	.0008	.0017	.4896
SDev	.0017	.0010	.0026	.0000	.0016	.0031	.0002
%RSD	.3340	1860.	.5306	.0022	213.2	184.2	.0410
#1	.4991	-.0160	.4962	.4964	-.0004	.0039	.4898
#2	.4967	.0138	.5000	.4965	.0019	-.0005	.4895
Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avg	97.50	2.026	2.040	.0277	.4970	2.035	-.0014
SDev	.34	.021	.020	.0009	.0009	.020	.0001
%RSD	.3533	1.018	.9925	3.332	.1787	1.001	10.49
#1	97.74	2.011	2.026	.0270	.4964	2.021	-.0015
#2	97.25	2.041	2.054	.0283	.4977	2.050	-.0013
Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.0007	-.0128	.0002	2.059	-.0008	.4981	-.0001
SDev	.0000	.0008	.0001	.012	.0089	.0004	.0010
%RSD	2.140	5.951	32.62	.5656	1076.	.0870	756.7
#1	.0007	-.0133	.0001	2.050	.0055	.4984	.0006
#2	.0008	-.0123	.0002	2.067	-.0071	.4978	-.0009

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.4969	.0003
SDev	.0000	.0016	.0003
%RSD	11.89	.3251	97.89

#1	-.0001	.4958	.0005
#2	-.0001	.4981	.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	628807	10000	--	--	--	--	--
SDev	2187.788	.00000000	--	--	--	--	--
%RSD	.3479269	.00000000	--	--	--	--	--
#1	630354	10000	--	--	--	--	--
#2	627260	10000	--	--	--	--	--

Analysis Report

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Method: DAILY? Sample Name: 243222

Operator:

Run Time: 06/15/04 12:44:05

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	-.0003	-.0136	-.0007	1.688	.2966	.0001	.0030
SD	.0004	.0032	.0010	.011	.0014	.0000	.0008
%RSD	129.4	23.73	136.1	.6219	.4832	21.86	25.63

#1	-.0006	-.0159	-.0014	1.696	.2956	.0000	.0025
#2	-.0000	-.0113	-.0000	1.681	.2976	.0001	.0035

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	29.11	.0004	.0025	-.0007	-.0006	.0802	.1416
SD	.04	.0000	.0001	.0001	.0003	.0011	.0058
%RSD	.1349	5.568	3.929	9.294	49.43	1.321	4.096

#1	29.08	.0004	.0024	-.0007	-.0009	.0810	.1457
#2	29.13	.0004	.0025	-.0007	-.0004	.0795	.1375

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	-.0002	.0002	.0976	.0041	.0015	2.930	1.865
SD	.0004	.0000	.0004	.0000	.0000	.077	.006
%RSD	239.4	14.57	.3797	1.061	2.018	2.623	.3338

#1	-.0005	.0002	.0973	.0041	.0015	2.984	1.860
#2	.0001	.0001	.0978	.0041	.0015	2.875	1.869

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.0588	-.0026	-.0008	.0025	-.0018	24.94	.0019
SD	.0026	.0085	.0020	.0011	.0001	.40	.0036
%RSD	4.446	320.6	252.7	43.46	5.638	1.587	186.5

#1	.0569	-.0086	-.0022	.0018	-.0017	25.22	.0045
#2	.0606	.0033	.0006	.0033	-.0019	24.66	-.0006

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avg	104.9	.0098	-.0010	.2740	.0014	.0026	-.0009
SD	.1	.0005	.0014	.0063	.0014	.0008	.0008
%RSD	.1162	4.870	139.5	2.300	95.70	29.89	89.18

#1	104.9	.0102	-.0020	.2695	.0005	.0021	-.0015
#2	105.0	.0095	-.0000	.2785	.0024	.0032	-.0003

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.2122	-.0014	.0001	.0022	.0082	.0002	-.0013
SD	.0002	.0003	.0001	.0026	.0129	.0001	.0011
%RSD	.1029	22.02	124.9	116.1	157.6	28.70	86.41

#1	.2120	-.0012	.0000	.0004	-.0009	.0002	-.0005
#2	.2123	-.0016	.0001	.0041	.0174	.0001	-.0021

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avgc	-.0002	.1116	.0001
SDev	.0000	.0001	.0001
%RSD	26.15	.1205	94.89

#1	-.0002	.1117	.0000
#2	-.0001	.1116	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avgc	676798	10000	--	--	--	--	--
SDev	796.2022	.00000000	--	--	--	--	--
%RSD	.1176425	.00000000	--	--	--	--	--
#1	676235	10000	--	--	--	--	--
#2	677361	10000	--	--	--	--	--

Analysis Report

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Method: DAILY2 Sample Name: 243223

Operator:

Run Time: 06/15/04 12:48:50

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00004	-.0177	.00019	.1383	.00072	.00001	-.00002
SDev	.00004	.00001	.00003	.00020	.00000	.00000	.00031
%RSD	95.42	.3041	15.19	1.478	.4997	11.03	1346.
#1	-.00001	-.0177	.00017	.1397	.00071	.00001	.00019
#2	-.00006	-.0176	.00021	.1368	.00072	.00001	-.00024
Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	17.75	.00002	.00010	-.00009	-.00010	.00097	4.888
SDev	.04	.00003	.00014	.00001	.00003	.00066	.017
%RSD	.2057	186.8	141.0	14.44	29.41	75.67	.3484
#1	17.78	.00004	.00020	-.00008	-.00008	.0133	4.876
#2	17.73	-.00001	.00000	-.00009	-.00012	.0040	4.900
Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00002	.00283	2.783	.00254	.00031	32.05	20.99
SDev	.00002	.00001	.0002	.00001	.00014	.07	.02
%RSD	94.73	.3177	.0888	.5084	43.77	.2100	.0973
#1	-.00003	.00284	2.785	.00255	.00021	32.00	20.97
#2	-.00001	.00283	2.781	.00253	.00041	32.10	21.00
Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.00008	.00202	-.00033	.00036	-.00012	6.809	.00017
SDev	.00003	.00081	.00008	.00004	.00004	.0006	.00044
%RSD	38.83	39.88	24.42	10.05	32.02	.0846	260.1
#1	.00011	.00260	-.00039	.00033	-.00009	6.814	-.00014
#2	.00006	.0145	-.00027	.00039	-.00015	6.805	.00048
Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	103.8	.0186	.00004	19.50	.00013	.00065	.0146
SDev	.7	.00033	.00024	.06	.00005	.00005	.00016
%RSD	.6597	17.88	634.4	.3219	39.23	8.193	10.72
#1	103.3	.0162	.00021	19.55	.00010	.00068	.0158
#2	104.3	.00209	-.00013	19.46	.00017	.00061	.0135
Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0787	-.00025	-.00003	-.0124	.0111	.00017	-.00028
SDev	.00001	.00008	.00001	.00013	.00060	.00003	.00020
%RSD	.1200	30.74	24.51	10.65	54.27	17.46	72.30
#1	.0786	-.00030	-.00004	-.0134	.0154	.00015	-.00042
#2	.0787	-.00020	-.00003	-.0115	.0069	.00019	-.00013

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0003	-.0001
SDev	.0001	.0004	.0002
%RSD	117.6	161.3	182.3

#1	-.0000	.0006	.0000
#2	-.0001	-.0000	-.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	669552	10000	--	--	--	--	--
SDev	4429.317	.00000000	--	--	--	--	--
%RSD	.6615344	.00000000	--	--	--	--	--
#1	666420	10000	--	--	--	--	--
#2	672684	10000	--	--	--	--	--

Analysis Report

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Method: DAILY2 Sample Name: 243224

Operator:

Run Time: 06/15/04 12:53:36

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0001	-.0134	.0006	-.0019	.0002	.0000	.0023
SDev	.0001	.0038	.0023	.0002	.0000	.0000	.0046
%RSD	89.77	28.36	415.6	10.78	4.618	158.1	201.0

#1	-.0000	-.0107	.0022	-.0017	.0002	-.0000	.0055
#2	-.0002	-.0160	-.0011	-.0020	.0002	.0000	-.0010

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	4.997	.0005	.0001	-.0002	-.0004	-.0031	.0012
SDev	.005	.0003	.0001	.0004	.0001	.0021	.0054
%RSD	.0929	72.82	120.2	176.2	22.21	66.96	450.0

#1	5.001	.0007	.0002	.0001	-.0004	-.0046	.0050
#2	4.994	.0002	.0000	-.0005	-.0005	-.0016	-.0026

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0000	-.0002	.0002	-.0000	.0002	7.468	4.521
SDev	.0003	.0000	.0013	.0001	.0003	.109	.000
%RSD	6430.	21.73	578.1	276.0	159.0	1.460	.0097

#1	-.0002	-.0002	-.0007	.0000	-.0000	7.391	4.522
#2	.0002	-.0002	.0011	-.0001	.0004	7.545	4.521

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0008	.0076	-.0035	-.0003	-.0005	-.0309	-.0005
SDev	.0010	.0047	.0013	.0017	.0008	.0128	.0000
%RSD	126.8	62.03	37.43	498.5	158.7	41.54	6.443

#1	.0001	.0110	-.0025	-.0015	-.0010	-.0218	-.0005
#2	.0014	.0043	-.0044	.0009	.0001	-.0399	-.0005

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	104.1	.0040	-.0060	.0323	-.0014	-.0026	-.0006
SDev	1.1	.0034	.0001	.0023	.0007	.0010	.0008
%RSD	1.016	84.16	2.480	7.071	51.56	38.62	134.1

#1	103.4	.0016	-.0059	.0307	-.0019	-.0034	-.0000
#2	104.9	.0064	-.0061	.0339	-.0009	-.0019	-.0012

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0001	.0016	.0001	-.0002	-.0095	.0005	-.0009
SDev	.0000	.0016	.0000	.0005	.0062	.0006	.0007
%RSD	4.540	102.9	71.43	251.3	64.66	123.1	81.63

#1	.0001	.0004	.0001	.0002	-.0139	.0001	-.0014
#2	.0001	.0027	.0000	-.0006	-.0052	.0010	-.0004

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0003	.0003
SDev	.0001	.0000	.0001
%RSD	329.1	1.006	25.74

#1	.0000	.0003	.0004
#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	671668	10000	--	--	--	--	--
SDev	6832.773	.0000000	--	--	--	--	--
%RSD	1.017285	.0000000	--	--	--	--	--
#1	666836	10000	--	--	--	--	--
#2	676499	10000	--	--	--	--	--

Analysis Report

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Method: DAILY2 Sample Name: 243225

Operator:

Run Time: 06/15/04 12:58:21

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0001	-.0027	-.0001	1.232	.1832	.0000	.0065
SDev	.0004	.0048	.0018	.009	.0003	.0000	.0045
%RSD	370.7	180.7	1344.	.7070	.1493	36.63	68.90

#1	.0004	.0007	.0011	1.238	.1834	.0001	.0096
#2	-.0002	-.0061	-.0014	1.226	.1830	.0000	.0033

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.2477	.0005	.0007	-.0007	-.0006	-.0008	.0682
SDev	.0021	.0002	.0010	.0000	.0001	.0035	.0053
%RSD	.8574	46.20	139.9	.1800	10.14	434.9	7.779

#1	.2492	.0006	.0015	-.0007	-.0005	-.0033	.0645
#2	.2462	.0003	.0000	-.0007	-.0006	.0017	.0720

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0002	.0001	.0302	.0011	.0006	2.317	1.360
SDev	.0003	.0000	.0024	.0000	.0003	.043	.005
%RSD	201.2	.7869	7.880	1.180	53.83	1.856	.3440

#1	.0004	.0001	.0318	.0011	.0008	2.348	1.364
#2	-.0001	.0001	.0285	.0011	.0004	2.287	1.357

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0157	.0039	-.0018	.0013	-.0014	.4319	-.0029
SDev	.0003	.0020	.0004	.0005	.0040	.0171	.0064
%RSD	1.749	51.08	20.57	40.76	284.8	3.971	222.9

#1	.0159	.0053	-.0016	.0009	.0014	.4441	.0017
#2	.0155	.0025	-.0021	.0016	-.0042	.4198	-.0074

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	104.0	.0063	-.0036	.4648	.0003	-.0003	.0016
SDev	.4	.0024	.0021	.0007	.0002	.0006	.0010
%RSD	.3634	38.60	59.28	.1534	83.33	228.1	66.09

#1	103.8	.0080	-.0050	.4653	.0001	-.0007	.0008
#2	104.3	.0046	-.0021	.4643	.0004	.0002	.0023

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0014	-.0014	.0002	.0019	.0279	.0000	.0015
SDev	.0000	.0001	.0000	.0008	.0233	.0001	.0022
%RSD	.3380	5.852	12.76	39.25	83.59	389.1	147.1

#1	.0014	-.0014	.0002	.0024	.0443	-.0000	-.0001
#2	.0014	-.0015	.0002	.0014	.0114	.0001	.0030

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0324	.0004
SDev	.0000	.0007	.0001
%RSD	100.9	2.185	23.99

#1	-.0000	.0329	.0005
#2	-.0001	.0319	.0004

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	671044	10000	--	--	--	--	--
SDev	2440.226	.0000000	--	--	--	--	--
%RSD	.3636458	.0000000	--	--	--	--	--
#1	669319	10000	--	--	--	--	--
#2	672770	10000	--	--	--	--	--

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Analysis Report

Method: DAILY2 Sample Name: 243225d
 Run Time: 06/15/04 13:03:07
 Comment:
 Mode: CONC Corr. Factor: 1

Operator:

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0001	-.0084	.0009	1.218	.1816	.0000	.0012
SDev	.0003	.0053	.0013	.006	.0003	.0000	.0036
%RSD	207.7	62.53	145.7	.5000	.1390	26.48	304.3
#1	.0001	-.0047	-.0000	1.223	.1818	.0000	.0037
#2	-.0004	-.0122	.0017	1.214	.1815	.0000	-.0014
Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.2422	.0005	.0011	.0004	-.0005	.0018	.0602
SDev	.0010	.0001	.0001	.0003	.0005	.0136	.0068
%RSD	.4086	14.09	14.16	70.16	91.88	742.4	11.22
#1	.2415	.0004	.0009	.0005	-.0002	.0114	.0554
#2	.2429	.0005	.0012	.0002	-.0009	-.0078	.0650
Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0002	.0001	.0296	.0010	.0003	2.161	1.347
SDev	.0003	.0000	.0005	.0001	.0007	.093	.006
%RSD	142.7	11.24	1.649	9.082	221.9	4.283	.4226
#1	-.0000	.0001	.0299	.0010	-.0002	2.226	1.343
#2	.0004	.0001	.0292	.0011	.0008	2.095	1.351
Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0148	.0020	-.0017	-.0018	-.0019	.4193	.0024
SDev	.0014	.0046	.0004	.0020	.0009	.0033	.0032
%RSD	9.503	234.5	25.80	109.9	46.26	.7968	133.4
#1	.0158	.0052	-.0020	-.0004	-.0025	.4169	.0001
#2	.0138	-.0013	-.0014	-.0033	-.0013	.4217	.0047
Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	105.3	.0071	-.0039	.4560	-.0018	-.0002	.0019
SDev	1.0	.0035	.0014	.0022	.0012	.0002	.0006
%RSD	.9075	48.56	35.72	.4873	67.97	117.5	33.16
#1	104.6	.0096	-.0049	.4576	-.0009	-.0000	.0024
#2	106.0	.0047	-.0029	.4544	-.0026	-.0004	.0015
Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0014	-.0018	.0002	.0012	.0039	.0006	-.0007
SDev	.0000	.0015	.0001	.0002	.0132	.0000	.0003
%RSD	.9277	84.36	51.18	15.93	340.7	2.449	43.40
#1	.0014	-.0029	.0003	.0011	.0132	.0006	-.0005
#2	.0014	-.0007	.0001	.0013	-.0054	.0006	-.0010

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.00000	.0318	.0001
SDev	.00000	.0009	.0001
%RSD	98.81	2.802	95.99

#1	-.0001	.0324	.0000
#2	-.0000	.0312	.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	679264	10000	--	--	--	--	--
SDev	6206.983	.00000000	--	--	--	--	--
%RSD	.9137807	.00000000	--	--	--	--	--
#1	674875	10000	--	--	--	--	--
#2	683653	10000	--	--	--	--	--

Analysis Report

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Method: DAILY2 Sample Name: 243226

Operator:

Run Time: 06/15/04 13:07:52

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	.0028	-.0092	2.091	.2733	.0001	-.0034
SDev	.0001	.0007	.0001	.018	.0002	.0000	.0060
%RSD	41.93	23.03	1.303	.8487	.0598	10.07	172.8

#1	-.0002	.0033	-.0091	2.104	.2734	.0001	-.0077
#2	-.0004	.0024	-.0093	2.079	.2732	.0001	.0008

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.2018	.0002	.0008	-.0002	-.0003	-.0083	.1393
SDev	.0014	.0004	.0007	.0003	.0002	.0080	.0072
%RSD	.7149	227.2	88.82	120.0	50.04	95.99	5.136

#1	.2008	-.0001	.0013	-.0000	-.0002	-.0139	.1342
#2	.2028	.0004	.0003	-.0004	-.0005	-.0027	.1443

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	.0006	.0293	.0011	-.0012	3.616	2.261
SDev	.0004	.0001	.0038	.0001	.0005	.255	.001
%RSD	127.4	7.984	13.08	4.489	39.86	7.059	.0529

#1	-.0006	.0006	.0266	.0011	-.0009	3.435	2.260
#2	-.0000	.0006	.0320	.0011	-.0015	3.796	2.261

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0356	.0590	.0063	.0034	-.0019	.3949	.0130
SDev	.0004	.0026	.0024	.0023	.0026	.0024	.0024
%RSD	1.089	4.377	37.43	67.54	140.1	.6145	18.44

#1	.0353	.0571	.0046	.0050	-.0038	.3932	.0147
#2	.0358	.0608	.0080	.0018	-.0000	.3967	.0113

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	108.0	.0678	.0112	1.572	.0044	.0301	.0792
SDev	.9	.0042	.0046	.015	.0007	.0017	.0025
%RSD	.8676	6.205	41.44	.9247	16.98	5.605	3.185

#1	107.3	.0708	.0079	1.582	.0049	.0289	.0774
#2	108.7	.0649	.0145	1.561	.0039	.0313	.0810

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0016	-.0005	.0012	-.0728	-.0001	.0003	-.0082
SDev	.0000	.0003	.0001	.0078	.0176	.0004	.0003
%RSD	.7993	54.28	8.083	10.66	17420.	104.2	3.159

#1	.0016	-.0007	.0013	-.0673	-.0125	.0006	-.0084
#2	.0016	-.0003	.0012	-.0783	.0123	.0001	-.0080

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0000	.0773	.0006
SDev	.0001	.0001	.0001
%RSD	621.6	.1840	21.00

#1	.0000	.0774	.0007
#2	-.0001	.0772	.0005

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---	---
Wavlen	361.384	---	---	---	---	---	---
Avge	696538	10000	---	---	---	---	---
SDev	6064.855	.0000000	---	---	---	---	---
%RSD	.8707135	.0000000	---	---	---	---	---
#1	692250	10000	---	---	---	---	---
#2	700827	10000	---	---	---	---	---

Analysis Report

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Method: DAILY2 Sample Name: 243227

Operator:

Run Time: 06/15/04 13:12:38

Comment:

Mode: CONC: Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0004	.0452	-.0014	2.012	.7653	.0001	.0071
SDev	.0003	.0013	.0015	.010	.0012	.0000	.0030
%RSD	72.73	2.837	114.3	.4937	.1589	10.75	41.43

#1	-.0006	.0442	-.0024	2.020	.7645	.0001	.0092
#2	-.0002	.0461	-.0003	2.005	.7662	.0001	.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	2.620	.0003	.0019	.0018	.0084	.0339	8.919
SDev	.001	.0003	.0003	.0000	.0003	.0101	.039
%RSD	.0418	85.99	15.69	2.050	3.164	29.87	.4357

#1	2.621	.0001	.0017	.0018	.0085	.0267	8.891
#2	2.619	.0006	.0022	.0019	.0082	.0410	8.946

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0000	.0006	.5374	.0485	.0011	18.17	11.90
SDev	.0001	.0000	.0032	.0000	.0003	.28	.01
%RSD	578.7	5.350	.5858	.0134	22.74	1.522	.0514

#1	-.0001	.0006	.5352	.0485	.0013	18.36	11.89
#2	.0001	.0006	.5396	.0485	.0010	17.97	11.90

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0238	.0078	.0015	.0007	-.0016	1.036	.0015
SDev	.0015	.0126	.0006	.0008	.0014	.004	.0025
%RSD	6.352	161.9	41.19	104.7	87.99	.3484	167.4

#1	.0249	-.0011	.0020	.0002	-.0026	1.034	.0032
#2	.0227	.0167	.0011	.0013	-.0006	1.039	-.0003

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.7	.0146	-.0025	1.535	.0010	.0032	.0069
SDev	.5	.0014	.0023	.007	.0003	.0010	.0017
%RSD	.4632	9.632	88.68	.4346	29.69	32.58	25.23

#1	102.4	.0156	-.0041	1.540	.0008	.0024	.0081
#2	103.0	.0136	-.0009	1.531	.0012	.0039	.0056

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0144	-.0009	.0016	-.0042	.0105	.0009	-.0026
SDev	.0000	.0007	.0001	.0041	.0033	.0002	.0010
%RSD	.1870	79.85	3.010	96.38	31.22	17.06	36.81

#1	.0144	-.0004	.0016	-.0071	.0082	.0010	-.0033
#2	.0144	-.0014	.0016	-.0014	.0129	.0008	-.0019

010139

Elem	Y_3710	Zn2062	Zr3496			
Units	ppm	ppm	ppm			
Avg	.0000	.2684	.0005			
SDev	.0001	.0014	.0001			
%RSD	975.8	.5268	13.99			
#1	.0001	.2694	.0006			
#2	-.0000	.2674	.0005			
IntStd	1	2	3	4	5	6
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---
Wavlen	361.384	---	---	---	---	---
Avg	667456	10000	---	---	---	---
SDev	3067.429	.0000000	---	---	---	---
%RSD	.4630390	.0000000	---	---	---	---
#1	660287	10000	---	---	---	---
#2	664625	10000	---	---	---	---

Analysis Report

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Method: DAILY2 Sample Name: P43228

Operator: 010140

Run Time: 06/15/04 13:17:23

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	-.0002	.1941	.0002	2.468	.4642	.0000	.0040
SDev	.0001	.0096	.0002	.009	.0007	.0000	.0041
%RSD	33.68	4.958	116.9	.3446	.1494	39.96	103.5

#1	-.0001	.2009	.0000	2.474	.4647	.0000	.0011
#2	-.0002	.1873	.0004	2.462	.4637	.0000	.0069

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	1.308	.0003	.0009	.0005	.0010	.0626	.9038
SDev	.000	.0002	.0001	.0000	.0005	.0059	.0020
%RSD	.0116	69.23	5.150	3.246	51.59	9.481	.2221

#1	1.308	.0004	.0009	.0005	.0006	.0668	.9024
#2	1.308	.0002	.0009	.0005	.0013	.0584	.9052

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	-.0004	.0005	.3642	.0004	-.0002	6.128	3.827
SDev	.0005	.0000	.0060	.0001	.0001	.038	.013
%RSD	151.6	8.194	1.656	22.94	76.35	.6181	.3405

#1	.0000	.0005	.3685	.0003	-.0001	6.102	3.836
#2	-.0007	.0005	.3600	.0004	-.0002	6.155	3.817

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.0002	.0373	-.0002	.0021	-.0022	.9869	-.0037
SDev	.0017	.0122	.0016	.0024	.0010	.0153	.0035
%RSD	707.6	32.68	1041.	116.2	44.92	1.554	96.35

#1	-.0009	.0287	.0010	.0004	-.0015	.9761	-.0061
#2	.0014	.0459	-.0013	.0038	-.0029	.9978	-.0012

Elem	Sc3613	1960/1	1960/2	Si2881	Pb2220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avg	104.0	.0134	-.0009	2.973	.0014	.0039	.0041
SDev	.7	.0060	.0004	.030	.0011	.0017	.0012
%RSD	.6455	44.95	48.99	.9952	79.81	44.17	30.15

#1	103.5	.0176	-.0012	2.994	.0006	.0051	.0049
#2	104.5	.0091	-.0006	2.952	.0021	.0027	.0032

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.0081	-.0038	.0075	.0010	.0044	.0011	-.0015
SDev	.0001	.0019	.0002	.0025	.0050	.0004	.0009
%RSD	.7050	49.96	2.165	257.1	112.7	36.84	57.22

#1	.0082	-.0051	.0076	.0028	.0009	.0008	-.0022
#2	.0081	-.0025	.0073	-.0008	.0079	.0014	-.0009

010141

Elem	Y_3710	Zn2062	Zn3496
Units	ppm	ppm	ppm
Avge	.0000	.1189	.0005
SDev	.0002	.0014	.0005
%RSD	1260.	1.153	92.06

#1	-.0001	.1199	.0002
#2	.0002	.1179	.0008

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	670641	10000	--	--	--	--	--
SDev	4352.949	.0000000	--	--	--	--	--
%RSD	.6490729	.0000000	--	--	--	--	--
#1	667563	10000	--	--	--	--	--
#2	673719	10000	--	--	--	--	--

Method: DAILY2

Sample Name: ~~CEVE~~

Operator:

Run Time: 06/15/04 13:25:49

CEBZ on 6-15-04

010142

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	L-.0001	L-.0034	L.0026	L.0074	L.0001	L.0001	L-.0009
SDev	.0005	.0037	.0036	.0016	.0000	.0000	.0047
%RSD	487.9	107.6	138.5	21.53	14.99	25.31	551.4

#1	L.0002	L-.0060	L.0001	L.0085	L.0001	L.0001	L.0025
#2	L-.0004	L-.0008	L.0052	L.0063	L.0001	L.0001	L-.0042

Errors	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low
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
Avg	L.0071	L.0005	L.0000	L-.0010	L-.0002	L-.0034	L-.0032
SDev	.0099	.0001	.0005	.0002	.0001	.0016	.0022
%RSD	138.4	28.21	1290.	20.42	64.05	45.37	69.30

#1	L.0002	L.0004	L.0004	L-.0009	L-.0001	L-.0023	L-.0048
#2	L.0141	L.0006	L-.0003	L-.0012	L-.0003	L-.0046	L-.0016

Errors	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low
High	22.00	1.100	5.500	2.200	2.200	11.00	22.00
Low	18.00	.9000	4.500	1.800	1.800	9.000	18.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	L-.0002	L.0000	L.0015	L-.0000	L.0009	L-.0045	L.0016
SDev	.0000	.0000	.0006	.0000	.0004	.0268	.0007
%RSD	29.12	162.3	41.46	110.1	46.90	593.5	42.65

#1	L-.0001	L.0000	L.0011	L-.0000	L.0012	L-.0235	L.0021
#2	L-.0002	L-.0000	L.0020	L-.0000	L.0006	L.0144	L.0012

Errors	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low
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
Avg	L-.0006	L.0038	-.0017	.0001	L-.0011	L.0031	L.0044
SDev	.0004	.0041	.0038	.0022	.0007	.0050	.0020
%RSD	67.76	108.3	220.7	2936.	64.07	164.1	46.11

#1	L-.0008	L.0009	.0010	.0016	L-.0006	L-.0005	L.0030
#2	L-.0003	L.0067	-.0044	-.0015	L-.0016	L.0066	L.0059

Errors	LC Low	LC Low	NOCHECK	NOCHECK	LC Low	LC Low	LC Low
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
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010143

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avg	100.8	.0046	-.0028	L.0105	L-.0005	L-.0003	L-.0004
SDev	.2	.0027	.0013	.0008	.0027	.0000	.0001
%RSD	.1706	58.04	45.64	7.575	536.8	9.350	18.51
#1	100.9	.0027	-.0019	L.0099	L.0014	L-.0004	L-.0003
#2	100.7	.0065	-.0037	L.0110	L-.0024	L-.0003	L-.0004
Errors	NOCHECK	NOCHECK	NOCHECK	LC Low	LC Low	LC Low	LC Low
High				5.500	5.500	5.500	5.500
Low				4.500	4.500	4.500	4.500
Elem	Sr4215	Th2837	Ti3349	Ti1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	L.0000	L-.0021	L.0000	L-.0067	L.0195	L.0004	L.0016
SDev	.0000	.0009	.0002	.0002	.0070	.0005	.0005
%RSD	44.92	41.49	4352.	2.541	35.87	128.9	32.34
#1	L.0000	L-.0015	L.0001	L-.0068	L.0244	L.0007	L.0019
#2	L.0000	L-.0028	L-.0001	L-.0065	L.0145	L.0000	L.0012
Errors	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low
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				
Avg	L-.0000	L.0015	L.0001				
SDev	.0001	.0032	.0004				
%RSD	223.1	215.9	305.4				
#1	L.0000	L-.0008	L.0004				
#2	L-.0001	L.0038	L-.0002				
Errors	LC Low	LC Low	LC Low				
High	5.500	1.100	5.500				
Low	4.500	.9000	4.500				

010144

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---	---
Wavlen	361.384	---	---	---	---	---	---
Avge	649998	10000	---	---	---	---	---
SDev	1071.267	.00000000	---	---	---	---	---
%RSD	.1648109	.00000000	---	---	---	---	---
#1	650755	10000	---	---	---	---	---
#2	649240	10000	---	---	---	---	---

Method: DAILY2 Sample Name: CCB2

Run Time: 06/15/04 13:32:24

Operator:

Comment:

Mode: CONC Corr. Factor: 1

CCV2 04 6-15-04

010145

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	H.9899	H9.677	H4.922	H4.769	H9.978	H.9720	H4.988
SDev	.0019	.029	.016	.001	.006	.0025	.012
%RSD	.1920	.2965	.3154	.0229	.0594	.2615	.2419
#1	H.9912	H9.697	H4.933	H4.768	H9.973	H.9738	H4.997
#2	H.9885	H9.656	H4.911	H4.770	H9.982	H.9702	H4.979
Errors	LC High	LC High	LC High	LC High	LC High	LC High	LC High
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
Avgc	H20.00	H.9955	H4.957	H1.945	H2.014	H10.15	H18.24
SDev	.01	.0016	.007	.002	.002	.01	.01
%RSD	.0680	.1587	.1390	.0803	.0864	.0820	.0285
#1	H20.01	H.9966	H4.962	H1.946	H2.015	H10.15	H18.23
#2	H19.99	H.9944	H4.952	H1.944	H2.013	H10.14	H18.24
Errors	LC High	LC High	LC High	LC High	LC High	LC High	LC High
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
Avgc	H4.927	H4.441	H19.84	H1.006	H4.942	H26.84	H18.95
SDev	.001	.019	.03	.001	.004	.28	.01
%RSD	.0118	.4323	.1367	.1365	.0874	1.042	.0637
#1	H4.928	H4.427	H19.86	H1.007	H4.939	H27.04	H18.94
#2	H4.927	H4.454	H19.82	H1.005	H4.945	H26.65	H18.96
Errors	LC High	LC High	LC High	LC High	LC High	LC High	LC High
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
Avgc	H4.858	H4.918	4.994	4.961	H1.017	H.9918	H.9852
SDev	.003	.094	.008	.006	.002	.0204	.0054
%RSD	.0603	1.902	.1660	.1117	.1613	2.052	.5506
#1	H4.856	H4.984	4.999	4.965	H1.016	H1.006	H.9814
#2	H4.860	H4.852	4.988	4.957	H1.018	H.9774	H.9891
Errors	LC High	LC High	NOCHECK	NOCHECK	LC High	LC High	LC High
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100
Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

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Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	99.43	5.161	5.147	H4.943	H4.972	H5.151	H4.911
SDev	.08	.013	.016	.003	.006	.015	.003
%RSD	.0765	.2425	.3179	.0589	.1299	.2927	.0648
#1	99.37	5.152	5.135	H4.945	H4.976	H5.141	H4.914
#2	99.48	5.170	5.158	H4.941	H4.967	H5.162	H4.909
Errors	NOCHECK	NOCHECK	NOCHECK	LC High	LC High	LC High	LC High
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	H5.049	H.9684	H4.857	H5.172	H.9760	H4.928	H.9860
SDev	.008	.0021	.001	.020	.0202	.001	.0027
%RSD	.1601	.2153	.0213	.3919	2.072	.0207	.2786
#1	H5.055	H.9699	H4.858	H5.157	H.9903	H4.929	H.9840
#2	H5.043	H.9669	H4.856	H5.186	H.9617	H4.927	H.9879
Errors	LC High	LC High	LC High	LC High	LC High	LC High	LC High
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	H4.967	H.9953	H4.808				
SDev	.007	.0000	.023				
%RSD	.1355	.0005	.4882				
#1	H4.972	H.9953	H4.792				
#2	H4.962	H.9953	H4.825				
Errors	LC High	LC High	LC High				
High	.0050	.0050	.0050				
Low	-.0050	-.0050	-.0050				

010147

Analysis Report

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IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---	---
Wavlen	361.384	---	---	---	---	---	---
Avge	641224	10000	---	---	---	---	---
SDev	460.3265	.00000000	---	---	---	---	---
%RSD	.0717888	.00000000	---	---	---	---	---
#1	640898	10000	---	---	---	---	---
#2	641549	10000	---	---	---	---	---

010148

Analysis Report

06/15/04 01:41:44 PM

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Method: DAILY2 Sample Name: 243229
 Run Time: 06/15/04 13:37:10
 Comment:
 Mode: CONC Corr. Factor: 1

Operator:

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	-.0001	-.0006	.0037	.1417	.0121	.0001	.0028
SD	.0004	.0029	.0025	.0020	.0001	.0000	.0013
%RSD	365.9	14.17	68.18	1.394	.7040	28.39	44.61
#1	-.0004	-.0027	.0019	.1431	.0121	.0001	.0019
#2	.0002	-.0185	.0055	.1403	.0122	.0001	.0037
Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	24.72	.0004	.0008	-.0000	-.0001	-.0032	5.348
SD	.05	.0002	.0001	.0002	.0003	.0051	.012
%RSD	.1959	43.45	19.27	2550.	269.4	160.2	.2214
#1	24.69	.0003	.0007	-.0002	.0001	-.0068	5.340
#2	24.75	.0005	.0009	.0001	-.0004	.0004	5.357
Elem	La3988	Li6707	Mg2790	Mn2576	Mn2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	-.0001	.0298	3.286	-.0000	.0059	34.42	22.50
SD	.0008	.0001	.005	.0001	.0008	.14	.01
%RSD	592.0	.2006	.1555	810.3	13.81	.4115	.0632
#1	-.0007	.0297	3.283	.0000	.0065	34.32	22.49
#2	.0004	.0298	3.290	-.0001	.0053	34.52	22.51
Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	-.0013	.0248	-.0036	.0011	-.0026	8.522	-.0001
SD	.0013	.0066	.0005	.0014	.0034	.038	.0000
%RSD	100.6	26.53	14.90	123.7	132.5	.4486	10.41
#1	-.0004	.0202	-.0033	.0021	-.0050	8.549	-.0001
#2	-.0022	.0295	-.0040	.0001	-.0002	8.495	-.0001
Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avg	103.9	.0176	-.0006	24.29	-.0004	.0055	.0160
SD	.1	.0003	.0003	.11	.0011	.0001	.0054
%RSD	.1065	1.695	45.09	.4673	260.2	1.557	34.07
#1	104.0	.0174	-.0004	24.37	.0004	.0055	.0198
#2	103.9	.0178	-.0008	24.21	-.0012	.0054	.0121
Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.1004	-.0052	-.0003	.0052	.0004	.0033	-.0016
SD	.0000	.0013	.0000	.0145	.0248	.0008	.0015
%RSD	.0364	24.24	9.554	277.7	5642.	24.11	90.89
#1	.1004	-.0043	-.0003	.0155	-.0171	.0027	-.0026
#2	.1004	-.0061	-.0003	-.0050	.0180	.0038	-.0006

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Elem	Y_3710	Zn2062	Zn3496
Units	ppm	ppm	ppm
Avge	-.0001	.0002	-.0000
SDev	.0000	.0003	.0003
%RSD	41.20	15.43	1625.

#1	-.0001	.0002	.0002
#2	-.0001	.0000	-.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	670390	10000	--	--	--	--	--
SDev	677.4083	.00000000	--	--	--	--	--
%RSD	.1010469	.00000000	--	--	--	--	--
#1	670869	10000	--	--	--	--	--
#2	669911	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 243230

Operator:

Run Time: 06/15/04 13:41:56

010150

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0001	.0190	-.0027	.2584	.0028	.0000	-.0030
SDev	.0007	.0010	.0034	.0052	.0001	.0000	.0063
%RSD	532.5	5.149	127.4	1.999	2.456	114.3	207.7

#1	-.0004	.0183	-.0003	.2621	.0028	.0000	-.0075
#2	.0006	.0196	-.0050	.2548	.0027	.0000	.0014

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	2.492	.0003	.0001	-.0006	.0015	.1358	4.511
SDev	.021	.0001	.0001	.0009	.0001	.0081	.050
%RSD	.8504	23.43	115.2	167.4	5.382	6.005	1.109

#1	2.507	.0004	.0001	-.0012	.0015	.1415	4.546
#2	2.477	.0003	.0000	.0001	.0016	.1300	4.475

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0003	.2591	.1121	.0037	.0459	213.4	127.8
SDev	.0012	.0035	.0055	.0007	.0009	3.5	2.0
%RSD	404.0	1.342	4.891	18.39	2.076	1.662	1.544

#1	-.0006	.2615	.1082	.0042	.0466	215.9	129.2
#2	.0012	.2566	.1160	.0032	.0452	210.9	126.5

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0008	.0571	.0044	.0036	-.0000	10.40	.0138
SDev	.0014	.0030	.0020	.0059	.0043	.21	.0060
%RSD	175.3	5.210	44.96	163.7	19960.	1.981	43.39

#1	-.0018	.0592	.0030	.0077	-.0031	10.55	.0180
#2	.0002	.0550	.0058	-.0006	.0030	10.26	.0095

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	87.83	.0546	.0111	7.883	.0039	.0256	.0623
SDev	1.93	.0214	.0009	.226	.0032	.0065	.0183
%RSD	2.200	39.21	8.045	2.865	83.42	25.54	29.31

#1	86.46	.0697	.0105	8.043	.0062	.0302	.0752
#2	89.19	.0395	.0117	7.724	.0016	.0210	.0494

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0070	-.0002	-.0001	-.0751	-.0030	-.0003	.0014
SDev	.0000	.0032	.0002	.0022	.0245	.0011	.0019
%RSD	.1029	1556.	109.2	2.888	818.6	307.0	142.2

#1	.0070	.0020	-.0000	-.0735	-.0203	-.0011	-.0000
#2	.0070	-.0024	-.0002	-.0766	.0143	.0004	.0027

Elem	Y_3710	Zn2062	Zn3496
Units	ppm	ppm	ppm
Avg	.0000	.0001	.0001
SD	.0001	.0005	.0001
%RSD	475.3	626.6	69.97

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#1	.0001	.0005	.0002
#2	.0000	.0003	.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avg	566438	10000	--	--	--	--	--
SD	12483.97	.0000000	--	--	--	--	--
%RSD	2.203945	.0000000	--	--	--	--	--
#1	557610	10000	--	--	--	--	--
#2	575265	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 243231

Operator:

Run Time: 06/15/04 13:46:41

010152

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0004	-.0199	.0096	.1360	.0081	.0001	.0018
SDev	.0004	.0037	.0043	.0016	.0000	.0000	.0063
%RSD	87.31	18.50	44.46	1.155	.2856	8.566	343.4

#1	-.0007	-.0173	.0126	.1371	.0082	.0001	.0063
#2	-.0002	-.0226	.0066	.1349	.0081	.0001	-.0026

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	13.29	.0002	.0009	-.0001	-.0006	.0144	5.487
SDev	.05	.0001	.0001	.0003	.0000	.0015	.043
%RSD	.3715	30.09	16.31	237.4	3.883	10.42	.7770

#1	13.26	.0001	.0011	-.0003	-.0005	.0154	5.457
#2	13.33	.0002	.0008	.0001	-.0006	.0133	5.518

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0000	.0310	2.053	.0057	.0098	39.08	25.33
SDev	.0006	.0001	.015	.0000	.0001	.00	.16
%RSD	2163.	.3252	.7379	.1634	1.238	.0045	.6361

#1	-.0004	.0310	2.043	.0057	.0098	39.08	25.22
#2	.0004	.0311	2.064	.0057	.0097	39.08	25.45

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0002	.0187	-.0010	.0003	.0018	6.957	.0028
SDev	.0016	.0109	.0020	.0013	.0009	.025	.0022
%RSD	737.7	58.50	195.0	459.1	54.10	.3575	79.95

#1	.0013	.0110	.0004	.0012	.0024	6.975	.0044
#2	-.0009	.0264	-.0025	-.0006	.0011	6.940	.0012

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	104.1	.0137	-.0016	25.68	-.0001	.0035	.0129
SDev	.9	.0022	.0015	.12	.0015	.0003	.0001
%RSD	.8688	15.96	93.83	.4819	1079.	7.623	.3784

#1	103.5	.0153	-.0027	25.77	.0009	.0033	.0130
#2	104.7	.0122	-.0005	25.60	-.0012	.0037	.0129

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0666	-.0031	-.0003	-.0089	.0122	.0056	.0006
SDev	.0004	.0018	.0000	.0030	.0121	.0002	.0006
%RSD	.5745	59.78	9.299	33.93	99.02	4.291	103.7

#1	.0663	-.0044	-.0003	-.0111	.0207	.0055	.0002
#2	.0668	-.0018	-.0003	-.0068	.0037	.0058	.0010

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avg	-.0001	.0016	.0002
SDev	.0000	.0000	.0001
%RSD	50.94	2.194	27.96

#1	-.0000	.0016	.0003
#2	-.0001	.0017	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avg	671378	10000	--	--	--	--	--
SDev	5786.962	.00000000	--	--	--	--	--
%RSD	.8619528	.00000000	--	--	--	--	--
#1	667286	10000	--	--	--	--	--
#2	675470	10000	--	--	--	--	--

Analysis Report

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Method: DAILY2 Sample Name: 243231s

Operator:

Run Time: 06/15/04 13:51:27

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0513	1.946	2.044	.1407	2.027	.0494	.0082
SDev	.0005	.004	.008	.0002	.004	.0000	.0046
%RSD	1.025	.2134	.3922	.1608	.1938	.0047	55.81

#1	.0516	1.943	2.038	.1409	2.024	.0494	.0114
#2	.0509	1.949	2.050	.1406	2.030	.0494	.0050

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	33.68	.0497	.5010	.1971	.2519	1.084	27.47
SDev	.06	.0001	.0008	.0013	.0007	.015	.10
%RSD	.1741	.2350	.1690	.6459	.2643	1.410	.3747

#1	33.64	.0497	.5004	.1980	.2514	1.073	27.40
#2	33.73	.0498	.5016	.1962	.2524	1.095	27.55

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0001	.0348	22.35	.5090	.0110	61.56	40.81
SDev	.0006	.0001	.05	.0000	.0007	.27	.02
%RSD	552.0	.2740	.2055	.0039	6.365	.4462	.0414

#1	-.0003	.0349	22.32	.5090	.0105	61.36	40.80
#2	.0005	.0348	22.38	.5090	.0115	61.75	40.83

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.4900	.0289	.4949	.4975	.0000	7.038	.5055
SDev	.0005	.0089	.0017	.0005	.0009	.064	.0015
%RSD	.1074	30.86	.3441	.0990	2094.	.9100	.2911

#1	.4903	.0352	.4961	.4978	-.0006	7.083	.5044
#2	.4896	.0226	.4937	.4971	.0007	6.993	.5065

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	100.7	2.243	2.226	25.89	.4966	2.232	.0127
SDev	.2	.008	.015	.05	.0009	.013	.0026
%RSD	.2380	.3776	.6636	.2073	.1804	.5677	20.77

#1	100.5	2.249	2.236	25.93	.4973	2.241	.0145
#2	100.8	2.237	2.216	25.85	.4960	2.223	.0108

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0675	-.0157	-.0002	2.075	.0081	.5050	.0007
SDev	.0001	.0046	.0001	.004	.0006	.0010	.0009
%RSD	.1367	29.10	36.07	.2165	6.908	.2012	126.2

#1	.0674	-.0189	-.0001	2.072	.0077	.5043	.0001
#2	.0675	-.0125	-.0002	2.079	.0085	.5057	.0013

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avg	-.0001	.5090	.0001
SDev	.0001	.0015	.0001
%RSD	121.0	.2892	99.45

#1	-.0001	.5079	.0000
#2	-.0000	.5100	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avg	649190	10000	--	--	--	--	--
SDev	1520.280	.00000000	--	--	--	--	--
%RSD	.2341810	.00000000	--	--	--	--	--
#1	648115	10000	--	--	--	--	--
#2	650265	10000	--	--	--	--	--

Analysis Report

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Method: DAILY2 Sample Name: 243232

Operator:

Run Time: 06/15/04 13:56:13

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0002	.0071	.0078	.1423	.0138	.0001	.0039
SDev	.0004	.0053	.0014	.0024	.0000	.0000	.0007
%RSD	234.9	74.08	17.52	1.705	.3017	2.176	17.00

#1	.0001	.0108	.0068	.1440	.0138	.0001	.0043
#2	-.0004	.0034	.0088	.1406	.0139	.0001	.0034

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	12.80	.0002	.0000	.0003	-.0003	.0061	3.814
SDev	.01	.0000	.0003	.0008	.0006	.0027	.0088
%RSD	.0717	.2813	11800.	245.7	203.9	44.77	.1987

#1	12.79	.0002	.0003	-.0002	.0001	.0080	3.819
#2	12.81	.0002	-.0002	.0009	-.0007	.0042	3.808

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0385	1.065	.0002	.0043	45.98	29.87
SDev	.0003	.0001	.005	.0002	.0005	.01	.04
%RSD	333.0	.1595	.4953	91.21	12.32	.0326	.1259

#1	.0001	.0384	1.069	.0004	.0039	45.97	29.90
#2	-.0003	.0385	1.061	.0001	.0047	45.99	29.84

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0007	.0088	.0011	-.0014	-.0014	8.093	.0015
SDev	.0004	.0088	.0013	.0009	.0021	.108	.0026
%RSD	61.97	100.4	121.4	64.58	150.0	1.331	168.2

#1	-.0010	.0150	.0020	-.0008	.0001	8.169	-.0003
#2	-.0004	.0025	.0002	-.0021	-.0028	8.017	.0033

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.9	.0167	-.0025	26.22	-.0006	.0039	.0123
SDev	1.2	.0069	.0054	.19	.0010	.0059	.0022
%RSD	1.183	41.31	218.9	.7273	182.5	151.0	17.88

#1	102.0	.0215	.0014	26.36	.0002	.0081	.0139
#2	103.7	.0118	-.0063	26.09	-.0013	-.0003	.0107

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0707	-.0023	-.0001	-.0094	.0224	.0067	.0005
SDev	.0000	.0031	.0002	.0015	.0224	.0003	.0018
%RSD	.0290	134.6	127.2	15.84	100.3	4.169	337.7

#1	.0707	-.0045	-.0000	-.0104	.0382	.0065	.0018
#2	.0707	-.0001	-.0002	-.0083	.0065	.0069	-.0007

Elem	Y_3710	Zn2062	Zn3496
Units	ppm	ppm	ppm
Avge	-.0001	-.0010	-.0001
SDev	.0000	.0003	.0002
%RSD	42.55	26.84	114.2

#1	-.0001	-.0008	-.0003
#2	-.0001	-.0011	-.0000

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---	---
Wavlen	.361.384	---	---	---	---	---	---
Avge	663352	10000	---	---	---	---	---
SDev	7814.237	.00000000	---	---	---	---	---
%RSD	1.177992	.00000000	---	---	---	---	---
#1	657827	10000	---	---	---	---	---
#2	668878	10000	---	---	---	---	---

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Method: DAILY2 Sample Name: 245108

Operator:

Run Time: 06/15/04 14:00:58

Comments:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.00001	-.00125	.00061	.1450	.00106	.00002	.00022
SDev	.00001	.00026	.00018	.00008	.00000	.00000	.00015
%RSD	59.76	21.16	29.28	.5430	.1696	14.52	72.01

#1	-.00002	-.00106	.00049	.1445	.00106	.00002	.00011
#2	-.00001	-.00143	.00074	.1456	.00106	.00002	.00032

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	13.59	.00000	.00012	.00003	.00005	.00120	3.705
SDev	.02	.00000	.00005	.00009	.00002	.00110	.0008
%RSD	.1350	76.03	38.58	274.5	29.32	91.84	.2253

#1	13.57	.00000	.00009	.00009	.00006	.00198	3.699
#2	13.60	.00001	.00015	-.00003	.00004	.00042	3.710

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.00001	.00372	1.345	.00017	.00082	50.06	32.54
SDev	.00001	.00001	.0005	.00001	.00005	.12	.03
%RSD	44.40	.1373	.3919	4.000	6.237	.2409	.0818

#1	.00001	.00372	1.341	.00018	.00006	49.98	32.52
#2	.00002	.00371	1.349	.00017	.00078	50.15	32.56

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.00000	.00172	-.00023	-.00012	.00006	9.427	-.00005
SDev	.00010	.00006	.00007	.00035	.00004	.0031	.00017
%RSD	207000.	3.386	30.64	300.2	75.20	.3255	350.9

#1	.00007	.00168	-.00028	-.00036	.00003	9.449	.00007
#2	-.00007	.00176	-.00018	.00013	.00009	9.405	-.00017

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	102.9	.00096	-.00045	19.71	-.00015	.00003	.00042
SDev	.4	.00017	.00014	.07	.00026	.00003	.00006
%RSD	.3549	17.96	31.06	.3508	168.1	138.6	14.03

#1	102.7	.00084	-.00035	19.76	-.00033	.00005	.00046
#2	103.2	.00108	-.00054	19.66	.00003	.00000	.00037

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0747	-.00030	-.00003	-.00023	.00154	.00133	.00057
SDev	.00002	.00025	.00000	.00005	.00028	.00001	.00020
%RSD	.2074	82.96	4.678	22.68	18.35	.3668	35.22

#1	.0746	-.00047	-.00003	-.00026	.00174	.00134	.00071
#2	.0749	-.00012	-.00003	-.00019	.00134	.00133	.00043

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	.0015	.0006
SDev	.0001	.0005	.0001
%RSD	49.46	31.31	9.715

#1	-.0001	.0019	.0006
#2	-.0002	.0012	.0007

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---	---
Wavlen	361.384	---	---	---	---	---	---
Avge	663732	10000	---	---	---	---	---
SDev	2319.310	.00000000	---	---	---	---	---
%RSD	.3494347	.00000000	---	---	---	---	---
#1	662092	10000	---	---	---	---	---
#2	665372	10000	---	---	---	---	---

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Analysis Report

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Method: DAILY2 Sample Name: 245108d

Operator:

Run Time: 06/15/04 14:05:44

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	-.0004	.0005	.1399	.0103	.0002	.0046
SDev	.0006	.0022	.0017	.0001	.0000	.0000	.0016
%RSD	2164.	10.75	19.91	.1103	.3152	19.45	35.77

#1	-.0004	-.0188	.0097	.1398	.0103	.0002	.0058
#2	.0004	-.0219	.0073	.1400	.0104	.0002	.0034

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	13.20	.0004	.0000	-.0004	.0006	.0032	3.593
SDev	.00	.0003	.0001	.0011	.0001	.0020	.002
%RSD	.0200	57.08	113.9	287.9	14.60	64.36	.0579

#1	13.20	.0006	.0000	.0004	.0006	.0017	3.591
#2	13.20	.0003	.0001	-.0011	.0005	.0046	3.594

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0361	1.309	.0016	.0083	48.93	31.58
SDev	.0004	.0001	.002	.0000	.0002	.04	.03
%RSD	82510.	.3504	.1444	2.072	1.985	.0878	.0955

#1	-.0003	.0360	1.310	.0016	.0084	48.96	31.60
#2	.0003	.0361	1.307	.0016	.0082	48.90	31.56

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0007	.0128	-.0036	.0012	-.0008	9.202	.0017
SDev	.0015	.0084	.0006	.0004	.0010	.032	.0021
%RSD	217.1	65.56	17.80	33.04	131.2	.3498	121.8

#1	.0017	.0069	-.0031	.0010	-.0015	9.225	.0033
#2	-.0004	.0188	-.0040	.0015	-.0001	9.180	.0002

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	106.0	.0066	-.0017	19.13	-.0004	.0011	.0050
SDev	.2	.0014	.0005	.09	.0001	.0001	.0007
%RSD	.1447	20.59	27.22	.4610	16.62	13.38	14.80

#1	106.1	.0076	-.0020	19.20	-.0004	.0012	.0055
#2	105.9	.0057	-.0014	19.07	-.0003	.0010	.0045

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0727	-.0019	-.0001	-.0034	.0162	.0131	.0036
SDev	.0002	.0014	.0001	.0028	.0101	.0005	.0012
%RSD	.2162	73.07	87.57	82.20	62.39	3.808	34.49

#1	.0726	-.0028	-.0002	-.0014	.0233	.0128	.0027
#2	.0729	-.0009	-.0001	-.0054	.0090	.0135	.0044

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avg	-.0000	.0028	.0004
SDev	.0000	.0004	.0002
%RSD	33.23	14.72	53.08

#1	-.0000	.0031	.0006
#2	-.0000	.0025	.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avg	683556	10000	--	--	--	--	--
SDev	990.6566	.00000000	--	--	--	--	--
%RSD	.1449270	.00000000	--	--	--	--	--
#1	684256	10000	--	--	--	--	--
#2	682855	10000	--	--	--	--	--

Analysis Report

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Method: DAILY2 Sample Name: 245108s

Operator:

Run Time: 06/15/04 14:10:30

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0504	1.940	2.028	.1420	2.008	.0489	.0073
SDev	.0003	.003	.001	.0002	.004	.0000	.0037
%RSD	.6129	.1658	.0673	.1561	.1881	.0798	50.34

#1	.0507	1.938	2.029	.1422	2.005	.0489	.0099
#2	.0502	1.942	2.027	.1419	2.010	.0490	.0047

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	33.77	.0492	.4979	.1952	.2513	1.060	26.00
SDev	.05	.0003	.0001	.0016	.0004	.003	.02
%RSD	.1545	.5418	.0300	.7975	.1774	.2462	.0759

#1	33.73	.0490	.4978	.1941	.2510	1.062	25.99
#2	33.81	.0494	.4980	.1963	.2517	1.058	26.01

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0002	.0404	21.76	.5007	.0090	72.50	47.49
SDev	.0003	.0000	.01	.0003	.0006	.12	.05
%RSD	170.3	.0755	.0465	.0660	7.090	.1681	.0949

#1	-.0004	.0404	21.75	.5005	.0086	72.42	47.53
#2	.0000	.0404	21.76	.5009	.0095	72.59	47.46

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.4825	.0230	.4958	.4932	-.0009	9.312	.5013
SDev	.0037	.0119	.0034	.0013	.0010	.099	.0079
%RSD	.7669	51.95	.6819	.2599	110.7	1.061	1.571

#1	.4798	.0314	.4934	.4923	-.0016	9.381	.4957
#2	.4851	.0145	.4982	.4941	-.0002	9.242	.5069

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	102.7	2.176	2.171	19.42	.4941	2.173	.0031
SDev	.1	.011	.014	.07	.0020	.013	.0007
%RSD	.1453	.4900	.6443	.3498	.3995	.5927	22.72

#1	102.8	2.183	2.181	19.47	.4927	2.182	.0036
#2	102.6	2.168	2.161	19.38	.4955	2.163	.0026

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0738	-.0151	-.0003	2.079	.0006	.5071	.0070
SDev	.0000	.0036	.0000	.014	.0042	.0021	.0018
%RSD	.0071	24.01	16.45	.6730	695.3	.4125	25.27

#1	.0738	-.0176	-.0003	2.069	-.0024	.5086	.0083
#2	.0738	-.0125	-.0002	2.089	.0036	.5057	.0058

Elem	Y_3710	Zn2062	Zn3496
Units	ppm	ppm	ppm
Avge	-.0002	.5084	.0000
SDev	.0001	.0009	.0002
%RSD	29.42	.1854	594.6

#1	-.0002	.5077	-.0001
#2	-.0001	.5091	.0002

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	662188	10000	--	--	--	--	--
SDev	965.2007	.00000000	--	--	--	--	--
%RSD	.1457594	.00000000	--	--	--	--	--
#1	662870	10000	--	--	--	--	--
#2	661505	10000	--	--	--	--	--

Analysis Report

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Method: DAILY2 Sample Name: 245109

Operator:

Run Time: 06/15/04 14:15:16

Comments:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0001	.0838	.0167	.1671	.0074	.0002	.0018
SDev	.0001	.0067	.0001	.0012	.0000	.0000	.0001
%RSD	61.67	7.962	.5235	.7063	.5671	.1158	7.517

#1	-.0001	.0885	.0168	.1679	.0074	.0002	.0019
#2	-.0001	.0791	.0167	.1662	.0074	.0002	.0017

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	6.691	.0007	.0008	.0009	.0010	.0350	3.029
SDev	.006	.0001	.0001	.0004	.0004	.0005	.014
%RSD	.0953	14.86	5.847	46.46	44.86	1.406	.4667

#1	6.686	.0006	.0008	.0006	.0007	.0354	3.019
#2	6.695	.0008	.0008	.0012	.0013	.0347	3.039

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0000	.0828	.5499	.0006	.0065	77.91	49.43
SDev	.0002	.0000	.0085	.0001	.0012	.01	.07
%RSD	588.9	.0457	1.547	10.03	19.14	.0170	.1454

#1	-.0001	.0828	.5439	.0006	.0056	77.90	49.38
#2	.0001	.0829	.5560	.0007	.0073	77.92	49.48

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.0003	.0332	-.0015	.0019	.0002	7.359	.0020
SDev	.0006	.0126	.0008	.0029	.0039	.040	.0026
%RSD	177.1	37.98	50.19	155.6	2542.	.5371	129.2

#1	-.0007	.0243	-.0021	.0039	-.0026	7.387	.0038
#2	.0001	.0421	-.0010	-.0002	.0029	7.331	.0002

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	102.7	.0163	.0006	25.62	.0008	.0059	.0080
SDev	.1	.0068	.0011	.10	.0017	.0030	.0016
%RSD	.0611	41.37	184.7	.4073	221.2	50.90	20.39

#1	102.7	.0211	.0014	25.70	.0020	.0080	.0092
#2	102.8	.0116	-.0002	25.55	-.0004	.0037	.0069

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0315	-.0003	.0006	-.0064	.0030	.0047	.0006
SDev	.0001	.0005	.0001	.0039	.0132	.0003	.0023
%RSD	.2393	156.9	15.95	60.92	440.0	6.356	351.8

#1	.0314	.0000	.0005	-.0092	-.0063	.0045	-.0010
#2	.0315	-.0007	.0006	-.0037	.0123	.0049	.0022

Elem	Y_3710	Zn2062	Zn3496
Units	ppm	ppm	ppm
Avge	.0001	.0008	.0009
SDev	.0001	.0004	.0002
%RSD	123.6	14.11	22.47

#1	.0000	.0031	.0007
#2	.0001	.0025	.0010

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	662605	10000	--	--	--	--	--
SDev	386.0803	.0000000	--	--	--	--	--
%RSD	.0582670	.0000000	--	--	--	--	--
#1	662332	10000	--	--	--	--	--
#2	662578	10000	--	--	--	--	--

Analysis Report

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Method: DAILY2 Sample Name: 245110

Operator:

Run Time: 06/15/04 14:20:02

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0005	-.0037	.0074	.1408	.0107	.0002	.0025
SDev	.0004	.0035	.0000	.0012	.0001	.0000	.0008
%RSD	85.59	14.78	.3772	.8444	1.334	9.563	30.78

#1	-.0008	-.0012	.0074	.1417	.0106	.0002	.0030
#2	-.0002	-.0062	.0074	.1400	.0108	.0002	.0019

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	13.63	.0000	.0009	-.0011	-.0004	.0030	3.725
SDev	.03	.0003	.0003	.0004	.0001	.0042	.031
%RSD	.2174	8986.	28.39	33.59	21.85	816.1	.8300

#1	13.61	-.0002	.0011	-.0008	-.0004	-.0141	3.703
#2	13.65	.0002	.0007	-.0013	-.0003	.0201	3.746

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0004	.0371	1.344	.0016	.0080	50.11	32.51
SDev	.0006	.0002	.008	.0001	.0004	.22	.08
%RSD	151.4	.4212	.5872	6.630	4.621	.4364	.2498

#1	-.0009	.0373	1.338	.0016	.0077	49.96	32.46
#2	.0000	.0370	1.350	.0017	.0082	50.27	32.57

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0009	.0271	-.0041	.0008	-.0016	9.457	.0040
SDev	.0001	.0165	.0020	.0013	.0019	.085	.0033
%RSD	9.784	60.75	47.78	162.2	114.0	.8959	82.60

#1	.0009	.0388	-.0055	-.0001	-.0030	9.517	.0063
#2	.0010	.0155	-.0027	.0017	-.0003	9.397	.0017

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	104.0	.0166	-.0026	19.64	-.0008	.0038	.0166
SDev	.2	.0010	.0018	.04	.0015	.0015	.0028
%RSD	.2091	5.906	70.14	.2290	181.9	39.79	16.65

#1	103.9	.0173	-.0013	19.67	-.0019	.0049	.0185
#2	104.2	.0159	-.0038	19.61	.0002	.0028	.0146

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0752	-.0018	-.0003	-.0174	.0077	.0133	-.0007
SDev	.0001	.0017	.0000	.0015	.0112	.0007	.0010
%RSD	.0859	98.60	8.534	8.678	145.3	5.566	141.8

#1	.0752	-.0005	-.0003	-.0164	-.0002	.0138	.0000
#2	.0751	-.0030	-.0003	-.0185	.0156	.0127	-.0014

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	-.0001	-.0002	.0002
SDev	.0001	.0003	.0003
%RSD	74.27	163.1	146.0

#1	-.0002	.0000	-.0000
#2	-.0001	-.0004	.0004

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	670985	10000	--	--	--	--	--
SDev	1401.486	.0000000	--	--	--	--	--
%RSD	.2088699	.0000000	--	--	--	--	--
#1	669994	10000	--	--	--	--	--
#2	671976	10000	--	--	--	--	--

Analysis Report

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Method: DAILY2 Sample Name: ~~SC42~~ *CEB3 m 6-15-04* Operator:
 Run Time: 06/15/04 14:28:28
 Comment:
 Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	L-.0001	L-.0119	L.0016	L.0018	L.0001	L.0002	L.0066
SD	.0004	.0021	.0000	.0006	.0000	.0000	.0084
%RSD	321.0	17.48	.5175	31.80	37.92	10.40	126.5

#1	L-.0004	L-.0134	L.0016	L.0022	L.0001	L.0002	L.0125
#2	L.0001	L-.0105	L.0016	L.0014	L.0001	L.0003	L.0007

Errors	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low
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
Avg	L.0004	L.0004	L.0005	L-.0003	L.0003	L-.0056	L-.0013
SD	.0003	.0002	.0004	.0003	.0001	.0210	.0078
%RSD	85.10	52.87	94.23	117.7	24.93	378.6	583.8

#1	L.0006	L.0003	L.0002	L-.0000	L.0003	L.0093	L.0042
#2	L.0001	L.0006	L.0008	L-.0005	L.0004	L-.0204	L-.0069

Errors	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low
High	22.00	1.100	5.500	2.200	2.200	11.00	22.00
Low	18.00	.9000	4.500	1.800	1.800	9.000	18.00

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	L.0003	L.0002	L.0032	L-.0001	L.0011	L-.0007	L.0100
SD	.0001	.0000	.0071	.0002	.0015	.0014	.0003
%RSD	53.80	1.991	226.0	331.9	140.8	211.9	3.132

#1	L.0002	L.0002	L-.0019	L-.0002	L.0000	L.0003	L.0102
#2	L.0003	L.0002	L.0082	L.0001	L.0022	L-.0017	L.0098

Errors	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low
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
Avg	L-.0002	L.0028	-.0001	.0010	L-.0014	L-.0235	L.0021
SD	.0001	.0095	.0058	.0007	.0007	.0079	.0025
%RSD	42.11	336.9	3883.	69.06	48.47	33.69	116.4

#1	L-.0002	L-.0039	.0039	.0015	L-.0009	L-.0179	L.0039
#2	L-.0003	L.0095	-.0042	.0005	L-.0018	L-.0291	L.0004

Errors	LC Low	LC Low	NOCHECK	NOCHECK	LC Low	LC Low	LC Low
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
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Analysis Report

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Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avg	100.8	.0021	-.0030	L.0055	L.0006	L-.0013	L.0014
SDev	.1	.0029	.0011	.0013	.0024	.0017	.0020
%RSD	.0960	135.9	36.48	23.10	372.8	133.3	142.4
#1	100.8	.0001	-.0037	L.0046	L.0023	L-.0024	L.0028
#2	100.7	.0041	-.0022	L.0064	L-.0010	L-.0001	L-.0000
Errors	NOCHECK	NOCHECK	NOCHECK	LC Low	LC Low	LC Low	LC Low
High				5.500	5.500	5.500	5.500
Low				4.500	4.500	4.500	4.500
Elem	Sr4215	Th2837	Ti3349	Ti1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	L.0000	L-.0034	L.0001	L.0022	L.0197	L.0003	L-.0015
SDev	.0000	.0013	.0000	.0010	.0021	.0004	.0023
%RSD	44.16	39.77	23.38	46.28	10.87	118.1	152.2
#1	L.0000	L-.0024	L.0001	L.0030	L.0212	L.0006	L-.0032
#2	L.0000	L-.0043	L.0001	L.0015	L.0182	L.0001	L.0001
Errors	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low	LC Low
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				
Avg	L-.0000	L-.0011	L.0007				
SDev	.0000	.0002	.0001				
%RSD	55.42	18.23	18.96				
#1	L-.0001	L-.0012	L.0008				
#2	L-.0000	L-.0010	L.0006				
Errors	LC Low	LC Low	LC Low				
High	5.500	1.100	5.500				
Low	4.500	.9000	4.500				

Analysis Report

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IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	649814	10000	--	--	--	--	--
SDev	560.7357	.00000000	--	--	--	--	--
%RSD	.0862917	.00000000	--	--	--	--	--
#1	650211	10000	--	--	--	--	--
#2	649418	10000	--	--	--	--	--

Analysis Report

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Method: DAILYP Sample Name: ~~CCB3~~ *CCV3 PH 6-15-04* Operator:
 Run Time: 06/15/04 14:35:04
 Comment:
 Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	H.9846	H9.644	H4.918	H4.748	H9.908	H.9699	H4.979
SDev	.0003	.0002	.0002	.011	.0001	.00012	.0007
%RSD	.0311	.0169	.0421	.2328	.0108	.1237	.1410
#1	H.9848	H9.643	H4.919	H4.740	H9.907	H.9691	H4.984
#2	H.9844	H9.645	H4.916	H4.756	H9.909	H.9708	H4.975
Errors	LC High	LC High	LC High	LC High	LC High	LC High	LC High
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
Avgc	H19.97	H.9882	H4.928	H1.943	H2.013	H10.10	H18.30
SDev	.08	.0027	.008	.004	.001	.03	.05
%RSD	.3868	.2743	.1642	.1934	.0403	.3177	.2597
#1	H19.91	H.9862	H4.922	H1.940	H2.014	H10.08	H18.33
#2	H20.02	H.9901	H4.934	H1.945	H2.012	H10.12	H18.26
Errors	LC High	LC High	LC High	LC High	LC High	LC High	LC High
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
Avgc	H4.925	H4.434	H19.81	H1.003	H4.936	H27.03	H18.88
SDev	.003	.010	.03	.001	.007	.03	.04
%RSD	.0635	.2284	.1582	.0942	.5543	.1089	.2375
#1	H4.923	H4.441	H19.79	H1.002	H4.917	H27.06	H18.91
#2	H4.927	H4.427	H19.83	H1.004	H4.956	H27.01	H18.85
Errors	LC High	LC High	LC High	LC High	LC High	LC High	LC High
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
Avgc	H4.787	H4.976	4.943	4.939	H1.020	H.9887	H.9809
SDev	.004	.145	.009	.023	.001	.0066	.0040
%RSD	.0838	2.916	.1872	.4716	.1065	.6628	.4023
#1	H4.784	H5.079	4.937	4.922	H1.019	H.9934	H.9837
#2	H4.789	H4.874	4.950	4.955	H1.020	H.9841	H.9782
Errors	LC High	LC High	NOCHECK	NOCHECK	LC High	LC High	LC High
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100
Elem	Se3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avg	100.0	5.178	5.123	H4.897	H4.940	H5.141	H4.904
SDev	.4	.004	.039	.004	.019	.027	.005
%RSD	.3714	.0770	.7551	.0768	.3767	.5274	.0978
#1	100.3	5.175	5.096	H4.899	H4.927	H5.122	H4.901
#2	99.74	5.181	5.150	H4.894	H4.953	H5.160	H4.907
Errors	NOCHECK	NOCHECK	NOCHECK	LC High	LC High	LC High	LC High
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
Avg	H5.064	H.9634	H4.843	H5.154	H.9829	H4.896	H.9760
SDev	.003	.0031	.001	.043	.0065	.001	.0076
%RSD	.0680	.3217	.0109	.8270	.6589	.0253	.7808
#1	H5.061	H.9656	H4.842	H5.124	H.9784	H4.897	H.9706
#2	H5.066	H.9612	H4.843	H5.184	H.9875	H4.895	H.9814
Errors	LC High	LC High	LC High	LC High	LC High	LC High	LC High
High	.0050	.0100	.0050	.0100	.1000	.0050	.0100
Low	-.0050	-.0100	-.0050	-.0100	-.1000	-.0050	-.0100
Elem	Y_3710	Zn2062	Zn3496				
Units	ppm	ppm	ppm				
Avg	H4.954	H.9986	H4.880				
SDev	.002	.0069	.002				
%RSD	.0333	.6888	.0455				
#1	H4.955	H.9938	H4.882				
#2	H4.952	H1.003	H4.878				
Errors	LC High	LC High	LC High				
High	.0050	.0050	.0050				
Low	-.0050	-.0050	-.0050				

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---	---
Wavlen	361.384	---	---	---	---	---	---
Avge	644960	10000	---	---	---	---	---
SDev	2440.226	.00000000	---	---	---	---	---
%RSD	.3783527	.00000000	---	---	---	---	---
#1	646686	10000	---	---	---	---	---
#2	643235	10000	---	---	---	---	---

Analysis Report

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Method: DAILY2 Sample Name: 245111

Operator:

Run Time: 06/15/04 14:39:50

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	.3962	.0099	.1705	.0081	.0003	.0031
SDev	.0005	.0493	.0050	.0004	.0002	.0000	.0083
%RSD	169700.	12.44	50.37	.2268	2.418	4.187	266.0

#1	-.0004	.4311	.0135	.1708	.0083	.0003	-.0027
#2	.0004	.3614	.0064	.1703	.0080	.0003	.0090

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	6.970	.0001	.0008	.0006	.0005	.1379	3.126
SDev	.075	.0001	.0005	.0006	.0001	.0023	.073
%RSD	1.077	154.5	67.83	91.80	19.77	1.657	2.337

#1	6.917	-.0000	.0012	.0011	.0005	.1363	3.075
#2	7.023	.0002	.0004	.0002	.0006	.1395	3.178

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0008	.0847	.6041	.0008	.0092	79.38	50.66
SDev	.0004	.0008	.0009	.0002	.0000	1.39	.69
%RSD	46.95	.8851	.1472	22.00	.2013	1.748	1.350

#1	.0010	.0842	.6035	.0010	.0092	78.40	50.17
#2	.0005	.0852	.6048	.0007	.0093	80.36	51.15

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0009	.0388	.0006	.0036	.0003	7.423	.0010
SDev	.0023	.0094	.0027	.0020	.0019	.134	.0016
%RSD	244.5	24.23	445.6	55.36	542.6	1.798	162.8

#1	.0025	.0455	-.0013	.0022	-.0010	7.518	-.0001
#2	-.0007	.0322	.0025	.0050	.0017	7.329	.0021

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	101.6	.0239	.0000	26.99	.0026	.0080	.0234
SDev	.0	.0034	.0086	.17	.0022	.0069	.0032
%RSD	.0027	14.14	30430.	.6138	84.70	85.75	13.76

#1	101.6	.0263	.0061	27.11	.0010	.0129	.0256
#2	101.6	.0215	-.0061	26.87	.0042	.0032	.0211

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0332	-.0011	.0036	-.0049	.0291	.0050	-.0000
SDev	.0003	.0018	.0004	.0089	.0025	.0006	.0015
%RSD	.8210	159.9	10.28	182.1	8.721	12.64	35060.

#1	.0330	.0001	.0039	.0014	.0309	.0054	.0010
#2	.0334	-.0024	.0034	-.0111	.0273	.0045	-.0011

010175

Elem	Y_3710	Zn2062	Zn3496
Units	ppm	ppm	ppm
Avge	.0002	.0017	.0013
SDev	.0002	.0003	.0002
%RSD	102.8	20.71	14.76

#1	.0003	.0020	.0014
#2	.0000	.0015	.0012

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---	---
Wavlen	361.384	---	---	---	---	---	---
Avge	654986	10000	---	---	---	---	---
SDev	9.899495	.0000000	---	---	---	---	---
%RSD	.0015114	.0000000	---	---	---	---	---
#1	654979	10000	---	---	---	---	---
#2	654993	10000	---	---	---	---	---

Analysis Report

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Method: DAILY2 Sample Name: P45112

Run Time: 06/15/04 14:44:36

Operator:

Comments:

Mode: CONC Corr. Factor: 1

010176

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0003	-.0176	-.0010	-.0017	.0001	.0003	.0055
SDev	.0001	.0008	.0009	.0014	.0001	.0000	.0047
%RSD	19.75	4.715	84.32	84.71	38.43	1.212	84.27
#1	-.0003	-.0170	-.0004	-.0007	.0002	.0003	.0089
#2	-.0003	-.0182	-.0017	-.0027	.0001	.0003	.0022
Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	10.01	.0010	.0009	-.0002	.0001	10.14	7.902
SDev	.01	.0002	.0004	.0003	.0002	.04	.018
%RSD	.1166	21.54	42.67	112.9	296.5	.4042	.2235
#1	10.02	.0012	.0006	-.0004	-.0001	10.17	7.914
#2	10.01	.0009	.0011	-.0000	.0002	10.11	7.889
Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0003	-.0001	9.838	-.0000	.0018	7.891	5.220
SDev	.0003	.0000	.017	.0001	.0002	.111	.003
%RSD	86.77	25.27	.1749	200.4	12.22	1.412	.0569
#1	-.0001	-.0001	9.850	.0000	.0017	7.970	5.218
#2	-.0005	-.0002	9.826	-.0001	.0020	7.812	5.222
Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0003	.0078	.0004	.0024	-.0014	-.0292	-.0013
SDev	.0005	.0139	.0026	.0013	.0006	.0008	.0033
%RSD	174.3	178.6	682.5	53.37	44.51	2.745	257.8
#1	.0001	-.0021	-.0015	.0015	-.0009	-.0297	-.0036
#2	-.0007	.0176	.0022	.0033	-.0018	-.0286	.0010
Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	102.6	.0024	-.0054	.0068	.0017	-.0028	.0004
SDev	.4	.0049	.0047	.0019	.0017	.0048	.0005
%RSD	.3505	206.3	87.32	28.52	99.14	170.8	120.6
#1	102.4	-.0011	-.0088	.0081	.0005	-.0062	.0008
#2	102.9	.0059	-.0021	.0054	.0030	.0006	.0001
Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0002	-.0097	.0003	.0077	.0146	-.0004	-.0023
SDev	.0000	.0030	.0001	.0027	.0122	.0003	.0007
%RSD	1.560	30.62	50.69	34.74	83.60	82.86	31.76
#1	.0002	-.0076	.0002	.0095	.0232	-.0002	-.0028
#2	.0002	-.0118	.0004	.0058	.0060	-.0006	-.0018

010177

Elem	Y_3710	Zn2062	Zn3496
Units	ppm	ppm	ppm
Avge	-.0001	.0004	.0001
SDev	.0000	.0001	.0003
%RSD	21.42	23.04	267.1

#1	-.0001	.0005	.0003
#2	-.0001	.0003	-.0001

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---	---
Wavlen	361.384	---	---	---	---	---	---
Avge	661990	10000	---	---	---	---	---
SDev	2382.950	.0000000	---	---	---	---	---
%RSD	.3599676	.0000000	---	---	---	---	---
#1	660305	10000	---	---	---	---	---
#2	663675	10000	---	---	---	---	---

Method: DAILY2 Sample Name: 245113

Operator:

Run Time: 06/15/04 14:49:22

Comment:

Mode: CONC Corr. Factor: 1

010178

Elem	Ag3290	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.1001	.0752	.0921	-.0033	.1005	.0966	-.0012
SDev	.0015	.0012	.0035	.0001	.0002	.0002	.0021
%RSD	1.460	1.608	3.816	2.414	.2083	.1650	183.6

#1	.1011	.0761	.0896	-.0033	.1007	.0967	.0003
#2	.0991	.0743	.0945	-.0032	.1004	.0965	-.0027

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	9.959	.0996	.0988	.0968	.0959	10.12	7.932
SDev	.011	.0009	.0007	.0010	.0004	.01	.037
%RSD	.1060	.8649	.6761	1.088	.3936	.1061	.4642

#1	9.966	.1002	.0992	.0976	.0962	10.11	7.958
#2	9.951	.0990	.0983	.0961	.0957	10.12	7.906

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0003	-.0001	9.773	.1007	.0924	8.140	5.288
SDev	.0003	.0000	.015	.0004	.0027	.083	.016
%RSD	111.5	26.07	.1491	.4249	2.911	1.016	.3087

#1	-.0001	-.0001	9.783	.1010	.0905	8.198	5.300
#2	-.0005	-.0002	9.762	.1004	.0943	8.081	5.277

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0982	.0044	.0975	.0994	-.0013	-.0406	.0957
SDev	.0008	.0107	.0006	.0032	.0015	.0102	.0002
%RSD	.8565	242.3	.6512	3.216	112.1	25.23	.2148

#1	.0977	.0120	.0970	.0971	-.0023	-.0478	.0959
#2	.0988	-.0031	.0979	.1016	-.0003	-.0333	.0956

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	103.0	.0981	.0917	.0070	.0987	.0939	-.0009
SDev	.7	.0016	.0025	.0016	.0023	.0011	.0017
%RSD	.7272	1.624	2.685	22.67	2.371	1.184	179.4

#1	102.4	.0993	.0900	.0081	.0971	.0931	.0003
#2	103.5	.0970	.0935	.0058	.1004	.0947	-.0021

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	9.912	.0909	.0001	.1031	.0329	.0980	-.0002
SDev	.020	.0031	.0000	.0009	.0029	.0004	.0014
%RSD	.2055	3.417	29.52	.8611	8.872	.4583	649.5

#1	9.926	.0887	.0001	.1024	.0349	.0983	.0008
#2	9.898	.0931	.0000	.1037	.0308	.0977	-.0012

010179

Elem	Y_3710	Zn2062	Zn3496
Units	ppm	ppm	ppm
Avg	-.0001	.0986	-.0003
SDev	.0000	.0004	.0001
%RSD	27.48	.4404	33.15

#1	-.0001	.0989	-.0002
#2	-.0001	.0983	-.0003

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---	---
Wavlen	361.384	---	---	---	---	---	---
Avg	664100	10000	---	---	---	---	---
SDev	4860.652	.0000000	---	---	---	---	---
%RSD	.7319157	.0000000	---	---	---	---	---
#1	660663	10000	---	---	---	---	---
#2	667537	10000	---	---	---	---	---

Method: DAILY2 Sample Name: 245114

Operator:

Run Time: 06/15/04 14:54:07

010180

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0001	-.0266	-.0025	-.0024	.0001	.0003	.0053
SDev	.0003	.0012	.0012	.0004	.0000	.0000	.0028
XRSD	235.0	4.429	48.03	16.60	10.98	.6054	52.30

#1	-.0003	-.0258	-.0016	-.0021	.0001	.0003	.0034
#2	.0001	-.0275	-.0033	-.0027	.0001	.0003	.0073

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0002	.0003	.0006	-.0004	-.0003	-.0067	-.0054
SDev	.0002	.0001	.0003	.0001	.0002	.0246	.0065
XRSD	104.2	28.44	46.10	21.78	67.50	368.6	120.9

#1	-.0003	.0004	.0004	-.0004	-.0004	.0107	-.0008
#2	-.0000	.0003	.0007	-.0005	-.0001	-.0241	-.0099

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0004	-.0001	.0003	.0000	.0009	-.0124	-.0005
SDev	.0011	.0000	.0011	.0001	.0002	.0241	.0000
XRSD	252.2	4.944	358.0	1066.	25.28	195.0	5.616

#1	-.0003	-.0001	.0011	-.0000	.0011	.0047	-.0006
#2	.0012	-.0001	-.0005	.0000	.0008	-.0294	-.0005

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0003	.0061	-.0031	.0007	.0004	-.0357	-.0049
SDev	.0001	.0089	.0044	.0036	.0018	.0078	.0032
XRSD	21.78	145.3	143.4	542.1	394.6	21.97	65.45

#1	.0003	.0124	-.0062	-.0019	-.0008	-.0301	-.0072
#2	.0003	-.0002	.0000	.0032	.0017	-.0412	-.0027

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	101.7	.0057	-.0046	.0061	-.0006	-.0012	-.0017
SDev	1.1	.0029	.0019	.0017	.0039	.0003	.0044
XRSD	1.037	51.21	40.58	27.14	681.0	23.72	267.2

#1	101.0	.0036	-.0033	.0073	-.0033	-.0010	-.0048
#2	102.5	.0077	-.0059	.0049	.0022	-.0013	.0015

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0001	-.0018	.0000	.0004	.0070	-.0001	-.0015
SDev	.0001	.0034	.0001	.0001	.0130	.0004	.0002
XRSD	50.43	187.1	925.9	28.88	185.1	344.7	12.49

#1	.0002	.0006	.0001	.0003	-.0022	-.0004	-.0016
#2	.0001	-.0042	-.0001	.0005	.0162	.0002	-.0014

010181

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avg	-.0000	-.0014	.0001
SDev	.0001	.0001	.0000
%RSD	355.7	7.001	29.10

#1	-.0001	-.0015	.0001
#2	.0000	-.0014	.0000

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---	---
Wavlen	361.384	---	---	---	---	---	---
Avg	656188	10000	---	---	---	---	---
SDev	6807.317	.0000000	---	---	---	---	---
%RSD	1.037404	.0000000	---	---	---	---	---
#1	651374	10000	---	---	---	---	---
#2	661001	10000	---	---	---	---	---

Method: DAILY2 Sample Name: 245115

Operator:

Run Time: 06/15/04 14:58:53

Comment:

Mode: CONC Corr. Factor: 1

010182

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0003	.3362	.0052	.1416	.0118	.0003	-.0004
SDev	.0002	.0510	.0011	.0005	.0000	.0000	.0047
%RSD	63.24	15.16	20.22	.3849	.3086	7.501	1292.

#1	.0001	.3722	.0060	.1419	.0118	.0003	.0030
#2	.0004	.3001	.0045	.1412	.0117	.0003	-.0037

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	13.97	.0005	.0007	-.0002	.0007	.1819	3.774
SDev	.05	.0001	.0003	.0006	.0003	.0197	.026
%RSD	.3590	11.78	44.63	245.5	34.90	10.84	.6804

#1	13.94	.0004	.0005	.0002	.0006	.1958	3.756
#2	14.01	.0005	.0009	-.0006	.0009	.1679	3.792

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0003	.0374	1.420	.0045	.0079	50.67	32.79
SDev	.0002	.0000	.004	.0002	.0014	.13	.03
%RSD	66.30	.0541	.2856	5.366	17.17	.2655	.0944

#1	.0001	.0375	1.417	.0047	.0089	50.58	32.76
#2	.0004	.0374	1.422	.0044	.0069	50.77	32.81

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0001	.0372	-.0019	.0005	-.0022	9.502	.0024
SDev	.0006	.0048	.0044	.0035	.0022	.170	.0013
%RSD	466.6	13.01	231.9	721.8	101.2	1.789	54.22

#1	-.0003	.0338	.0012	.0029	-.0037	9.622	.0033
#2	.0005	.0406	-.0051	-.0020	-.0006	9.382	.0015

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	103.2	.0145	.0003	20.74	-.0003	.0050	.0089
SDev	1.1	.0077	.0005	.28	.0038	.0022	.0008
%RSD	1.020	52.98	208.2	1.357	1261.	43.97	9.103

#1	102.4	.0091	.0006	20.94	.0024	.0035	.0095
#2	103.9	.0200	-.0001	20.54	-.0030	.0066	.0093

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	.0770	-.0007	.0038	-.0090	.0099	.0136	-.0019
SDev	.0002	.0013	.0004	.0048	.0171	.0003	.0004
%RSD	.2929	180.6	11.17	53.26	173.1	2.574	22.91

#1	.0768	-.0017	.0041	-.0056	-.0022	.0139	-.0022
#2	.0771	.0002	.0035	-.0124	.0219	.0134	-.0016

010183

Elem	Y_3710	Zn2062	Zr3496
Units	ppm	ppm	ppm
Avge	.0001	.0011	.0011
SDev	.0000	.0002	.0000
%RSD	13.00	17.41	.4020

#1	.0001	.0013	.0011
#2	.0001	.0010	.0011

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	665406	10000	--	--	--	--	--
SDev	6843.379	.00000000	--	--	--	--	--
%RSD	1.028452	.00000000	--	--	--	--	--
#1	660567	10000	--	--	--	--	--
#2	670245	10000	--	--	--	--	--

Method: DAILY2 Sample Name: 245116

Operator:

Run Time: 06/15/04 15:03:39

010184

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	-.00003	.4978	.0019	.1721	.0084	.0004	.0021
SDev	.00002	.1567	.0031	.0020	.0001	.0000	.0045
%RSD	58.51	31.48	165.8	1.185	1.203	11.90	212.8

#1	-.00002	.6085	.0041	.1736	.0044	.0003	.0053
#2	-.00004	.3870	-.0003	.1707	.0083	.0004	-.0011

Elem	Ca3179	Cd2265	Co2286	Cr2677	Cu3247	Fe2714	K_7664
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	7.315	.00002	.0013	.00002	.00005	.1665	3.224
SDev	.021	.0000	.0005	.0001	.0004	.0273	.015
%RSD	.2881	22.17	41.87	69.79	72.54	16.41	.4656

#1	7.300	.00002	.0009	.0001	.0007	.1859	3.214
#2	7.329	.00002	.0016	.0003	.0002	.1472	3.235

Elem	La3988	Li6707	Mg2790	Mn2576	Mo2020	Na3302	Na5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0005	.0879	.6405	.0012	.0052	82.50	52.47
SDev	.0005	.0005	.0137	.0001	.0005	.51	.21
%RSD	107.3	.5711	2.139	13.01	9.945	.6160	.3935

#1	.0001	.0876	.6501	.0013	.0048	82.14	52.32
#2	.0009	.0883	.6308	.0011	.0056	82.86	52.62

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0002	.0391	-.0019	.0028	.0000	7.566	.0044
SDev	.0001	.0155	.0027	.0008	.0008	.128	.0023
%RSD	23.19	39.66	137.7	28.06	1877.	1.694	53.30

#1	.0002	.0501	-.0001	.0034	-.0005	7.657	.0060
#2	.0002	.0282	-.0038	.0023	.0006	7.475	.0027

Elem	Sc3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avge	98.94	.0255	-.0003	27.84	.0013	.0083	.0266
SDev	.76	.0019	.0043	.61	.0014	.0035	.0050
%RSD	.7636	7.378	1513.	2.206	112.8	41.97	19.00

#1	98.40	.0269	.0028	28.27	.0023	.0108	.0302
#2	99.47	.0242	-.0033	27.40	.0003	.0059	.0230

Elem	Sr4215	Th2837	Ti3349	Tl1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avge	.0355	.0004	.0043	-.0263	.0116	.0036	-.0052
SDev	.0001	.0020	.0013	.0021	.0068	.0000	.0020
%RSD	.4236	463.2	30.84	8.001	58.64	.2739	38.46

#1	.0354	-.0010	.0052	-.0248	.0163	.0036	-.0066
#2	.0356	.0019	.0034	-.0278	.0068	.0036	-.0038

010185

Elem	Y_3710	Zn2062	Zn3496
Units	ppm	ppm	ppm
Avg	.0001	.0021	.0012
SD	.0000	.0004	.0005
%RSD	.8400	21.13	40.81

#1	.0001	.0024	.0016
#2	.0001	.0018	.0009

IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---	---
Wavlen	361.384	---	---	---	---	---	---
Avg	638104	10000	---	---	---	---	---
SD	4838.732	.0000000	---	---	---	---	---
%RSD	.7582989	.0000000	---	---	---	---	---
#1	634682	10000	---	---	---	---	---
#2	641525	10000	---	---	---	---	---

Method: DAILY2 Sample Name: ccv4

Operator:

Run Time: 06/15/04 15:14:52

010186

Comment:

Mode: CONC Corr. Factor: 1

Elem	Ag3280	Al3082	As1990	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	.9813	9.668	4.894	4.745	9.925	.9651	4.957
SD	.0001	.003	.003	.000	.001	.0001	.004
%RSD	.0120	.0321	.0581	.0048	.0087	.0129	.0766
#1	.9814	9.670	4.892	4.744	9.924	.9650	4.960
#2	.9812	9.666	4.896	4.745	9.925	.9651	4.955
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
Avg	19.86	.9823	4.898	1.931	2.013	10.04	18.38
SD	.02	.0021	.003	.002	.003	.02	.05
%RSD	.0819	.2107	.0571	.1275	.1634	.1874	.2892
#1	19.85	.9809	4.896	1.929	2.011	10.03	18.34
#2	19.87	.9838	4.900	1.933	2.015	10.05	18.42
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
Avg	4.925	L4.457	19.73	.9989	4.920	L26.92	L18.91
SD	.001	.006	.01	.0005	.020	.05	.02
%RSD	.0302	.1251	.0727	.0521	.4008	.1984	.1274
#1	4.924	L4.461	19.72	.9986	4.906	L26.89	L18.90
#2	4.926	L4.453	19.74	.9993	4.934	L26.96	L18.93
Errors	LC Pass	LC Low	LC Pass	LC Pass	LC Pass	LC Low	LC Low
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
Avg	4.759	4.873	4.927	4.893	1.024	.9855	.9846
SD	.001	.067	.015	.003	.003	.0041	.0009
%RSD	.0116	1.384	.3083	.0620	.3361	.4152	.0953
#1	4.759	4.921	4.937	4.891	1.022	.9884	.9852
#2	4.758	4.825	4.916	4.895	1.026	.9826	.9839
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

010187

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avg	100.7	5.178	5.119	4.926	4.904	5.139	4.887
SD	.1	.005	.007	.001	.003	.003	.002
XRSD	.0958	.0997	.1321	.0168	.0620	.0542	.0414
#1	100.8	5.182	5.114	4.926	4.906	5.137	4.889
#2	100.6	5.174	5.124	4.925	4.902	5.140	4.886
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	Ti1908	U_4090	V_2924	W_2079
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avg	5.065	.9635	4.850	5.125	.9755	4.871	.9762
SD	.000	.0034	.003	.068	.0142	.002	.0040
XRSD	.0097	.3581	.0697	1.321	1.454	.0454	.4073
#1	5.065	.9610	4.847	5.077	.9654	4.869	.9734
#2	5.066	.9659	4.852	5.173	.9855	4.872	.9790
Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC Pass	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				
Avg	4.945	.9879	4.779				
SD	.004	.0007	.024				
XRSD	.0870	.0673	.5104				
#1	4.948	.9874	4.761				
#2	4.942	.9883	4.796				
Errors	LC Pass	LC Pass	LC Pass				
High	5.500	1.100	5.500				
Low	4.500	.9000	4.500				

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IntStd	1	2	3	4	5	6	7
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	---	---	---	---	---	---
Wavlen	361.384	---	---	---	---	---	---
Avge	649448	10000	---	---	---	---	---
SDev	596.0910	.00000000	---	---	---	---	---
%RSD	.0917842	.00000000	---	---	---	---	---
#1	649870	10000	---	---	---	---	---
#2	649027	10000	---	---	---	---	---

Method: DAILY2 Sample Name: ccb4
 Run Time: 06/15/04 15:21:28
 Comment:
 Mode: CONC Corr. Factor: 1

Operator: **010189**

Elem	Ag3280	Al3082	As1890	B_2496	Ba4934	Be3130	Bi2230
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0001	-.0224	.0011	.0037	.0003	.0004	-.0018
SDcv	.0008	.0058	.0000	.0020	.0003	.0001	.0023
%RSD	580.3	25.76	1.248	53.14	90.21	13.33	127.8

#1	.0004	-.0183	.0011	.0051	.0001	.0004	-.0002
#2	-.0007	-.0265	.0011	.0023	.0005	.0004	-.0035

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
Avgc	.0016	.0004	-.0001	-.0014	.0004	-.0052	-.0038
SDcv	.0005	.0001	.0002	.0000	.0004	.0043	.0047
%RSD	28.84	36.56	145.2	1.174	86.36	82.11	125.9

#1	.0013	.0005	.0000	-.0014	.0002	-.0082	-.0004
#2	.0020	.0003	-.0003	-.0014	.0007	-.0022	-.0071

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	Nb5889
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0003	.0002	-.0046	-.0000	H.0062	H.0550	.0087
SDcv	.0003	.0001	.0050	.0001	.0016	.0180	.0010
%RSD	121.2	30.34	109.2	3669.	25.83	32.68	11.76

#1	-.0000	.0002	-.0011	-.0001	H.0073	H.0677	.0094
#2	-.0005	.0003	-.0082	.0001	H.0050	.0423	.0080

Errors	LC Pass	LC Pass	LC Pass	LC Pass	LC High	LC High	LC Pass
High	.0050	.0050	.0500	.0050	.0050	.0500	.0500
Low	-.0050	-.0050	-.0500	-.0050	-.0050	-.0500	-.0500

Elem	Ni2316	P_1782	2203/1	2203/2	Pd3404	S_1820	Sb2068
Units	ppm	ppm	ppm	ppm	ppm	ppm	ppm
Avgc	-.0005	.0027	-.0003	-.0004	-.0006	L-.0155	.0003
SDcv	.0001	.0214	.0011	.0007	.0028	.0009	.0024
%RSD	28.15	799.2	416.5	188.7	506.9	5.980	899.1

#1	-.0006	L-.0125	-.0011	.0001	.0014	L-.0149	-.0014
#2	-.0004	H.0178	.0005	-.0009	-.0026	L-.0162	.0020

Errors	LC Pass	LC Pass	NOCHECK	NOCHECK	LC Pass	LC Low	LC Pass
High	.0050	.0100			.0050	.0100	.0100
Low	-.0050	-.0100			-.0050	-.0100	-.0100

Elem	Se3613	1960/1	1960/2	Si2881	Pb220	Se196	Sn1899
------	--------	--------	--------	--------	-------	-------	--------

010190

Units	%R	ppm	ppm	ppm	ppm	ppm	ppm
Avg	101.8	.0035	-.0008	.0059	-.0003	.0006	-.0015
SD	.4	.0030	.0035	.0014	.0001	.0013	.0018
XRSD	.4256	86.48	427.2	22.92	31.41	213.4	120.9
#1	101.5	.0014	.0017	.0068	-.0003	.0016	-.0002
#2	102.1	.0056	-.0033	.0049	-.0004	-.0003	-.0028
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
Avg	.0001	-.0014	-.0000	.0081	.0023	-.0003	.0009
SD	.0001	.0005	.0000	.0000	.0118	.0002	.0002
XRSD	104.5	31.37	129.7	.5143	519.5	63.24	25.59
#1	.0000	-.0011	-.0000	.0080	.0106	-.0004	.0011
#2	.0002	-.0018	-.0000	.0081	-.0060	-.0001	.0008
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				
Avg	.0001	-.0011	.0018				
SD	.0001	.0001	.0003				
XRSD	161.0	6.482	15.04				
#1	-.0000	-.0011	.0020				
#2	.0002	-.0010	.0016				
Errors	LC Pass	LC Pass	LC Pass				
High	.0050	.0050	.0050				
Low	-.0050	-.0050	-.0050				

IntStd	1	2	3	4	5	6	010191
Mode	*Counts	Time	NOTUSED	NOTUSED	NOTUSED	NOTUSED	NOTUSED
Elem	Sc	--	--	--	--	--	--
Wavlen	361.384	--	--	--	--	--	--
Avge	656498	10000	--	--	--	--	--
SDev	2836.912	.00000000	--	--	--	--	--
%RSD	.4321281	.00000000	--	--	--	--	--
#1	654492	10000	--	--	--	--	--
#2	658504	10000	--	--	--	--	--

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Richard D. Hinchey
5/25/04

Analyst: RSS
Method: EPA 300

DSS



103-104

010192

	System ID	Analyte	Conc mg/L	RESULT mg/L	Qual	DL	TV	% Rec or RPD	DF
04/25/04	243233	Fluoride	0.162	0.162		0.1			1
04/25/04	243233	Chloride	1.052	1.05		0.1			1
04/25/04	243233	Nitrite-N	0.000	0.1	U	0.1			1
04/25/04	243233	Bromide	0.000	0.1	U	0.1			1
04/25/04	243233	Nitrate-N	0.082	0.1	U	0.1			1
04/25/04	243233	Phosphate-P	0.014	0.1	U	0.1			1
04/25/04	243233	Sulfate	132.874	133		2			20
04/25/04	243233D	Fluoride	0.165	0.165		0.1		1.83%	1
04/25/04	243233D	Chloride	1.003	1.00		0.1		4.77%	1
04/25/04	243233D	Nitrite-N	0.000	0.1	U	0.1		0.00%	1
04/25/04	243233D	Bromide	0.000	0.1	U	0.1		0.00%	1
04/25/04	243233D	Nitrate-N	0.081	0.1	U	0.1		0.00%	1
04/25/04	243233D	Phosphate-P	0.015	0.1	U	0.1		0.00%	1
04/25/04	243233D	Sulfate	131.925	132		2		0.72%	20
04/25/04	243233S	Fluoride	1.029	1.03		0.1	1	86.7%	1
04/25/04	243233S	Chloride	2.846	2.85		0.1	2	89.7%	1
04/25/04	243233S	Nitrite-N	0.893	0.893		0.1	1	89.3%	1
04/25/04	243233S	Bromide	3.955	3.96		0.1	4	98.9%	1
04/25/04	243233S	Nitrate-N	0.843	0.843		0.1	0.904	93.3%	1
04/25/04	243233S	Phosphate-P	1.632	1.63		0.1	1.91	85.4%	1
04/25/04	243233S	Sulfate	211.071	211		2	80	97.7%	20
04/25/04	243234	Fluoride	0.086	0.1	U	0.1			1
04/25/04	243234	Chloride	1.034	1.03		0.1			1
04/25/04	243234	Nitrite-N	0.000	0.1	U	0.1			1
04/25/04	243234	Bromide	0.000	0.1	U	0.1			1
04/25/04	243234	Nitrate-N	0.019	0.1	U	0.1			1
04/25/04	243234	Phosphate-P	0.000	0.1	U	0.1			1
04/25/04	243234	Sulfate	0.468	0.468		0.1			1
04/25/04	243235	Fluoride	0.061	0.1	U	0.1			1
04/25/04	243235	Chloride	0.258	0.258		0.1			1
04/25/04	243235	Nitrite-N	0.000	0.1	U	0.1			1
04/25/04	243235	Bromide	0.000	0.1	U	0.1			1
04/25/04	243235	Nitrate-N	0.018	0.1	U	0.1			1
04/25/04	243235	Phosphate-P	0.000	0.1	U	0.1			1
04/25/04	243235	Sulfate	0.588	0.588		0.1			1
04/25/04	243236	Fluoride	0.320	0.320		0.1			1
04/25/04	243236	Chloride	4.129	4.13		0.1			1
04/25/04	243236	Nitrite-N	0.018	0.1	U	0.1			1
04/25/04	243236	Bromide	0.000	0.1	U	0.1			1
04/25/04	243236	Nitrate-N	0.114	0.114		0.1			1
04/25/04	243236	Phosphate-P	0.033	0.1	U	0.1			1
04/25/04	243236	Sulfate	2.075	2.08		0.1			1
04/25/04	243237	Fluoride	0.399	0.399		0.1			1
04/25/04	243237	Chloride	8.877	8.88		0.1			1
04/25/04	243237	Nitrite-N	0.013	0.1	U	0.1			1
04/25/04	243237	Bromide	0.000	0.1	U	0.1			1
04/25/04	243237	Nitrate-N	0.124	0.124		0.1			1
04/25/04	243237	Phosphate-P	0.222	0.222		0.1			1
04/25/04	243237	Sulfate	2.855	2.86		0.1			1
04/25/04	243238	Fluoride	1.063	1.06		0.1			1
04/25/04	243238	Chloride	6.839	6.84		0.1			1
04/25/04	243238	Nitrite-N	0.011	0.1	U	0.1			1

04/25/04	243238	Bromide	0.033	0.1	U	0.1			1
04/25/04	243238	Nitrate-N	1.549	1.55		0.1			1
04/25/04	243238	Phosphate-P	0.015	0.1	U	0.1		010193	1
04/25/04	243238	Sulfate	25.101	25.1		2			20
04/25/04	243239	Fluoride	3.985	3.99		0.1			1
04/25/04	243239	Chloride	7.961	7.96		0.1			1
04/25/04	243239	Nitrite-N	0.000	0.1	U	0.1			1
04/25/04	243239	Bromide	0.043	0.1	U	0.1			1
04/25/04	243239	Nitrate-N	0.000	0.1	U	0.1			1
04/25/04	243239	Phosphate-P	0.000	0.1	U	0.1			1
04/25/04	243239	Sulfate	26.543	26.5		2			20
04/25/04	243240	Fluoride	2.113	2.11		0.1			1
04/25/04	243240	Chloride	6.736	6.74		0.1			1
04/25/04	243240	Nitrite-N	0.017	0.1	U	0.1			1
04/25/04	243240	Bromide	0.040	0.1	U	0.1			1
04/25/04	243240	Nitrate-N	1.568	1.57		0.1			1
04/25/04	243240	Phosphate-P	0.017	0.1	U	0.1			1
04/25/04	243240	Sulfate	20.971	21.0		2			20
04/25/04	243241	Fluoride	1.850	1.85		0.1			1
04/25/04	243241	Chloride	6.497	6.50		0.1			1
04/25/04	243241	Nitrite-N	0.000	0.1	U	0.1			1
04/25/04	243241	Bromide	0.037	0.1	U	0.1			1
04/25/04	243241	Nitrate-N	1.098	1.10		0.1			1
04/25/04	243241	Phosphate-P	0.000	0.1	U	0.1			1
04/25/04	243241	Sulfate	23.583	23.6		2			20
04/25/04	243242	Fluoride	1.260	1.26		0.1			1
04/25/04	243242	Chloride	6.848	6.85		0.1			1
04/25/04	243242	Nitrite-N	0.023	0.1	U	0.1			1
04/25/04	243242	Bromide	0.035	0.1	U	0.1			1
04/25/04	243242	Nitrate-N	0.161	0.161		0.1			1
04/25/04	243242	Phosphate-P	0.000	0.1	U	0.1			1
04/25/04	243242	Sulfate	20.707	20.7		2			20
04/25/04	243243	Fluoride	0.000	0.1	U	0.1			1
04/25/04	243243	Chloride	0.008	0.1	U	0.1			1
04/25/04	243243	Nitrite-N	0.000	0.1	U	0.1			1
04/25/04	243243	Bromide	0.000	0.1	U	0.1			1
04/25/04	243243	Nitrate-N	0.380	0.380		0.1			1
04/25/04	243243	Phosphate-P	0.000	0.1	U	0.1			1
04/25/04	243243	Sulfate	0.043	0.1	U	0.1			1

U = UNDETECTED

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Analyst: RSS
Method: EPA 300

010194

	System ID	Analyte	Conc mg/L	RESULT mg/L	Qual	DL	TV	% Rec or RPD
04/25/04	ICV	Fluoride	101.380	101		0.1	100	101%
04/25/04	ICV	Chloride	205.282	205		0.1	200	103%
04/25/04	ICV	Nitrite-N	99.008	99.0		0.1	101	98.0%
04/25/04	ICV	Bromide	412.332	412		0.1	400	103%
04/25/04	ICV	Nitrate-N	87.245	87.2		0.1	90.4	96.5%
04/25/04	ICV	Phosphate-P	196.451	196		0.1	191.0	103%
04/25/04	ICV	Sulfate	411.068	411		0.1	400	103%
04/25/04	ICB	Fluoride	0.000	0.1	U	0.1		
04/25/04	ICB	Chloride	0.004	0.1	U	0.1		
04/25/04	ICB	Nitrite-N	0.000	0.1	U	0.1		
04/25/04	ICB	Bromide	0.000	0.1	U	0.1		
04/25/04	ICB	Nitrate-N	0.000	0.1	U	0.1		
04/25/04	ICB	Phosphate-P	0.000	0.1	U	0.1		
04/25/04	ICB	Sulfate	0.000	0.1	U	0.1		

U = UNDETECTED

Work continued from Page

SwRI®

147-01-1C4 20ppm Anions Mux 010195

Anion	Std Vol. mL	Conc. mg/L	Inorg #	Spec Lot #	exp. date
Fluoride	0.2 mL	1000 mg/L	4388	25-5AS	1/15/05
Chloride			4387	7-147VY	1/15/05
Nitrite-N			4480	7-158VY	3/15/05
Bromide			4106	23-52AS	5/30/04
Nitrate-N			4389	25-85AS	1/15/05
Phosphate-P			4390	7-145VY	1/15/05
Sulfate			4180	7-149VY	5/30/04

15 Diluted to 10ml DI H₂O.147-02-1C4 5ppm Anions
3ml 147-01-1C4 + 1 ml DI H₂O20 147-03-1C4 10ppm Anions
2ml 147-01-1C4 + 2ml DI H₂O147-04-1C4 5ppm Anions
2ml 147-03-1C4 + 2ml DI H₂O25 147-05-1C4 1ppm Anions
4ml DI H₂O + 1 ml 147-04-1C430 147-06-1C4 0.5ppm Anions
2ml 147-05-1C4 + 2ml DI H₂O147-07-1C4 0.1ppm Anions
4.0 ml 147-06-1C4 + 1 ml 147-06-1C4
DI H₂O35 147-08-1C4 0 ppm
DI H₂O.

Work continued to Page

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SIGNATURE

DATE

4/20/04

DISCLOSED TO AND UNDERSTOOD BY

DATE

7/1/04

WITNESS

DATE

Work continued from Page

SwRI®

010196

5 146-01-CH Nitrite-N, 101 mg/L
5 ml of Nitrite- (Spex 23-2348, 1000 mg/L NO₂)
(Inorg# 4107)
+ 10 ml DI H₂O.

10

15

20

25

30

35

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SIGNATURE

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Work continued to Page

DATE

DATE

WITNESS

DATE

Southwest Research Institute
Dionex DX500 Ion Chromatography Daily Log

010197

Analyst: RSmurDate: 4/20/04Conductivity: 18.1

Client	Project #	TO #	Analytical Method
NFT	06232.31.006	040326-3	300

Loop: 40ulMethod: Anions 040310Column: AS14#01502087Calibration: 3/10/04

Comments: _____

ICV/CCV/MS:

1st Source SPEX (inorg#4518)2nd Source Nitrate NLot #: 25-145ASLot #: 146-01HCHCCV Conc: 1:20CCV Conc: 1:20MS Conc: 1:100MS Conc: 1:100

✓ ELUENT SOLUTION PREP:

mM Sodium Bicarbonate

&

3.5

FV = 2.0L DI H2O

mM Sodium Carbonate

Weight: 0.168g NaHCO₃Weight: 0.7419g Na₂CO₃Source: AldrichSource: Alfa AesarLot: 15308 EILot: 106m.34Balance # 34

Other Eluent: _____

50

mA-Autoregen (ASRS)

Other Regen: _____

✓ 7/16/04

Southwest Research Institute
Dionex DX500 Ion Chromatography Daily Log

010198

Analyst: RSprerDate: 4/20/04Conductivity: 18.0

Client	Project #	TO #	Analytical Method
Curve	—	—	300
PES	—	—	9056

Loop: 40ul Method: Anions 040420
 Column: AS14# Calibration: 4/20/04
 Comments: _____

ICV/CCV/MS:

1st Source SPEX (#4518)2nd Source Nitrite NLot #: 25-145ASLot #: 146-01-1C4CCV Conc: 1:20CCV Conc: 1:20MS Conc: 1:100MS Conc: 1:100

see pg.

11143 ELUENT SOLUTION PREP:

FV = 2.0L DI H2O

_____ mM Sodium Bicarbonate

&

_____ mM Sodium Carbonate

Weight: _____

NaHCO₃

Weight: _____

Na₂CO₃

Source: _____

Source: _____

Lot: _____

Lot: _____

Other Eluent: _____

50

mA-Autoregen (ASRS)

Other Regen: _____

Eppendorfs: 5000J
1000H
200J

Hyf 7/6/04

Book/Page: 11 149

Southwest Research Institute
Dionex DX500 Ion Chromatography Daily Log

010199

Analyst: R SpierDate: 4/25/04Conductivity: 17.9

Client	Project #	TO #	Analytical Method
DIV 20	06002.D1.141	040415-2	300.

Loop: 40 ul Method: An ions 040420
Column: AS14 # 015-02-087 Calibration: 4/20/04
Comments: _____

ICV/CCV/MS:

1st Source Spex (#4518) 2nd Source Nitrate N
Lot #: 25-145AS Lot #: 146-01-1C4
CCV Conc: 1:20 CCV Conc: 1:20
MS Conc: 1:100 MS Conc: 1:100

✓ ELUENT SOLUTION PREP: FV = 2.0L DI H2O
1.0 mM Sodium Bicarbonate Inorg #2626 & 3.5 mM Sodium Carbonate Inorg #4033
Weight: 0.168g NaHCO₃ Weight: 0.7419g Na₂CO₃
Source: Aldrich Source: Alfa Aesar
Lot: 15308EI Lot: LO6M34

Other Eluent: _____

50 mA-Autoregen (ASRS)

Other Regen: _____

Balance #14

✓ 4/25/04Eppendorf's 5000 J
1000 H
200 J

Line	Sample	Sample Type	Level	Method	Data File	Dilution
1	ICV	Sample		anions040420.met	040425_001.dxd	20
2	ICB	Sample		anions040420.met	040425_002.dxd	1
3	243233	Sample		anions040420.met	040425_003.dxd	1
4	243233D	Sample		anions040420.met	040425_004.dxd	1 010200
5	243233S	Sample		anions040420.met	040425_005.dxd	1
6	243234	Sample		anions040420.met	040425_006.dxd	1
7	243235	Sample		anions040420.met	040425_007.dxd	1
8	243236	Sample		anions040420.met	040425_008.dxd	1
9	243237	Sample		anions040420.met	040425_009.dxd	1
10	243238	Sample		anions040420.met	040425_010.dxd	1
11	243239	Sample		anions040420.met	040425_011.dxd	1
12	243240	Sample		anions040420.met	040425_012.dxd	1
13	CCV	Sample		anions040420.met	040425_013.dxd	20
14	CCB	Sample		anions040420.met	040425_014.dxd	1
15	243241	Sample		anions040420.met	040425_015.dxd	1
16	243242	Sample		anions040420.met	040425_016.dxd	1
17	243243	Sample		anions040420.met	040425_017.dxd	1
18	243233	Sample		anions040420.met	040425_018.dxd	20
19	243233D	Sample		anions040420.met	040425_019.dxd	20
20	243233S	Sample		anions040420.met	040425_020.dxd	20
21	243234	Sample		anions040420.met	040425_021.dxd	20
22	243235	Sample		anions040420.met	040425_022.dxd	20
23	243236	Sample		anions040420.met	040425_023.dxd	20
24	243237	Sample		anions040420.met	040425_024.dxd	20
25	CCV	Sample		anions040420.met	040425_025.dxd	20
26	CCB	Sample		anions040420.met	040425_026.dxd	1
27	243238	Sample		anions040420.met	040425_027.dxd	20
28	243239	Sample		anions040420.met	040425_028.dxd	20
29	243240	Sample		anions040420.met	040425_029.dxd	20
30	243241	Sample		anions040420.met	040425_030.dxd	20
31	243242	Sample		anions040420.met	040425_031.dxd	20
32	243243	Sample		anions040420.met	040425_032.dxd	20
33	CCV	Sample		anions040420.met	040425_033.dxd	20
34	CCB	Sample		anions040420.met	040425_034.dxd	1
35	CCB	Sample		astop.met	040425	1

Default Method Path: C:\PEAKNET\METHOD

Default Data Path: c:\peaknet\data\040425

Comment:

DIV 20 TO # 040415-2 06002.01.141

ICV / CCV = SPEX 25-145AS (# 4518)

NO₂N = 146-01-1C4.

Sample Name : ICV
Dilution Factor : 20.00
Injection Number : 1
Data File Name : c:\peaknet\data\040425\040425_001.DXD
Method File Name : c:\peaknet\method\anions040420.met
Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 6:11:59 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010201

Peak Information : All Components

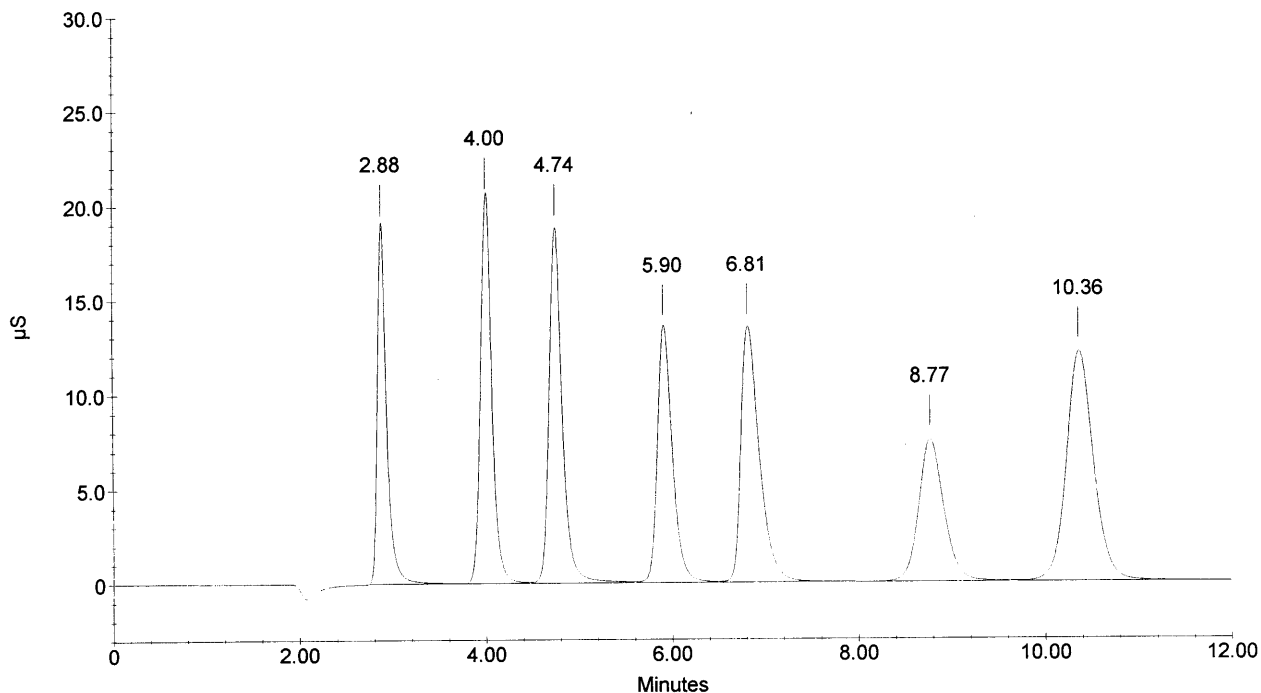
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.88	FLUORIDE	101.380	187915	1304165	2	-1.48
2	4.00	CHLORIDE	205.282	201730	1745029	2	-0.58
3	4.74	NITRITE-N	99.008	187527	1846515	2	-1.39
4	5.90	BROMIDE	412.332	134235	1524149	2	-0.62
5	6.81	NITRATE-N	87.245	134466	1870665	2	1.19
6	8.77	PHOSPHATE-P	196.451	75230	1415134	2	0.80
7	10.36	SULFATE	411.068	121219	2464002	2	-0.61

0.00

---total(s)---
1512.766

12169658

ICV



Sample Name : ICB
 Dilution Factor : 1.00
 Injection Number : 2
 Data File Name : c:\peaknet\data\040425\040425_002.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

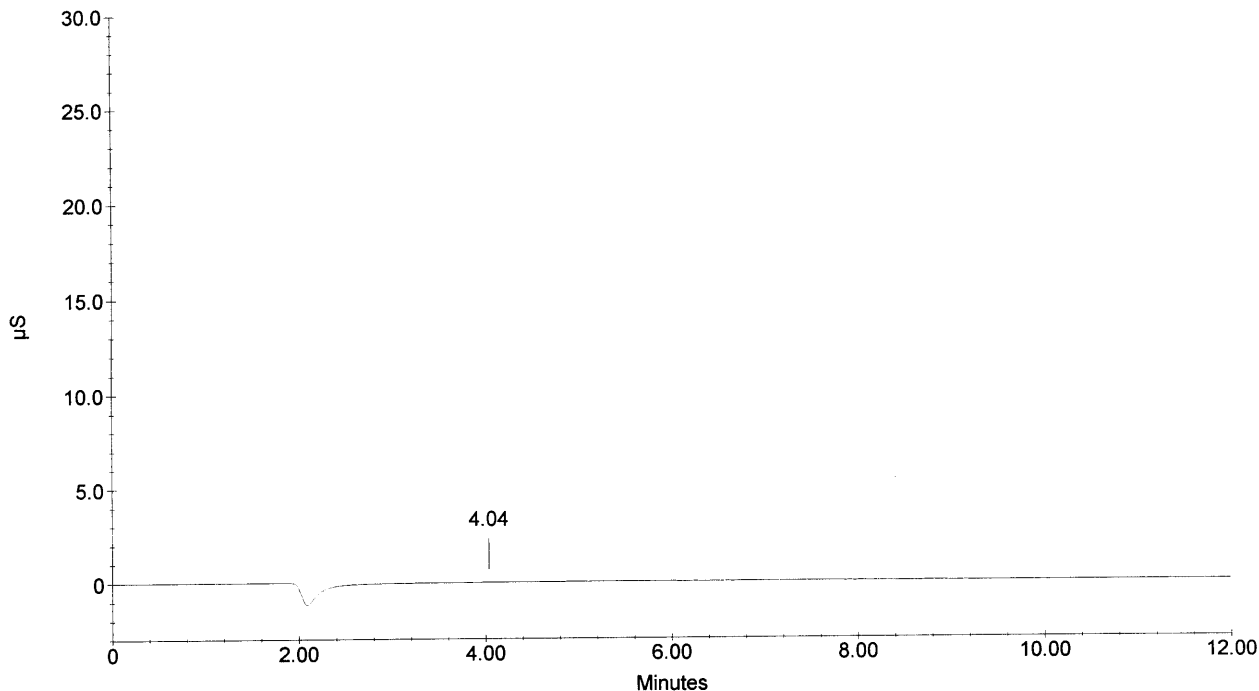
Date Time Collected : 4/25/04 6:26:43 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010202

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	4.04	CHLORIDE	0.004	89	614	1	0.41
1	4.04	CHLORIDE	0.004	89	614	1	0.41
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
			---total(s)---				
0.00			0.008		1227		

ICB



Sample Name : 243233
Dilution Factor : 1.00
Injection Number : 3
Data File Name : c:\peaknet\data\040425\040425_003.DXD
Method File Name : c:\peaknet\method\anions040420.met
Schedule File Name : c:\peaknet\schedule\25apr04.sch

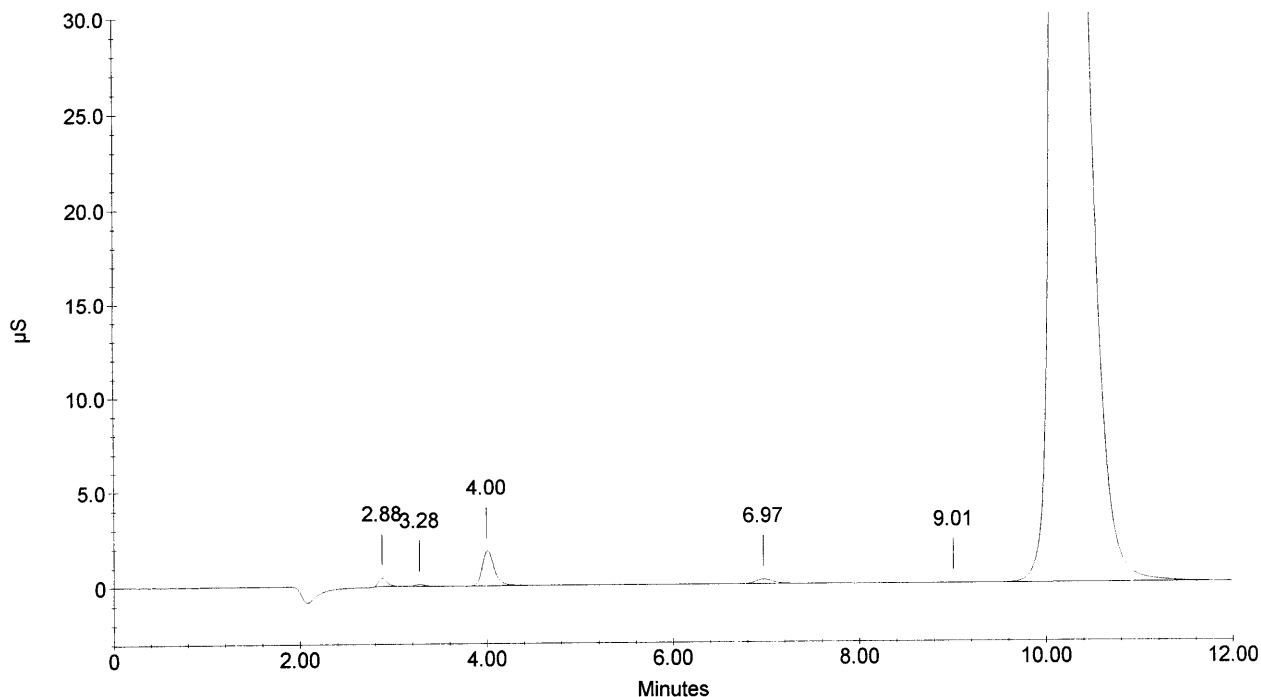
Date Time Collected : 4/25/04 6:41:24 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010203

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.88	FLUORIDE	0.162 ✓	4451	28555	1	-1.48
3	4.00	CHLORIDE	1.052 ✓	18156	167199	1	-0.58
		NITRITE-N ✓					
		BROMIDE ✓					
4	6.97	NITRATE-N	0.082 ✓	2449	34069	1	3.57
5	9.01	PHOSPHATE-P	0.014 ✓	117	1875	1	3.56
6	10.21	SULFATE	23.336	975429	20641835	1	-2.02
			---total(s)---				
0.00			24.646		20873533		

243233



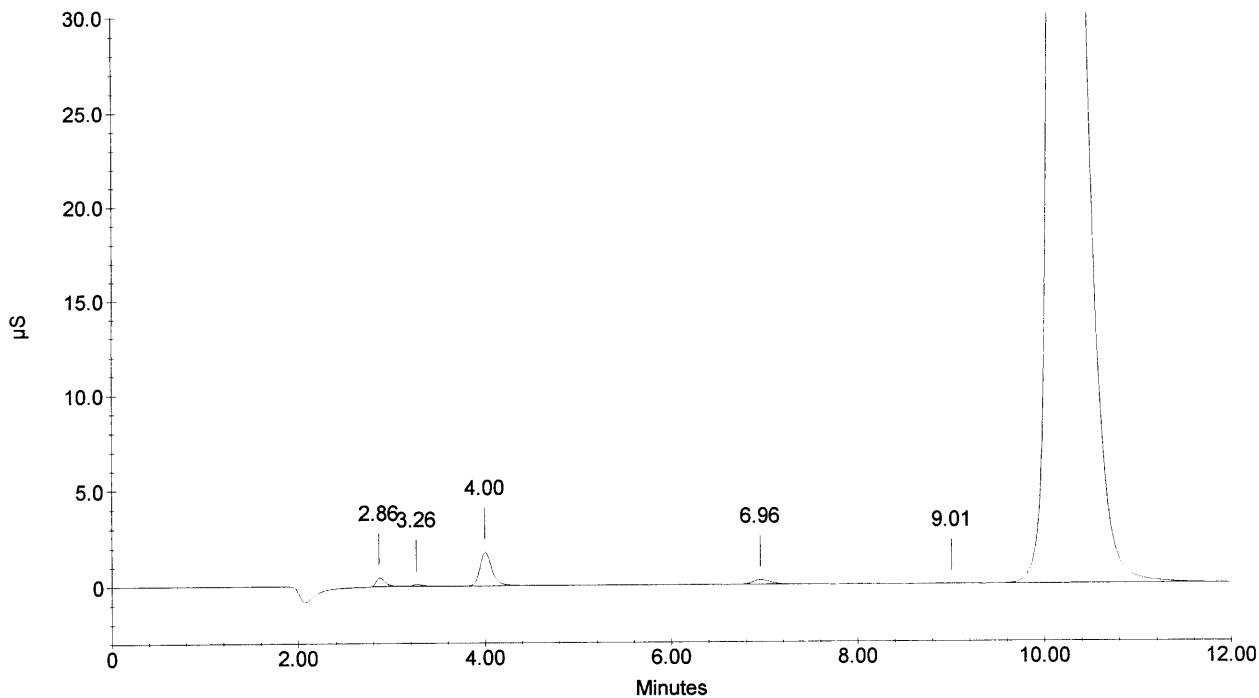
Sample Name : 243233D
Dilution Factor : 1.00
Injection Number : 4
Data File Name : c:\peaknet\data\040425\040425_004.DXD
Method File Name : c:\peaknet\method\anions040420.met
Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 6:56:05 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010204

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.86	FLUORIDE	0.165 ✓	4426	29416	1	-1.94
3	4.00	CHLORIDE	1.003 ✓	17509	159285	1	-0.58
		NITRITE-N ✓					
		BROMIDE ✓					
4	6.96	NITRATE-N	0.081 ✓	2422	33655	1	3.37
5	9.01	PHOSPHATE-P	0.015 ✓	126	2005	1	3.56
6	10.20	SULFATE	23.655	973671	20596598	1	-2.14
			---total(s)---				
0.00			24.919		20820959		

243233D



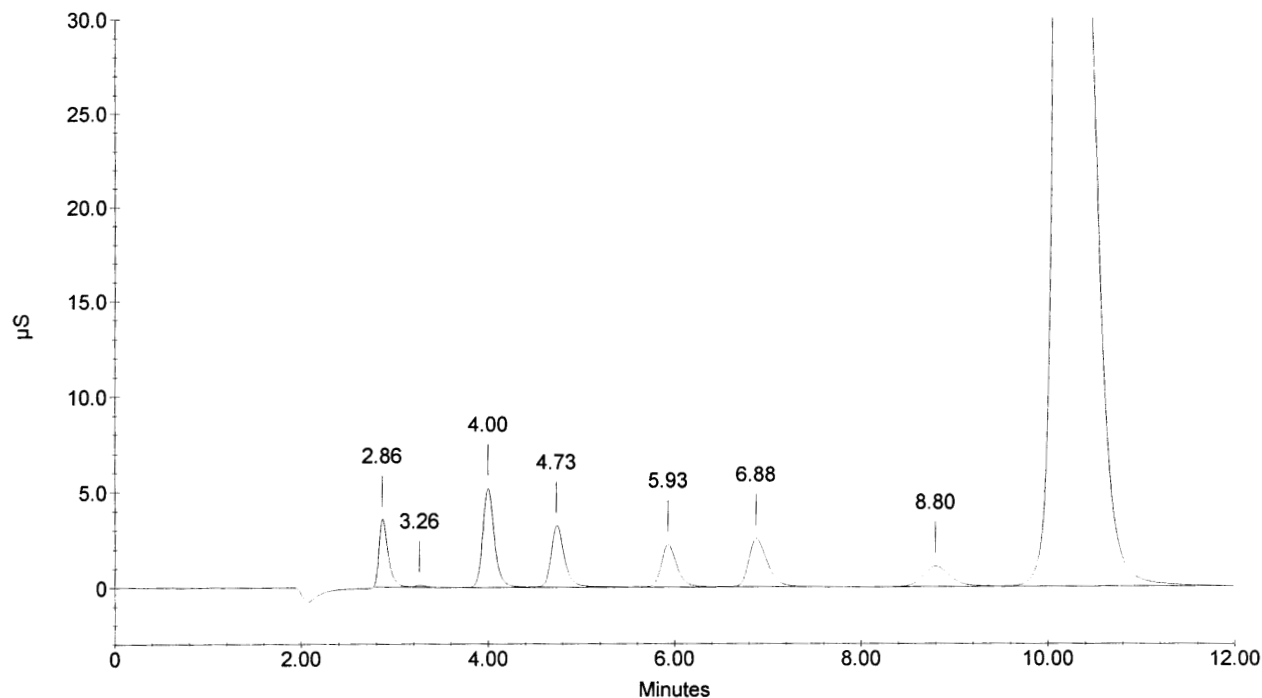
Sample Name : 243233S
 Dilution Factor : 1.00
 Injection Number : 5
 Data File Name : c:\peaknet\data\040425\040425_005.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 7:10:47 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010205

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.86	FLUORIDE	1.029✓	34971	241706	2	-1.94
3	4.00	CHLORIDE	2.846✓	51733	457726	2	-0.58
4	4.73	NITRITE-N	0.893✓	32103	330981	2	-1.66
5	5.93	BROMIDE	3.955✓	22275	261967	2	-0.17
6	6.88	NITRATE-N	0.843 ✓	25332	351749	2	2.18
7	8.80	PHOSPHATE-P	1.632 ✓	10860	220786	2	1.11
8	10.20	SULFATE	21.642	981725	20878769	2	-2.14
---total(s)---							
0.00				32.840	22743684		

243233S



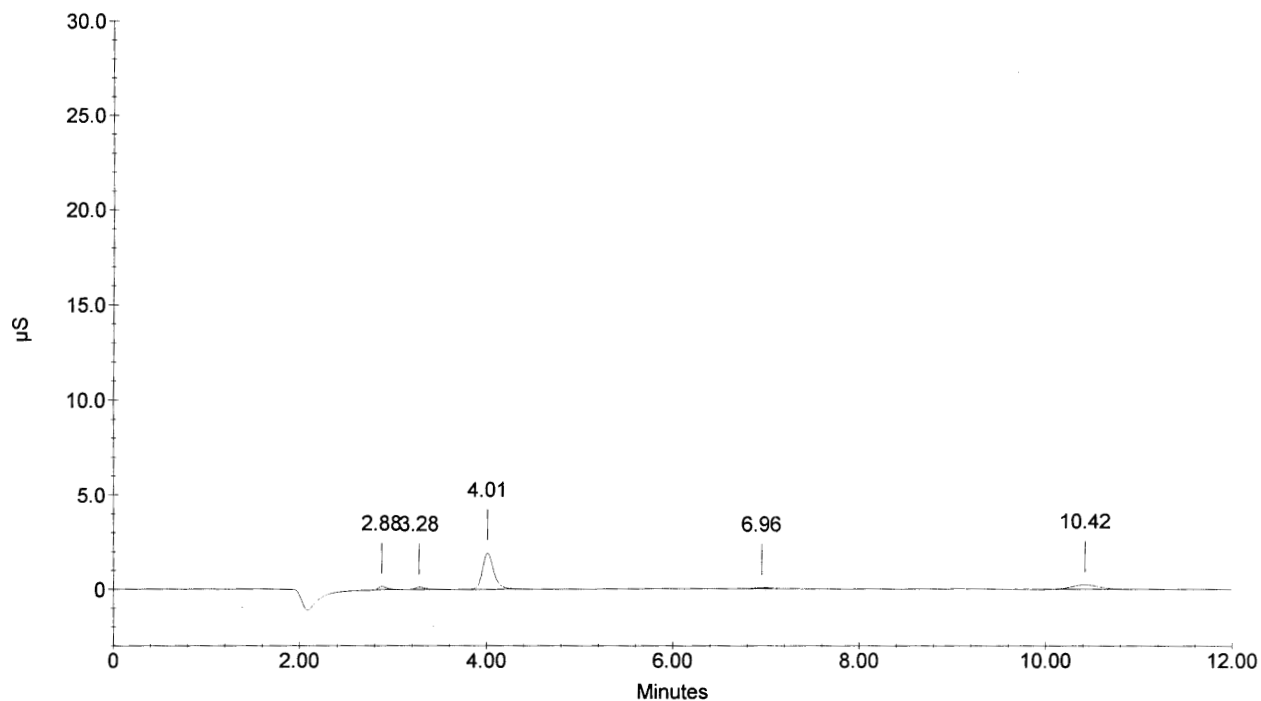
Sample Name : 243234
 Dilution Factor : 1.00
 Injection Number : 6
 Data File Name : c:\peaknet\data\040425\040425_006.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 7:25:28 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010206

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.88	FLUORIDE	0.086✓	1687	10193	1	-1.48
3	4.01	CHLORIDE	1.034✓	19261	164292	1	-0.25
		NITRITE-N✓					
		BROMIDE✓					
4	6.96	NITRATE-N✓	0.019✓	561	7707	1	3.37
		PHOSPHATE-P✓					
5	10.42	SULFATE	0.468✓	2436	50312	1	0.03
	0.00		---total(s)---				
			1.607		232504		

243234



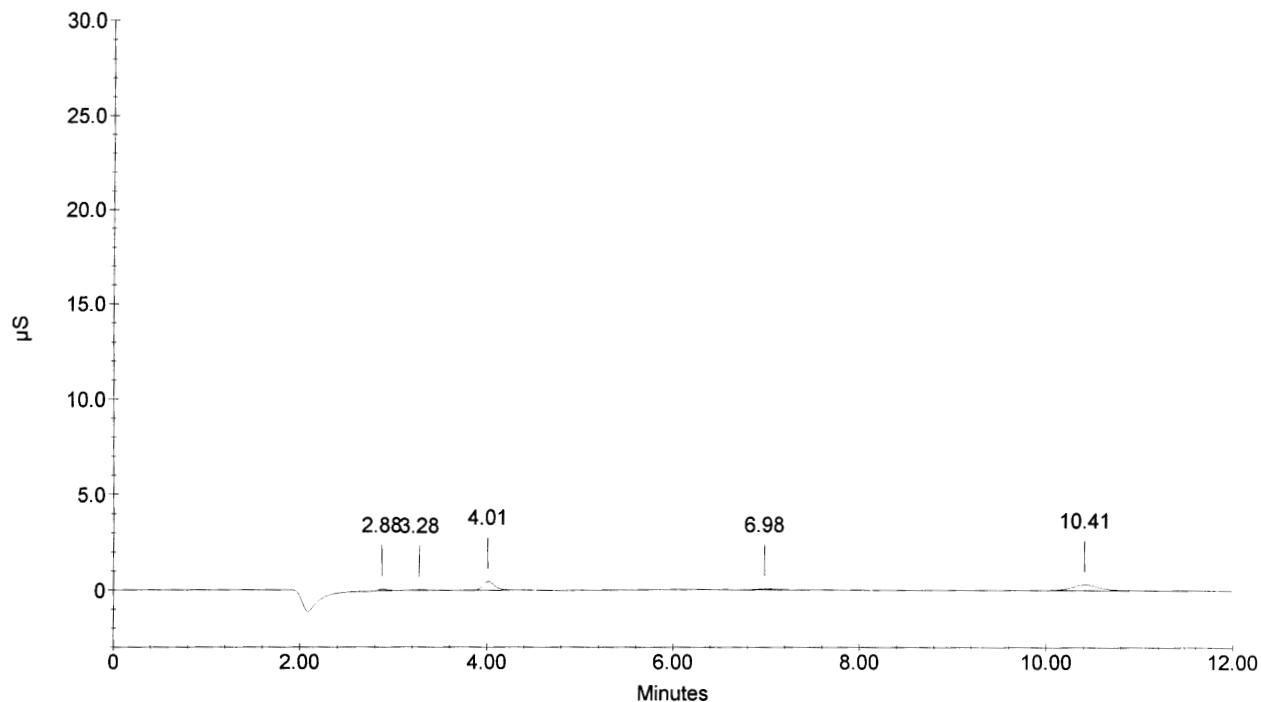
Sample Name : 243235
 Dilution Factor : 1.00
 Injection Number : 7
 Data File Name : c:\peaknet\data\040425\040425_007.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 7:40:09 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010207

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.88	FLUORIDE	0.061 ✓	778	4222	1	-1.48
3	4.01	CHLORIDE	0.258 ✓	4519	40696	1	-0.25
		NITRITE-N ✓					
		BROMIDE ✓					
4	6.98	NITRATE-N	0.018 ✓	552	7353	1	3.76
		PHOSPHATE-P ✓					
5	10.41	SULFATE	0.588 ✓	3004	63230	1	-0.10
---total(s)---							
	0.00		0.924		115501		

243235



Sample Name : 243236
 Dilution Factor : 1.00
 Injection Number : 8
 Data File Name : c:\peaknet\data\040425\040425_008.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 7:54:49 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010208

Peak Information : All Components

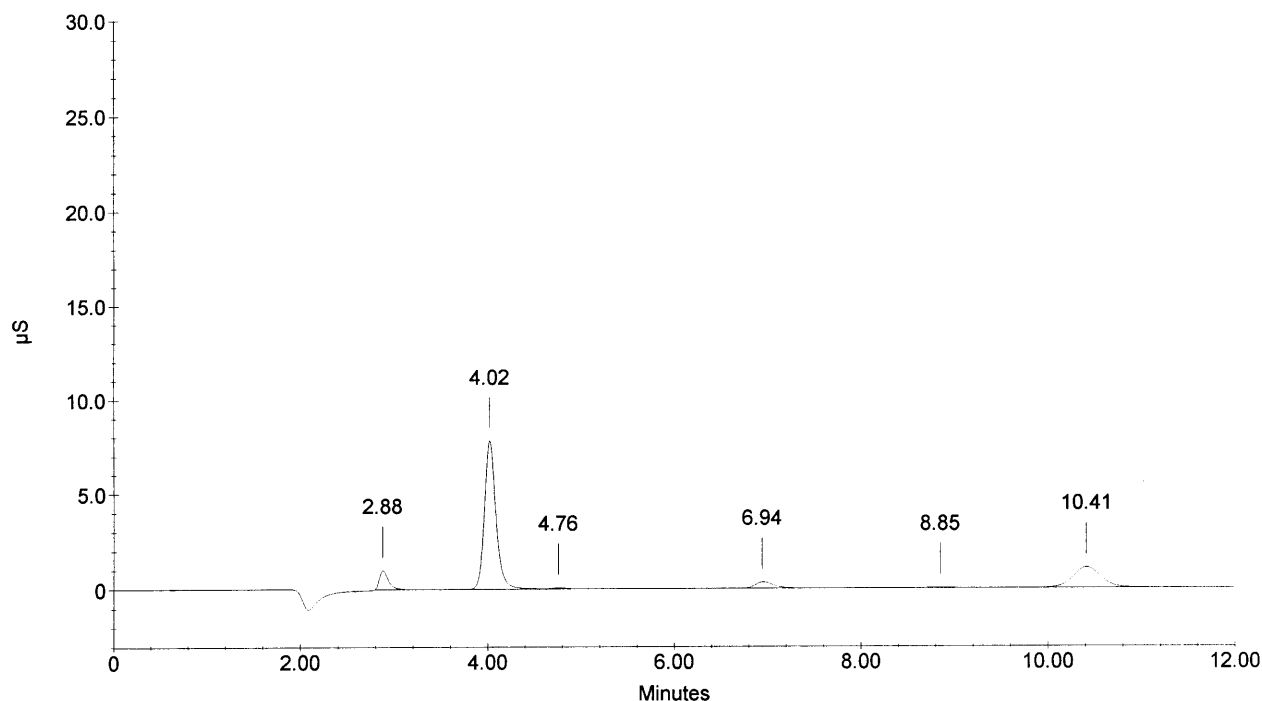
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.88	FLUORIDE	0.320 ✓	9948	67091	1	-1.48
2	4.02	CHLORIDE	4.129 ✓	78126	670010	2	0.08
3	4.76	NITRITE-N BROMIDE ✓	0.018 ✓	633	6812	2	-1.11
4	6.94	NITRATE-N	0.114 ✓	3348	47349	1	3.17
5	8.85	PHOSPHATE-P	0.033 ✓	249	4424	1	1.72
6	10.41	SULFATE	2.075 ✓	10760	224844	1	-0.10

0.00

---total(s)---
6.690

1020531

243236



Sample Name : 243237
 Dilution Factor : 1.00
 Injection Number : 9
 Data File Name : c:\peaknet\data\040425\040425_009.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 8:09:30 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010209

Peak Information : All Components

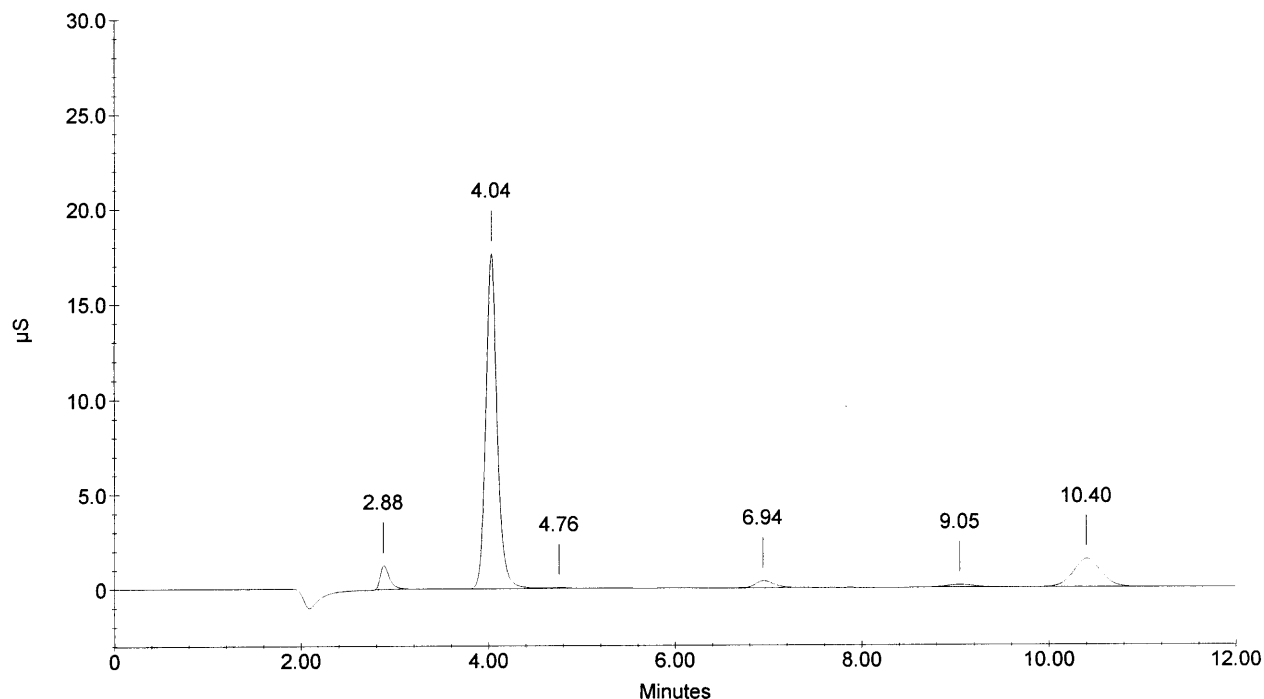
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.88	FLUORIDE	0.399 ✓	12389	86242	1	-1.48
2	4.04	CHLORIDE	8.877 ✓	175913	1492504	3	0.41
3	4.76	NITRITE-N BROMIDE ✓	0.013 ✓	470	4659	4	-1.11
4	6.94	NITRATE-N	0.124 ✓	3693	51591	1	3.17
5	9.05	PHOSPHATE-P	0.222 ✓	1402	29757	1	4.02
6	10.40	SULFATE	2.855 ✓	14969	310496	1	-0.22

0.00

---total(s)---
12.490

1975250

243237



Sample Name : 243238

Dilution Factor : 1.00

Injection Number : 10

Data File Name : c:\peaknet\data\040425\040425_010.DXD

Method File Name : c:\peaknet\method\anions040420.met

Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 8:24:11 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-#015724 AG14-#1018096

System Operator : RSS

010210

Peak Information : All Components

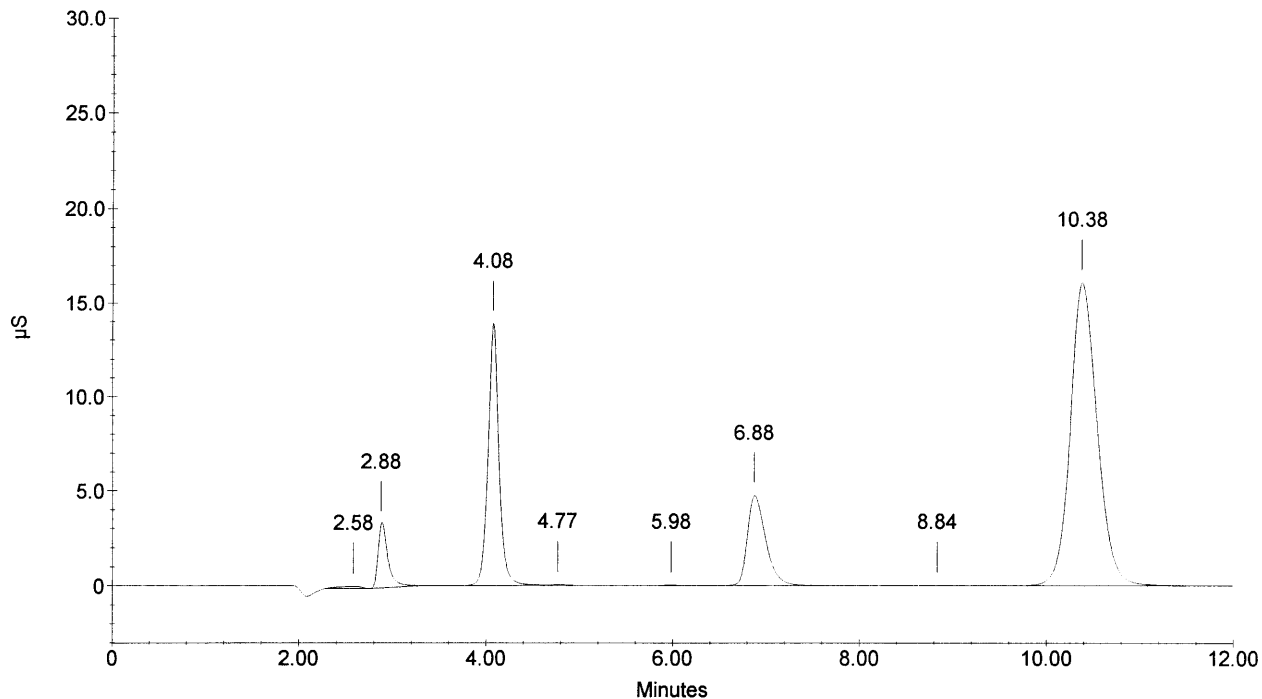
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
2	2.88	FLUORIDE	1.063✓	33277	250160	1	-1.48
3	4.08	CHLORIDE	6.839✓	138905	1131843	3	1.41
4	4.77	NITRITE-N	0.011✓	394	3977	4	-0.83
5	5.98	BROMIDE	0.033✓	210	2138	1	0.73
6	6.88	NITRATE-N	1.549 ✓	47201	649941	1	2.18
7	8.84	PHOSPHATE-P	0.015 ✓	114	1975	1	1.57
8	10.38	SULFATE	25.806	160689	3207087	1	-0.35

0.00

---total(s)---
35.316

5247121

243238



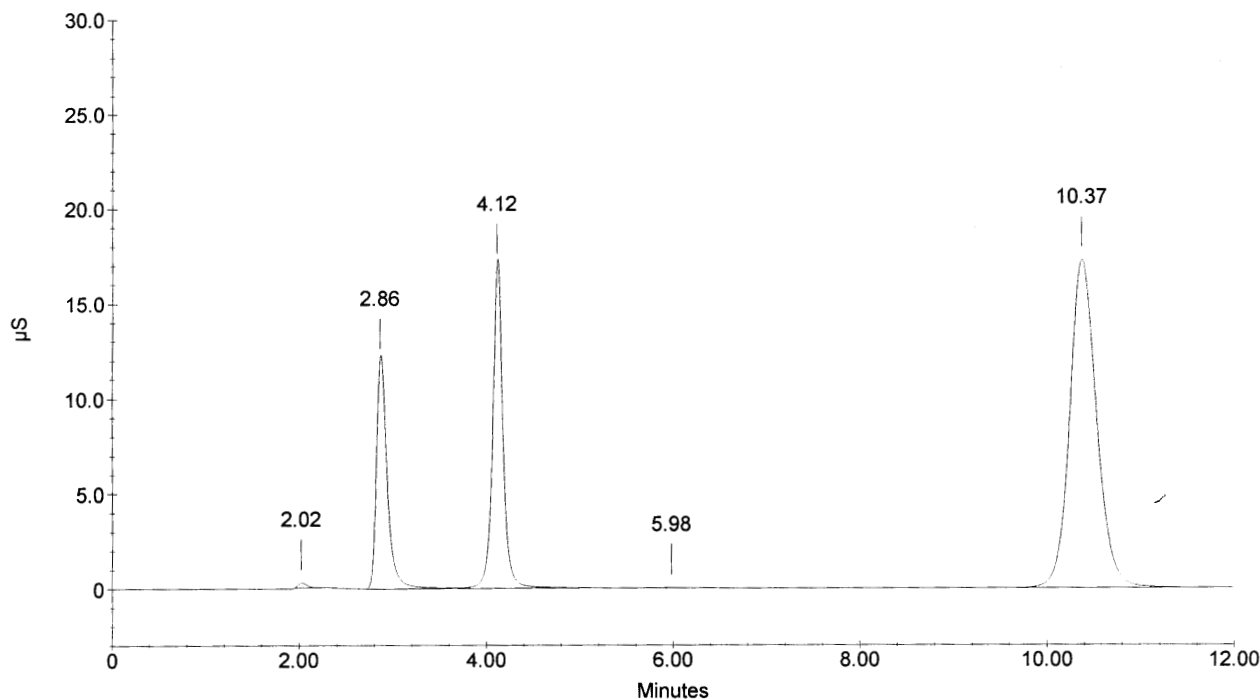
Sample Name : 243239
 Dilution Factor : 1.00
 Injection Number : 11
 Data File Name : c:\peaknet\data\040425\040425_011.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 8:38:53 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010211

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
2	2.86	FLUORIDE	3.895✓	119041	984002	2	-1.94
3	4.12	CHLORIDE	7.961✓	168672	1328948	2	2.40
4	5.98	NITRITE-N ✓	0.043✓	245	2789	1	0.73
		NITRATE-N ✓					
		PHOSPHATE-P ✓					
5	10.37	SULFATE	27.411	172222	3447295	1	-0.48
---total(s)---							
0.00		39.310		5763034			

243239



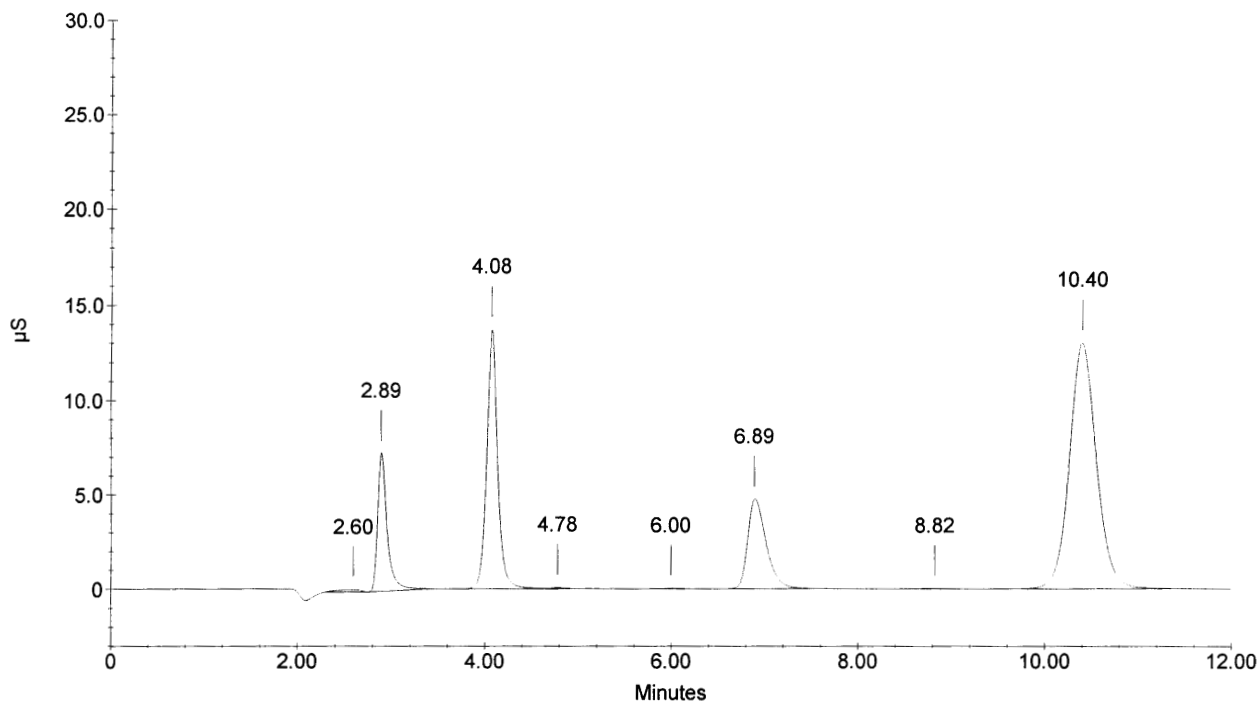
Sample Name : 243240
 Dilution Factor : 1.00
 Injection Number : 12
 Data File Name : c:\peaknet\data\040425\040425_012.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 8:53:34 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010212

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
2	2.89	FLUORIDE	2.113 ✓	72914	515740	1	-1.03
3	4.08	CHLORIDE	6.736 ✓	136581	1113894	3	1.41
4	4.78	NITRITE-N	0.017 ✓	590	6197	4	-0.55
5	6.00	BROMIDE	0.040 ✓	247	2579	1	0.95
6	6.89	NITRATE-N	1.568 ✓	47243	657909	1	2.38
7	8.82	PHOSPHATE-P	0.017 ✓	105	2308	1	1.42
8	10.40	SULFATE	21.591	129810	2605975	1	-0.22
---total(s)---				32.081	4904600		

243240



Sample Name : CCV
Dilution Factor : 20.00
Injection Number : 13
Data File Name : c:\peaknet\data\040425\040425_013.DXD
Method File Name : c:\peaknet\method\anions040420.met
Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 9:08:15 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

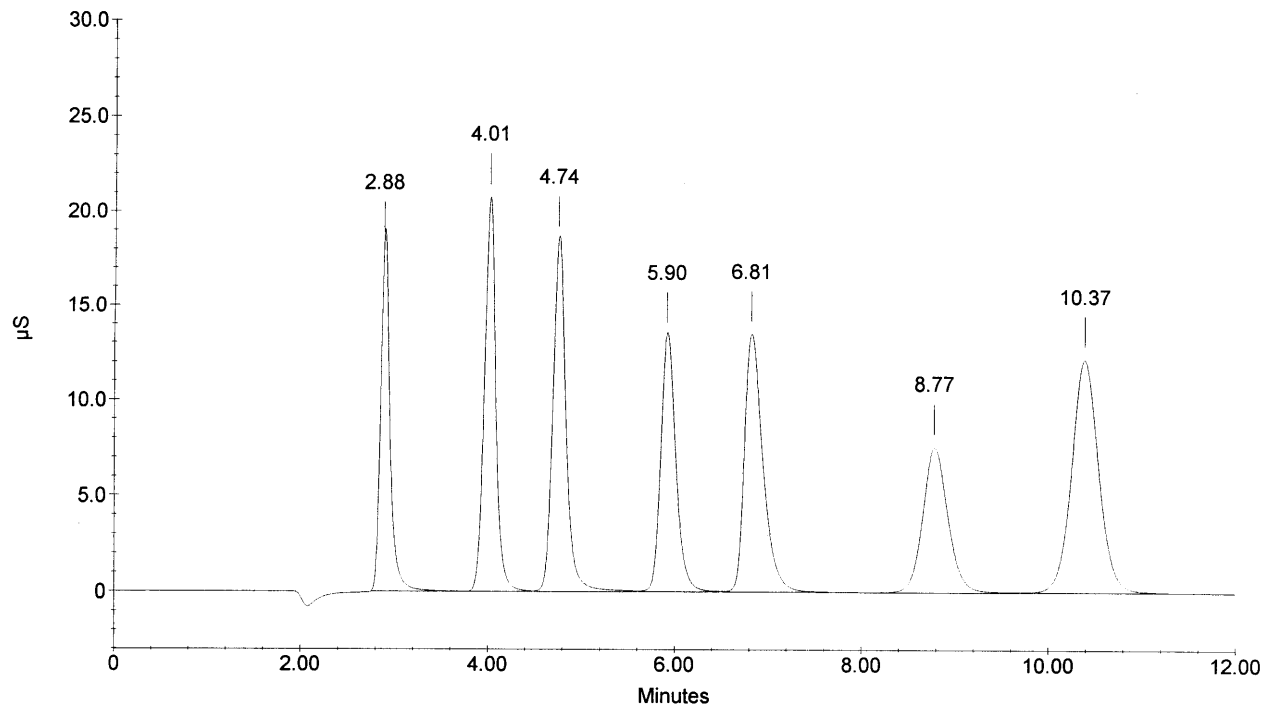
010213

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.88	FLUORIDE	101.164	181769	1301175	2	-1.48
2	4.01	CHLORIDE	205.235	207324	1744597	2	-0.25
3	4.74	NITRITE-N	98.288	184852	1832979	2	-1.39
4	5.90	BROMIDE	411.304	133863	1519728	2	-0.62
5	6.81	NITRATE-N	86.678	134378	1858089	2	1.19
6	8.77	PHOSPHATE-P	196.028	75230	1411840	2	0.80
7	10.37	SULFATE	408.945	121499	2449593	2	-0.48

0.00 ---total(s)--- 1507.641 12118003

CCV



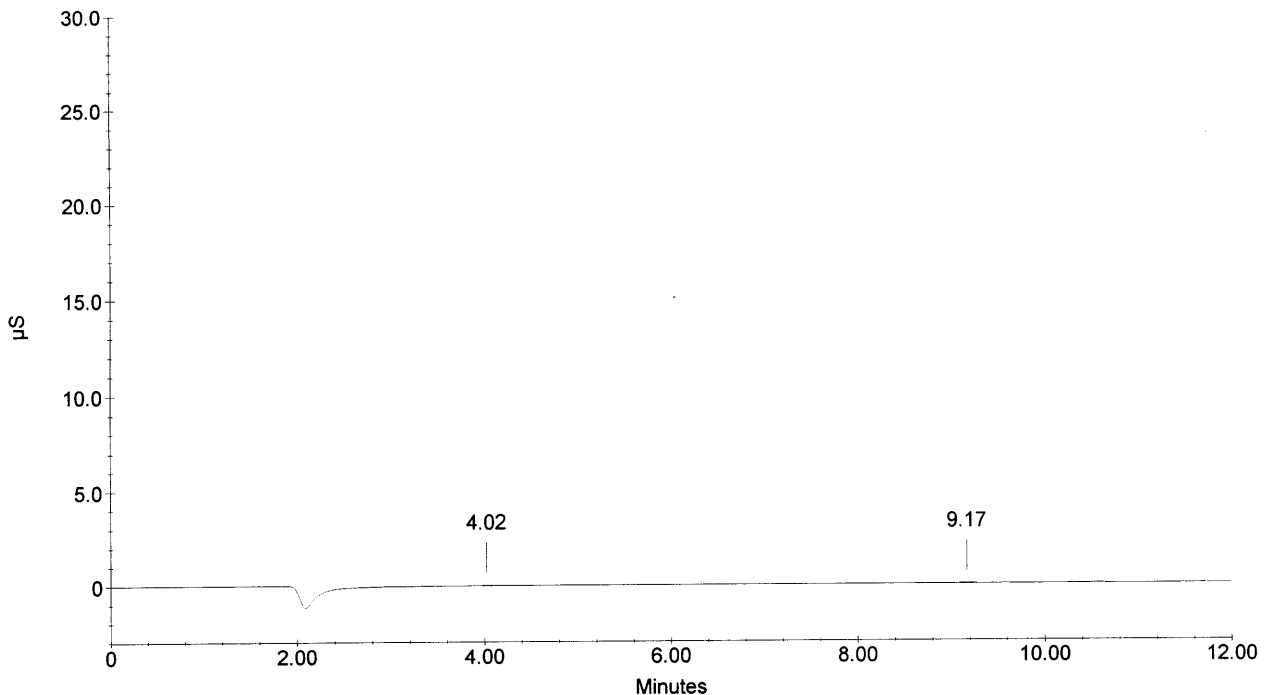
Sample Name : CCB
 Dilution Factor : 1.00
 Injection Number : 14
 Data File Name : c:\peaknet\data\040425\040425_014.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 9:22:56 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010214

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	4.02	CHLORIDE	0.006	104	908	1	0.08
1	4.02	CHLORIDE	0.006	104	908	1	0.08
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
2	9.17	PHOSPHATE-P	0.004	45	600	1	5.40
		SULFATE					
0.00		---total(s)---			2417		
		0.016					

CCB



Sample Name : 243241

Dilution Factor : 1.00

Injection Number : 15

Data File Name : c:\peaknet\data\040425\040425_015.DXD

Method File Name : c:\peaknet\method\anions040420.met

Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 9:37:37 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-#015724 AG14-#1018096

System Operator : RSS

010215

Peak Information : All Components

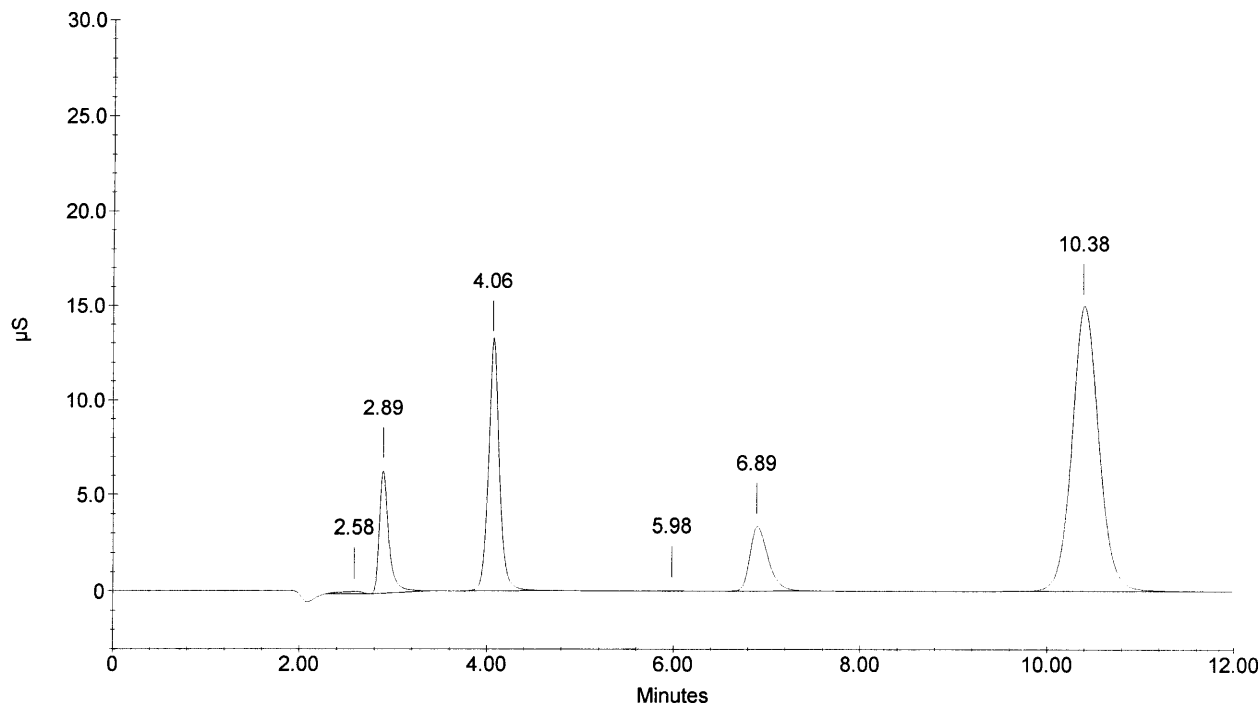
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
2	2.89	FLUORIDE	1.850✓	63579	448635	1	-1.03
3	4.06	CHLORIDE NITRITE-N✓	6.497✓	129326	1072514	1	1.08
4	5.98	BROMIDE	0.037 ✓	224	2368	1	0.73
5	6.89	NITRATE-N PHOSPHATE-P✓	1.098 ✓	33034	458819	1	2.38
6	10.38	SULFATE	24.331	149183	2992059	1	-0.35

0.00

---total(s)---
33.813

4974396

243241



Sample Name : 243242

Dilution Factor : 1.00

Injection Number : 16

Data File Name : c:\peaknet\data\040425\040425_016.DXD

Method File Name : c:\peaknet\method\anions040420.met

Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 9:52:17 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-#015724 AG14-#1018096

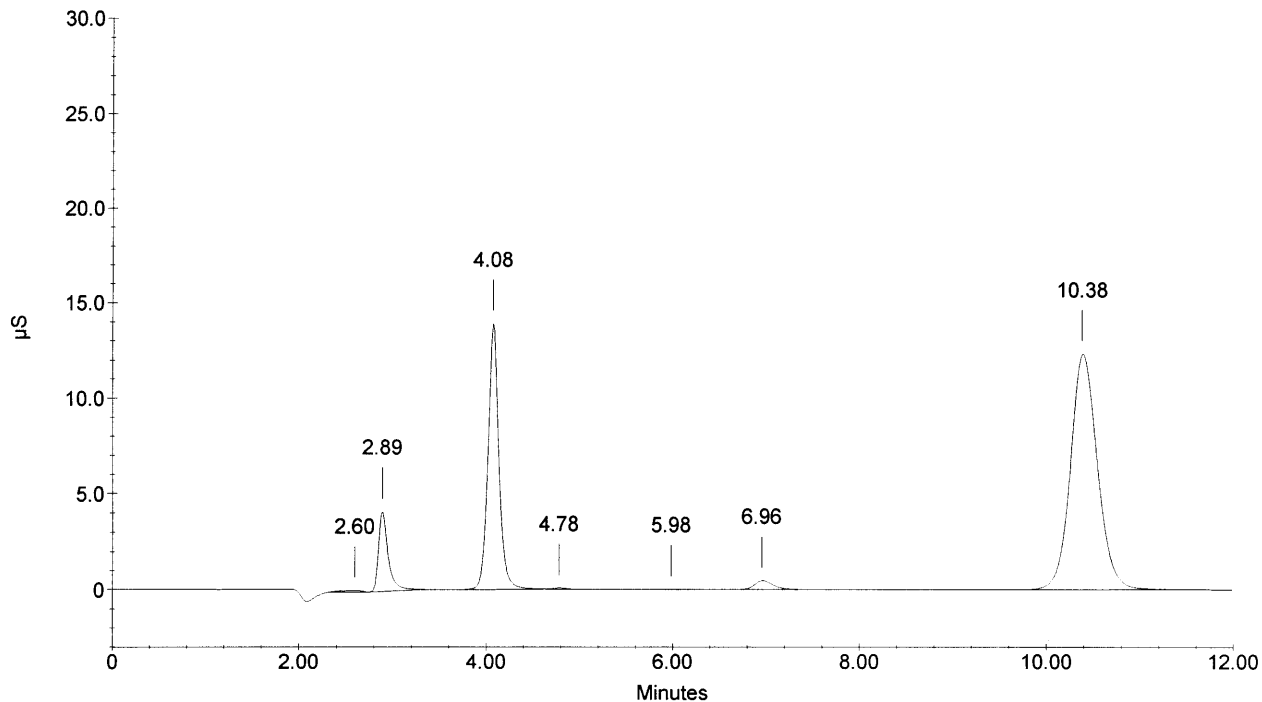
System Operator : RSS

010216

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
2	2.89	FLUORIDE	1.260 ✓	41520	299539	1	-1.03
3	4.08	CHLORIDE	6.848 ✓	138863	1133489	2	1.41
4	4.78	NITRITE-N	0.023 ✓	773	8674	2	-0.55
5	5.98	BROMIDE	0.035 ✓	225	2263	1	0.73
6	6.96	NITRATE-N	0.161 ✓	4695	66894	1	3.37
		PHOSPHATE-P ✓					
7	10.38	SULFATE	20.617	122952	2472605	1	-0.35
			---total(s)---				
0.00			28.945		3983465		

243242



Sample Name : 243243

Dilution Factor : 1.00

Injection Number : 17

Data File Name : c:\peaknet\data\040425\040425_017.DXD

Method File Name : c:\peaknet\method\anions040420.met

Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 10:06:58 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-#015724 AG14-#1018096

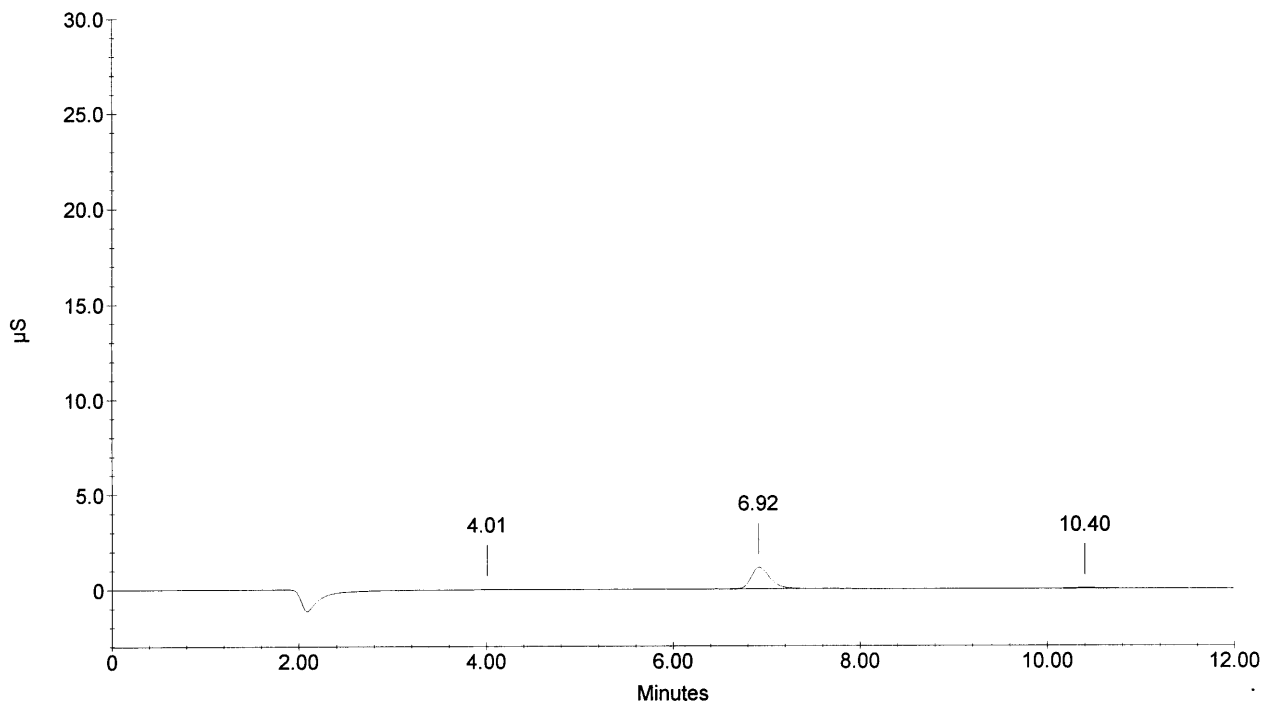
System Operator : RSS

010217

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.01	CHLORIDE	0.008 ✓	173	1203	1	-0.25
1	4.01	CHLORIDE	0.008 ✓	173	1203	1	-0.25
		NITRITE-N ✓					
		BROMIDE ✓					
2	6.92	NITRATE-N ✓	0.380 ✓	11266	157815	1	2.77
		PHOSPHATE-P ✓					
3	10.40	SULFATE ✓	0.043 ✓	264	4586	1	-0.22
			---total(s)---				
0.00			0.437		164807		

243243



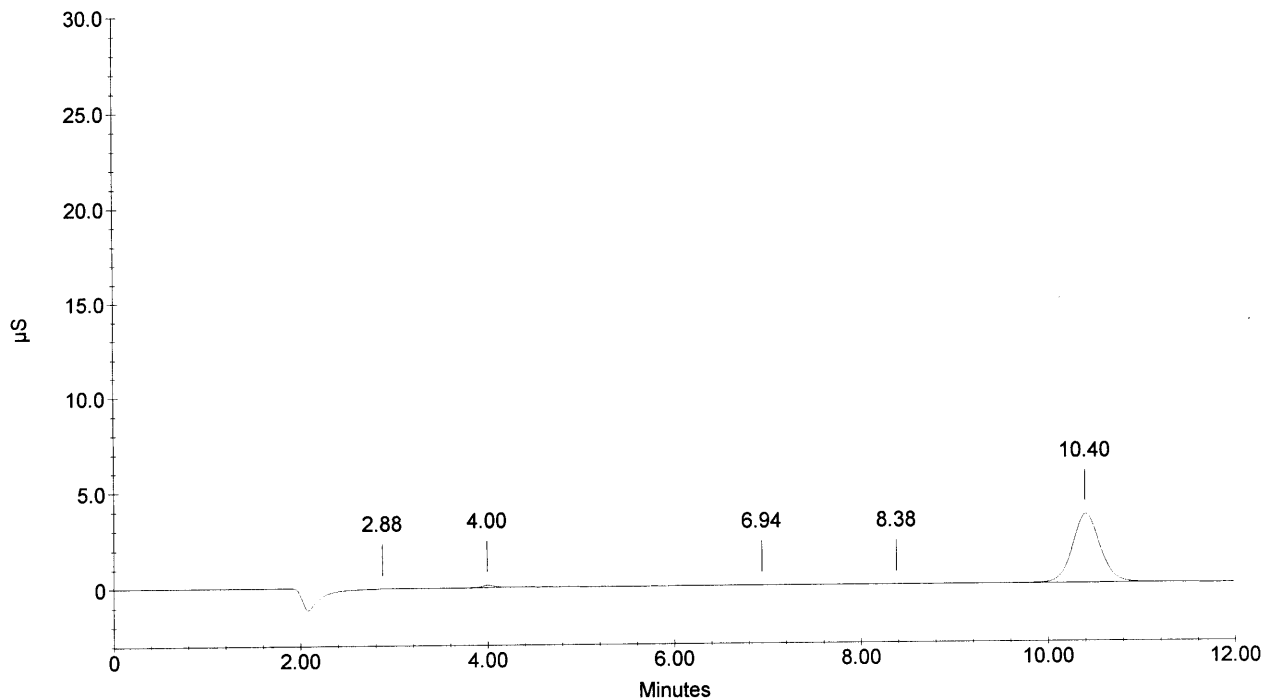
Sample Name : 243233
 Dilution Factor : 20.00
 Injection Number : 18
 Data File Name : c:\peaknet\data\040425\040425_018.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 10:21:38 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010218

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.88	FLUORIDE	0.917	96	451	1	-1.48
2	4.00	CHLORIDE	1.383	1245	10912	1	-0.58
		NITRITE-N					
		BROMIDE					
3	6.94	NITRATE-N	0.065	113	1343	1	3.17
4	8.38	PHOSPHATE-P	0.149	77	996	1	-3.64
5	10.40	SULFATE	132.874 ✓	35498	735981	1	-0.22
			---total(s)---				
0.00			135.386		749684		

243233



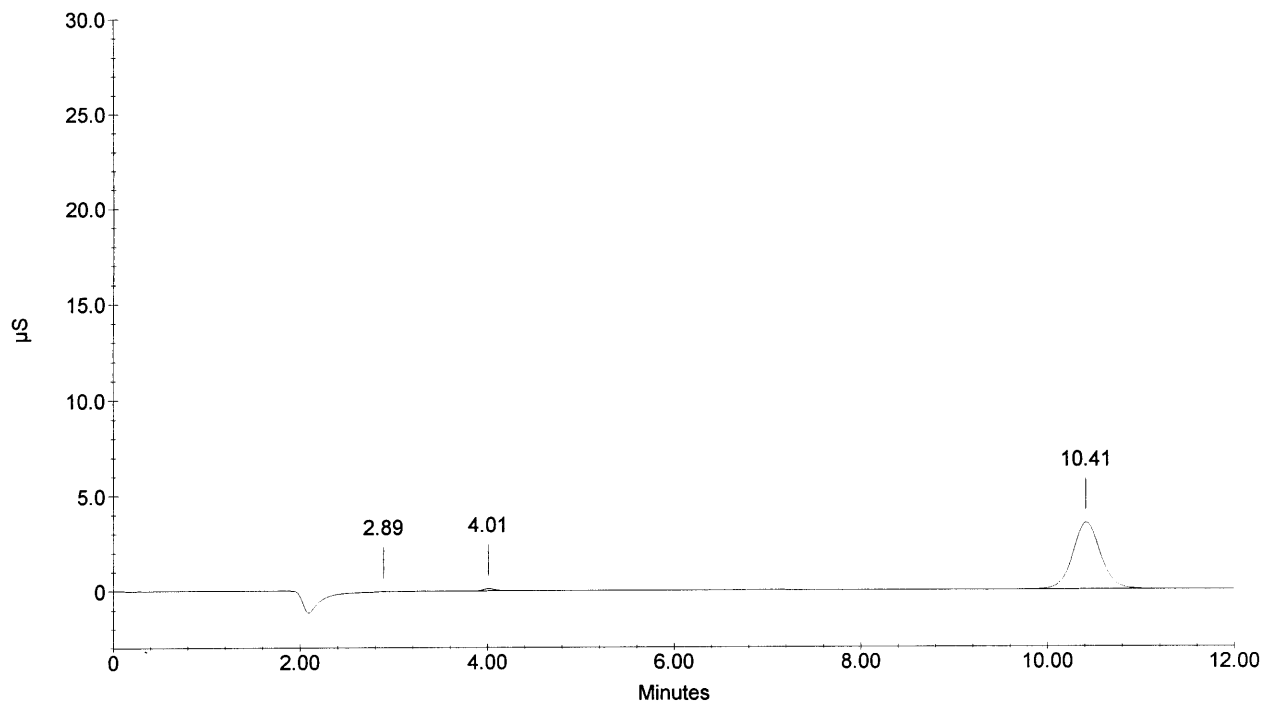
Sample Name : 243233D
Dilution Factor : 20.00
Injection Number : 19
Data File Name : c:\peaknet\data\040425\040425_019.DXD
Method File Name : c:\peaknet\method\anions040420.met
Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 10:36:18 PM
System Name : Dx-500
Detector Name : Conductivity Detector
Column Type : AS14-#015724 AG14-#1018096
System Operator : RSS

010219

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.89	FLUORIDE	0.925	135	553	1	-1.03
2	4.01	CHLORIDE	1.371	1165	10821	1	-0.25
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
3	10.41	SULFATE	131.925 ✓	35167	730552	1	-0.10
---total(s)---							
	0.00		134.221		741926		

243233D



Sample Name : 243233S

Dilution Factor : 20.00

Injection Number : 20

Data File Name : c:\peaknet\data\040425\040425_020.DXD

Method File Name : c:\peaknet\method\anions040420.met

Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 10:50:59 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-#015724 AG14-#1018096

System Operator : RSS

010220

Peak Information : All Components

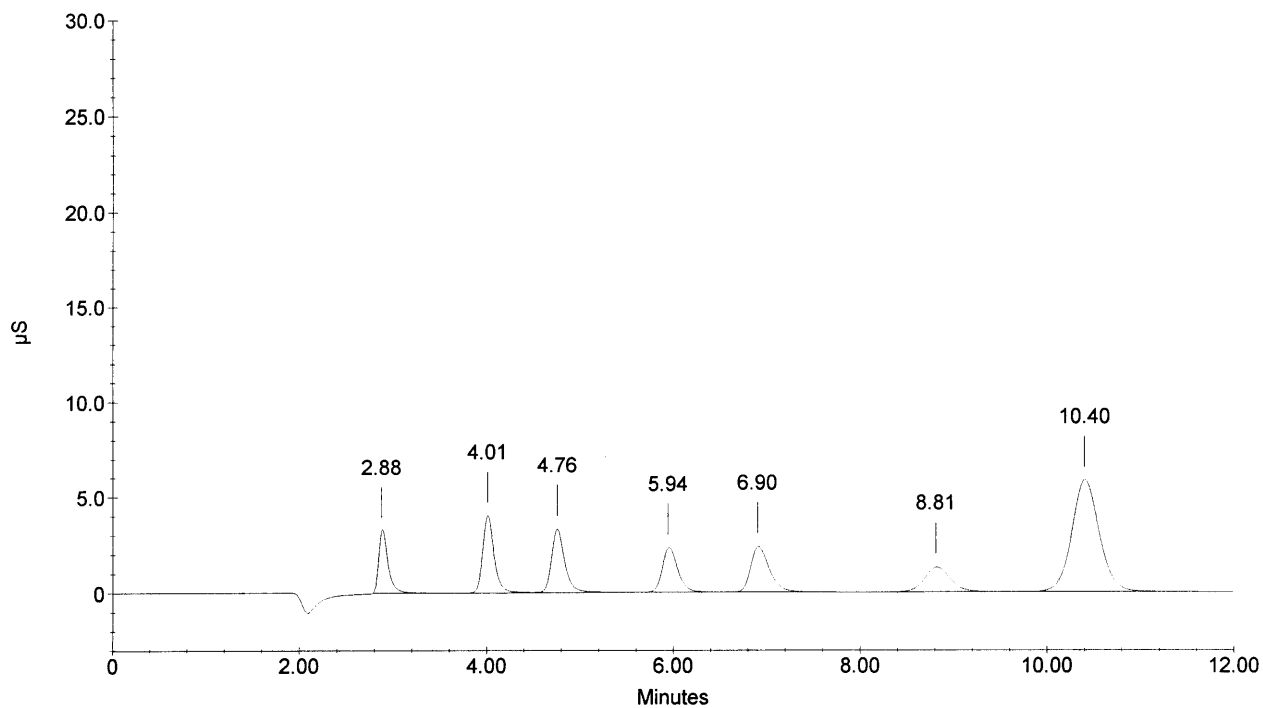
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.88	FLUORIDE	19.552	32042	228947	1	-1.48
2	4.01	CHLORIDE	42.742	40058	342008	2	-0.25
3	4.76	NITRITE-N	17.550	32954	325256	2	-1.11
4	5.94	BROMIDE	80.902	22883	268035	1	0.06
5	6.90	NITRATE-N	15.819	23541	329898	1	2.58
6	8.81	PHOSPHATE-P	37.160	12875	251830	1	1.26
7	10.40	SULFATE	211.071 ✓	58120	1193081	1	-0.22

0.00

---total(s)---
424.796

2939055

243233S



Sample Name : 243234

Dilution Factor : 20.00

Injection Number : 21

Data File Name : c:\peaknet\data\040425\040425_021.DXD

Method File Name : c:\peaknet\method\anions040420.met

Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 11:05:39 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-#015724 AG14-#1018096

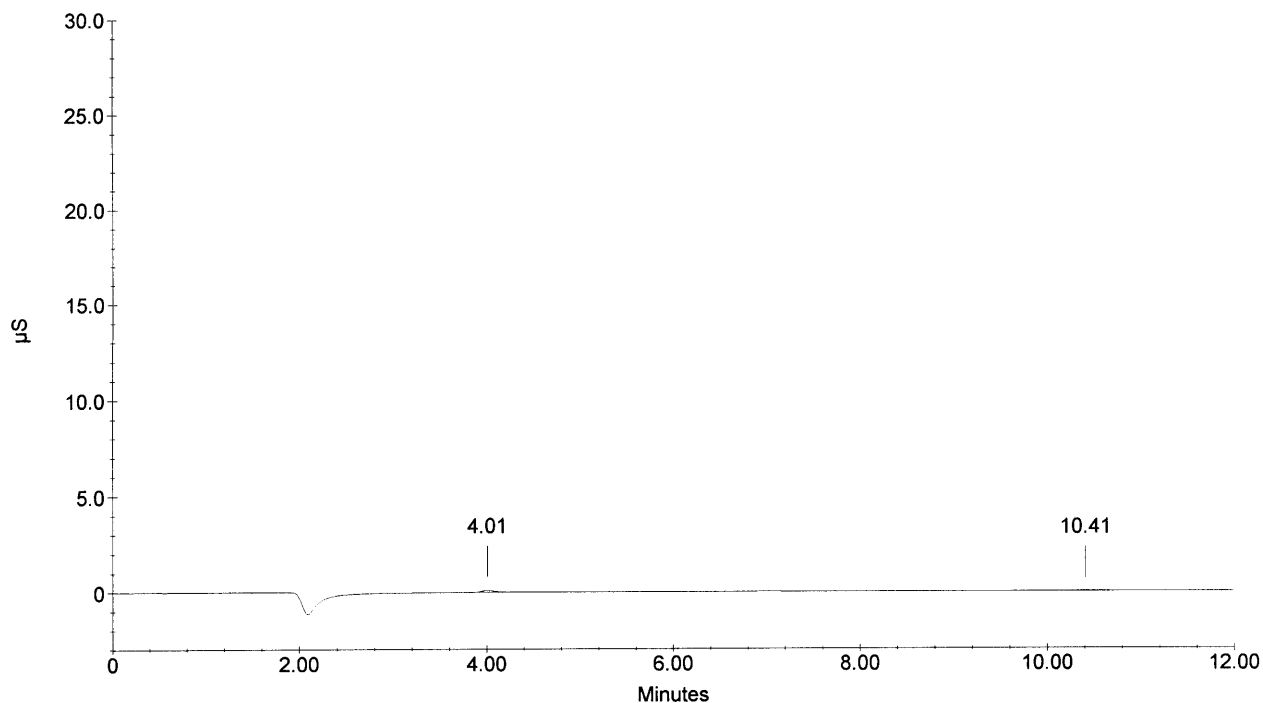
System Operator : RSS

010221

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	4.01	CHLORIDE	1.151	1082	9081	1	-0.25
1	4.01	CHLORIDE	1.151	1082	9081	1	-0.25
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
2	10.41	SULFATE	0.454	133	2435	1	-0.10
			---total(s)---				
0.00			2.755		20598		

243234



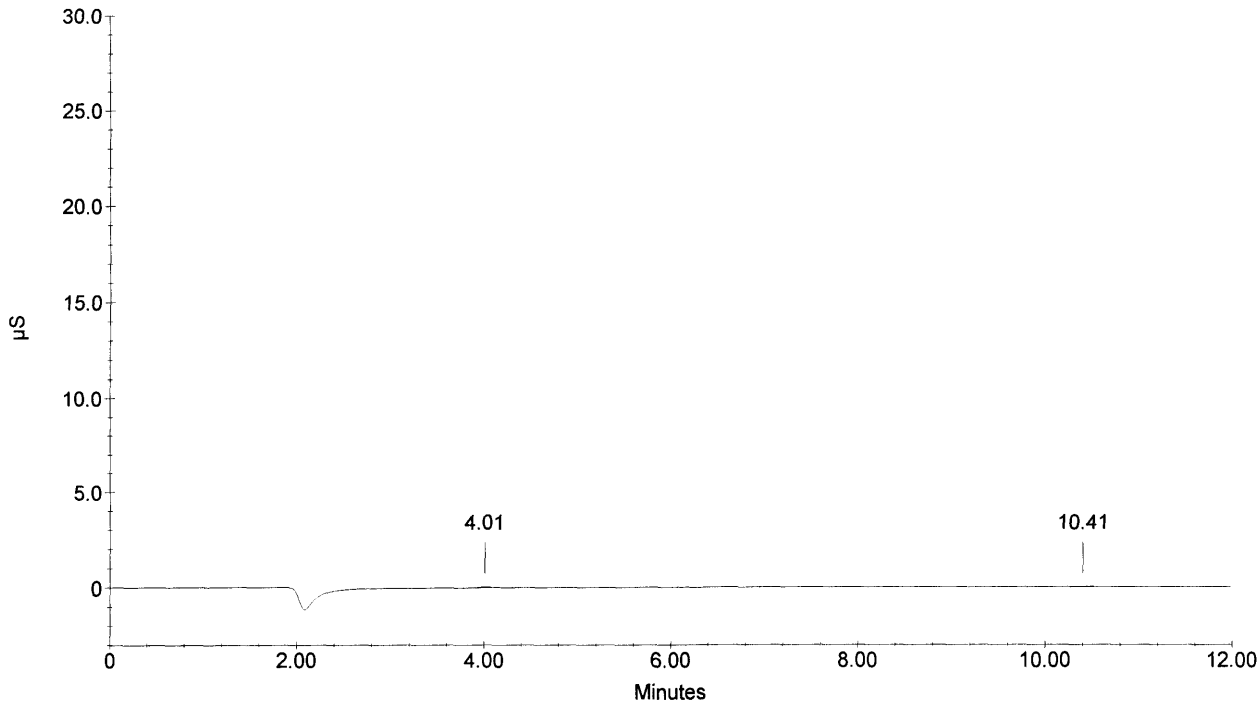
Sample Name : 243235
 Dilution Factor : 20.00
 Injection Number : 22
 Data File Name : c:\peaknet\data\040425\040425_022.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 11:20:20 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010222

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.01	CHLORIDE	0.273	299	2154	1	-0.25
1	4.01	CHLORIDE	0.273	299	2154	1	-0.25
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
2	10.41	SULFATE	0.544	157	2920	1	-0.10
---total(s)---							
	0.00		1.090		7228		

243235



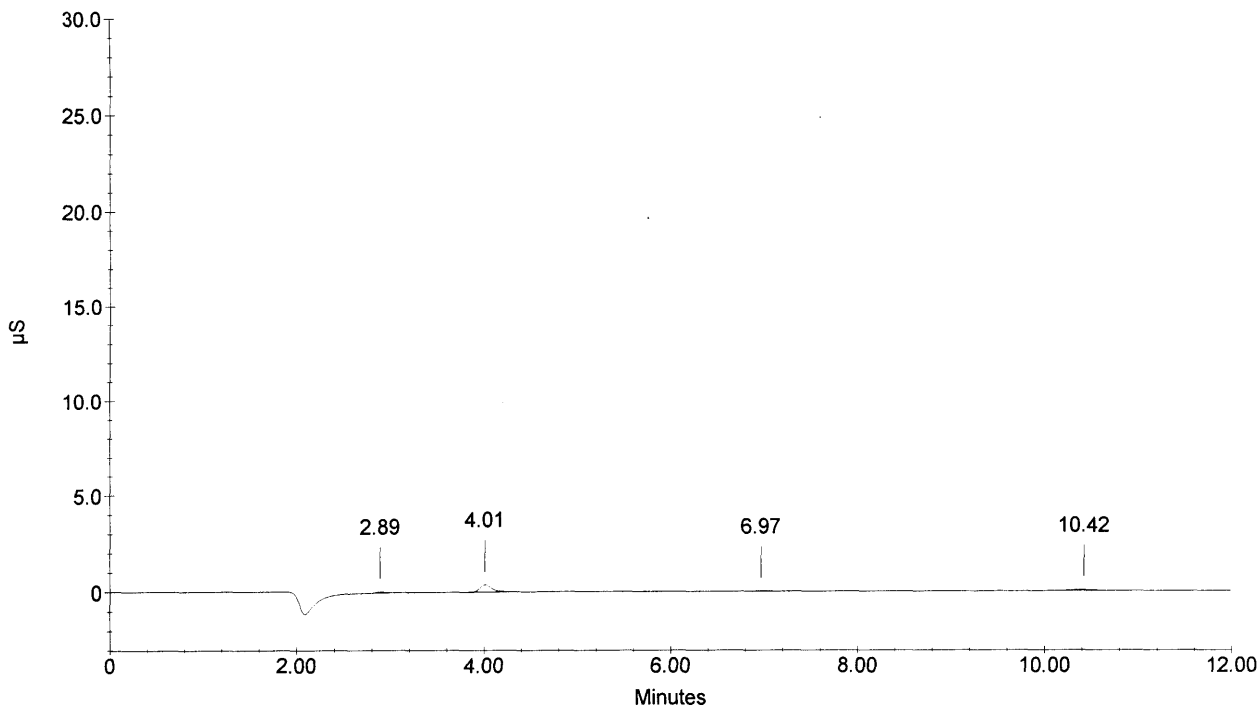
Sample Name : 243236
 Dilution Factor : 20.00
 Injection Number : 23
 Data File Name : c:\peaknet\data\040425\040425_023.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 11:35:01 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010223

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.89	FLUORIDE	1.056	390	2141	1	-1.03
2	4.01	CHLORIDE	4.292	3723	33903	1	-0.25
		NITRITE-N					
		BROMIDE					
3	6.97	NITRATE-N	0.095	162	1973	1	3.57
		PHOSPHATE-P					
4	10.42	SULFATE	1.870	517	10040	1	0.03
	0.00		---total(s)---				
			7.314		48058		

243236



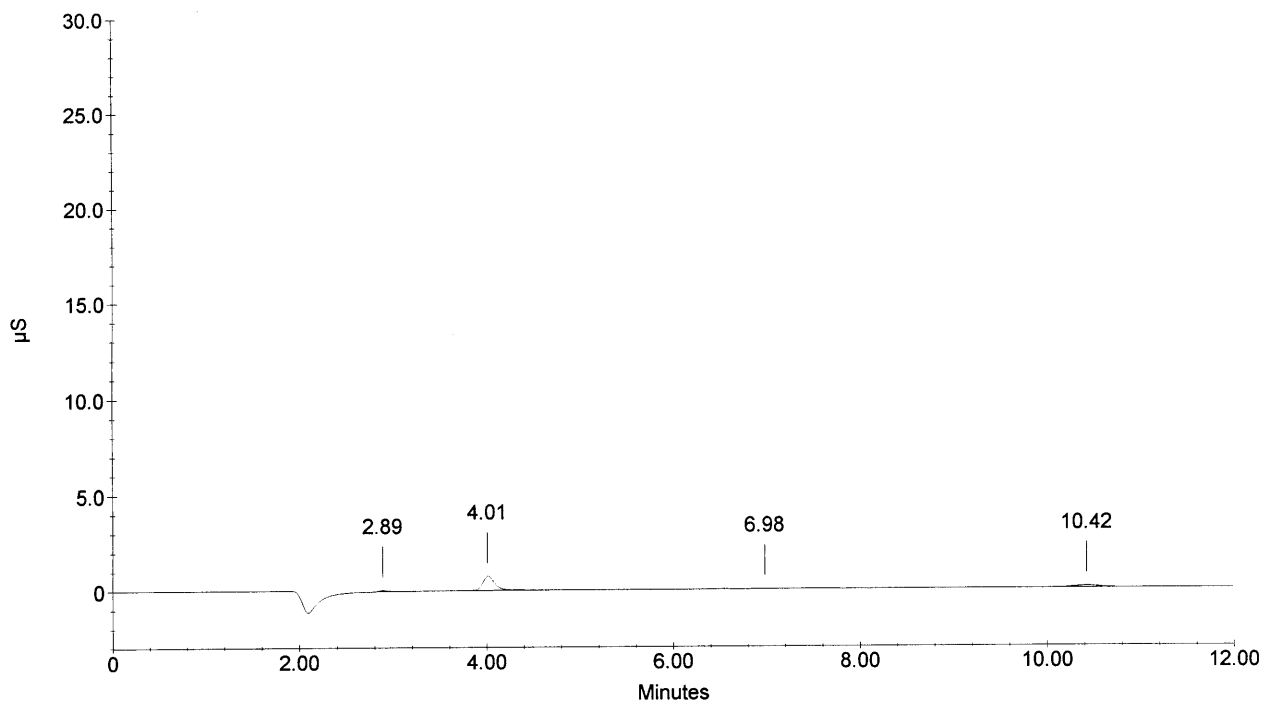
Sample Name : 243237
 Dilution Factor : 20.00
 Injection Number : 24
 Data File Name : c:\peaknet\data\040425\040425_024.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/25/04 11:49:41 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010224

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.89	FLUORIDE	1.074	466	2357	1	-1.03
2	4.01	CHLORIDE	8.380	7430	66291	1	-0.25
		NITRITE-N					
		BROMIDE					
3	6.98	NITRATE-N	0.077	152	1601	1	3.76
		PHOSPHATE-P					
4	10.42	SULFATE	4.083	1044	21925	1	0.03
			---total(s)---				
0.00			13.614		92175		

243237



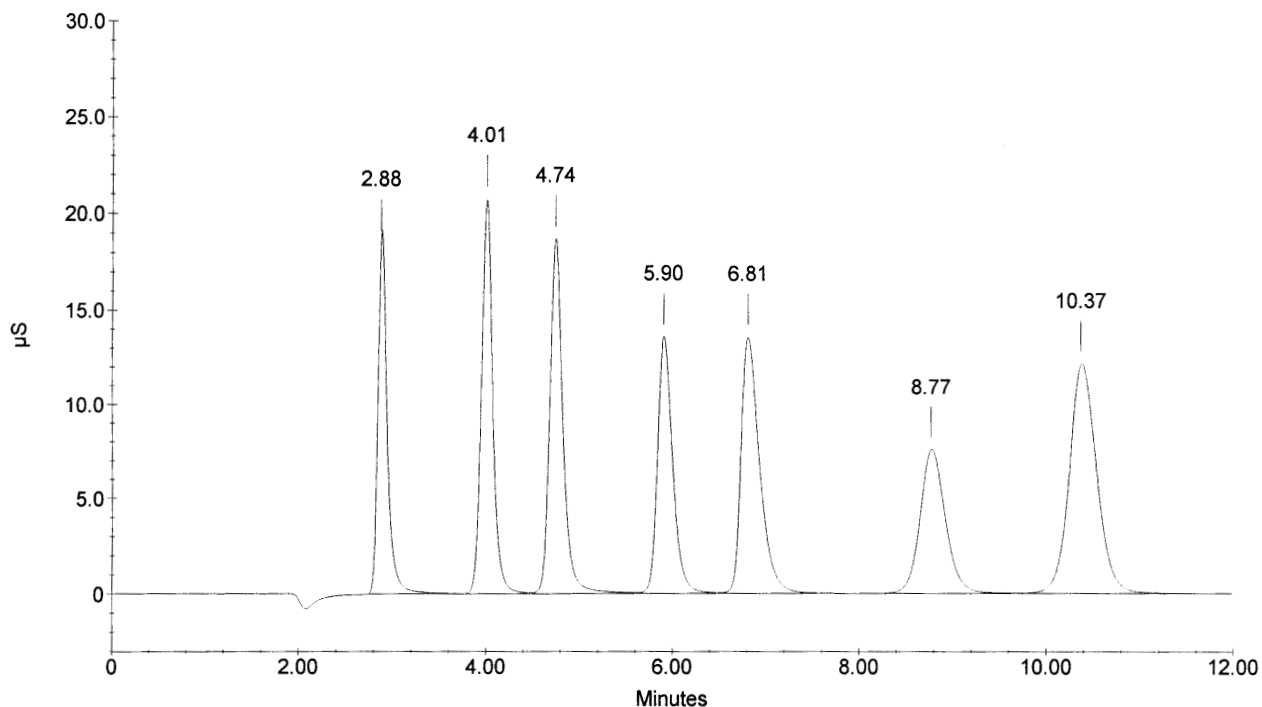
Sample Name : CCV
 Dilution Factor : 20.00
 Injection Number : 25
 Data File Name : c:\peaknet\data\040425\040425_025.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/26/04 12:04:21 AM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010225

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.88	FLUORIDE	101.624	183999	1307533	1	-1.48
2	4.01	CHLORIDE	205.354	206712	1745697	2	-0.25
3	4.74	NITRITE-N	98.453	185926	1836075	2	-1.39
4	5.90	BROMIDE	412.668	135413	1525592	2	-0.62
5	6.81	NITRATE-N	87.137	135124	1868273	2	1.19
6	8.77	PHOSPHATE-P	197.399	75520	1422533	2	0.80
7	10.37	SULFATE	410.463	121170	2459891	2	-0.48
			---total(s)---				
0.00			1513.097		12165594		

CCV



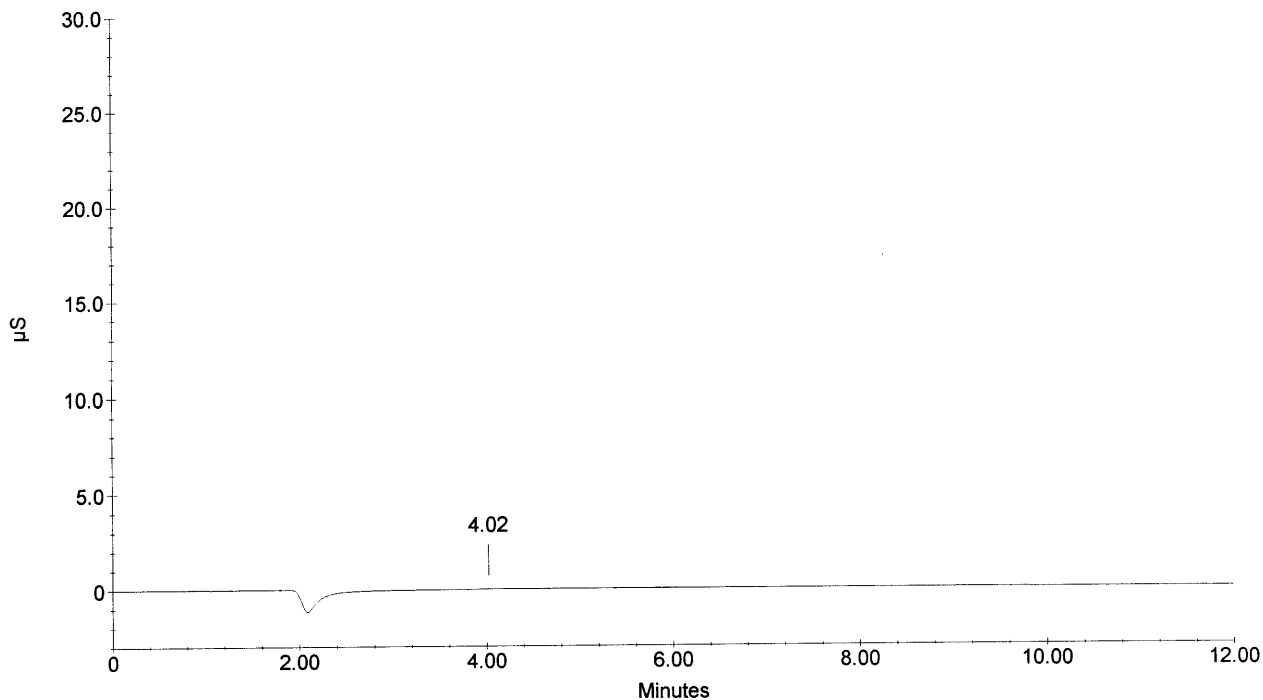
Sample Name : CCB
 Dilution Factor : 1.00
 Injection Number : 26
 Data File Name : c:\peaknet\data\040425\040425_026.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/26/04 12:19:02 AM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010226

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	4.02	CHLORIDE	0.006	133	919	1	0.08
1	4.02	CHLORIDE	0.006	133	919	1	0.08
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
	0.00		---total(s)---				
			0.012		1839		

CCB



Sample Name : 243238

Dilution Factor : 20.00

Injection Number : 27

Data File Name : c:\peaknet\data\040425\040425_027.DXD

Method File Name : c:\peaknet\method\anions040420.met

Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/26/04 12:33:43 AM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-#015724 AG14-#1018096

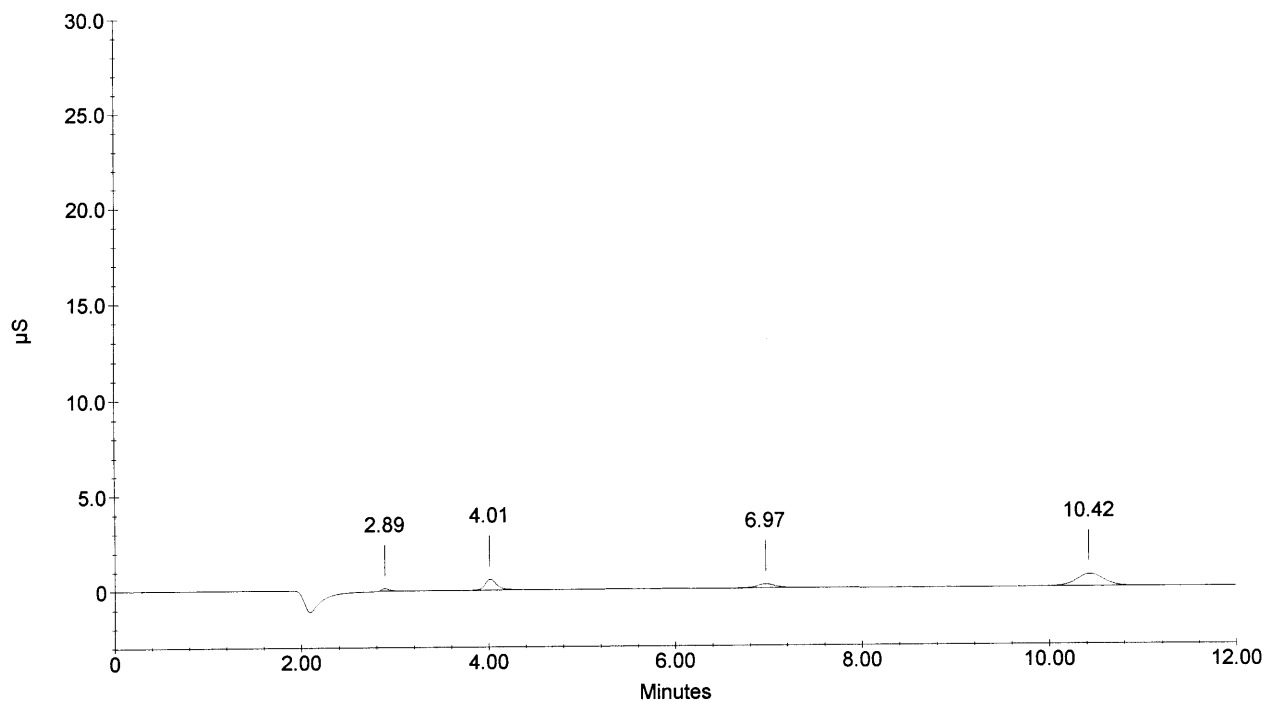
System Operator : RSS

010227

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.89	FLUORIDE	1.552	1379	8134	1	-1.03
2	4.01	CHLORIDE	6.576	5786	51989	1	-0.25
		NITRITE-N					
		BROMIDE					
3	6.97	NITRATE-N	1.446	2133	30003	1	3.57
		PHOSPHATE-P					
4	10.42	SULFATE	25.101	6487	135456	1	0.03
			---total(s)---				
0.00			34.675		225581		

243238



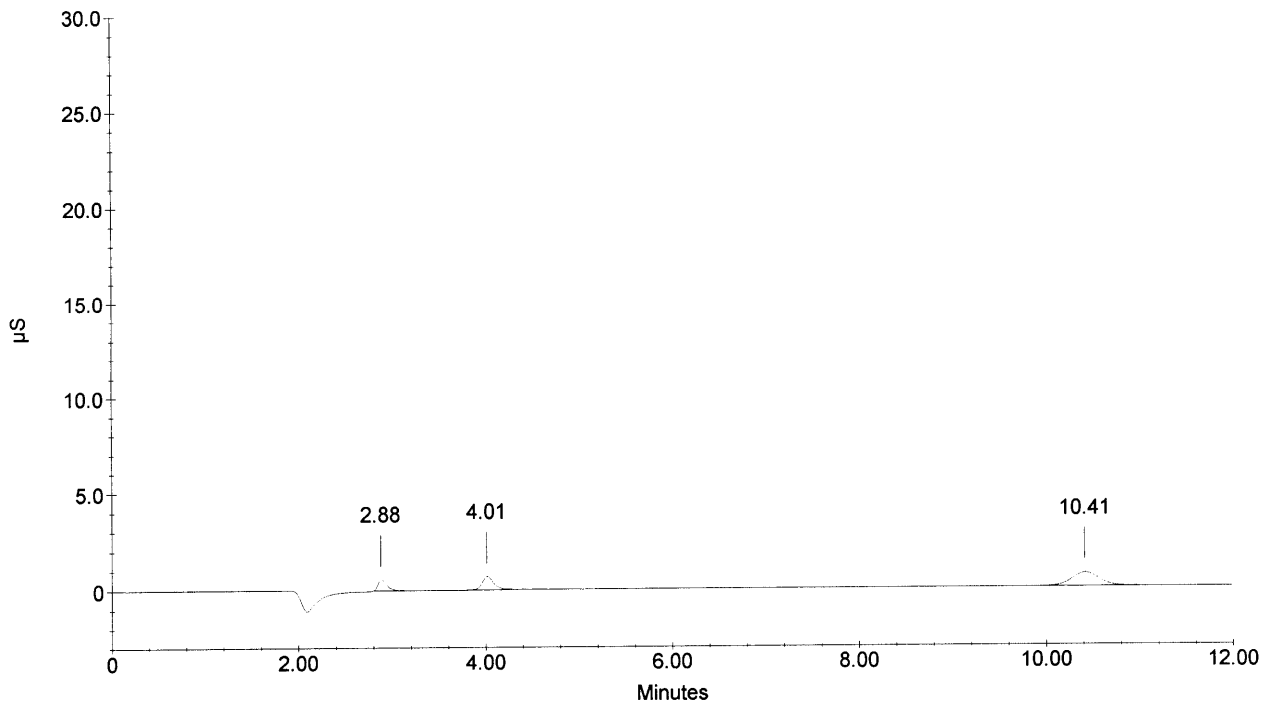
Sample Name : 243239
 Dilution Factor : 20.00
 Injection Number : 28
 Data File Name : c:\peaknet\data\040425\040425_028.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/26/04 12:48:23 AM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010228

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.88	FLUORIDE	4.015	5539	38011	1	-1.48
2	4.01	CHLORIDE	7.550	6684	59705	1	-0.25
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
3	10.41	SULFATE	26.543 ✓	6865	143291	1	-0.10
	0.00		---total(s)---				
			38.108		241007		

243239



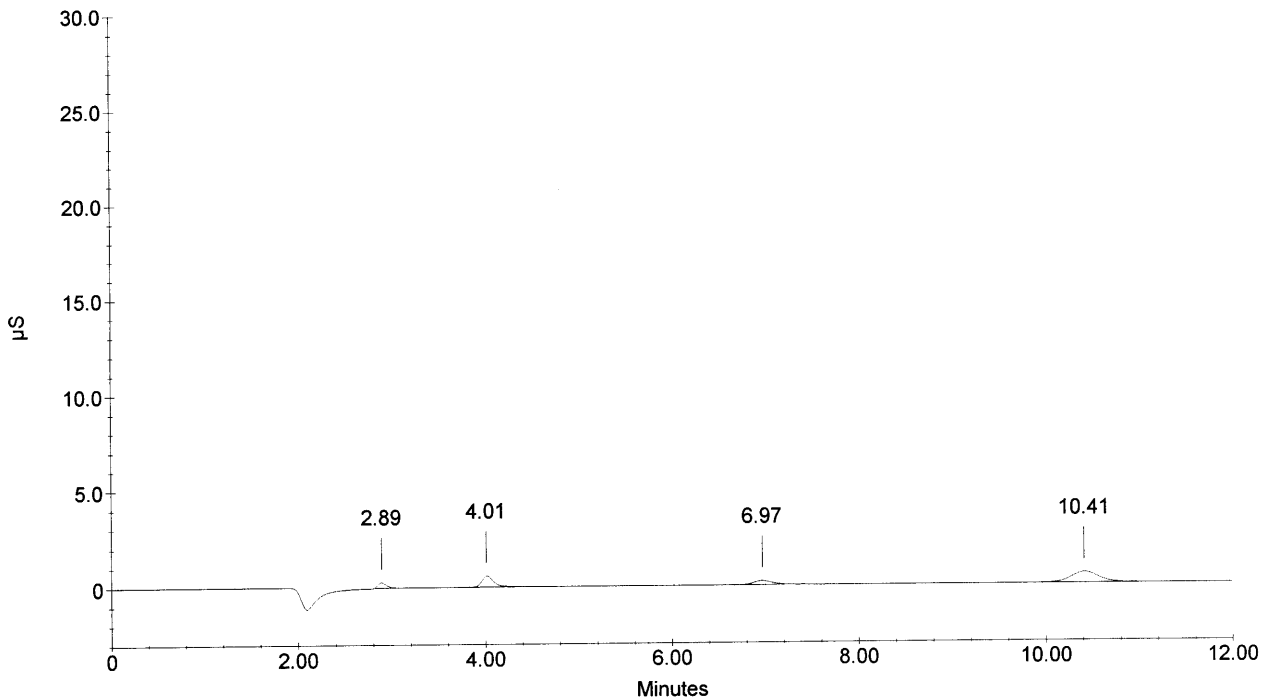
Sample Name : 243240
 Dilution Factor : 20.00
 Injection Number : 29
 Data File Name : c:\peaknet\data\040425\040425_029.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/26/04 1:03:03 AM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010229

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.89	FLUORIDE	2.420	2911	18659	1	-1.03
2	4.01	CHLORIDE	6.434	5718	50861	1	-0.25
		NITRITE-N					
		BROMIDE					
3	6.97	NITRATE-N	1.364	2076	28288	1	3.57
		PHOSPHATE-P					
4	10.41	SULFATE	20.971 ✓	5464	113062	1	-0.10
			---total(s)---				
0.00			31.189		210870		

243240



Sample Name : 243241

Dilution Factor : 20.00

Injection Number : 30

Data File Name : c:\peaknet\data\040425\040425_030.DXD

Method File Name : c:\peaknet\method\anions040420.met

Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/26/04 1:17:43 AM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-#015724 AG14-#1018096

System Operator : RSS

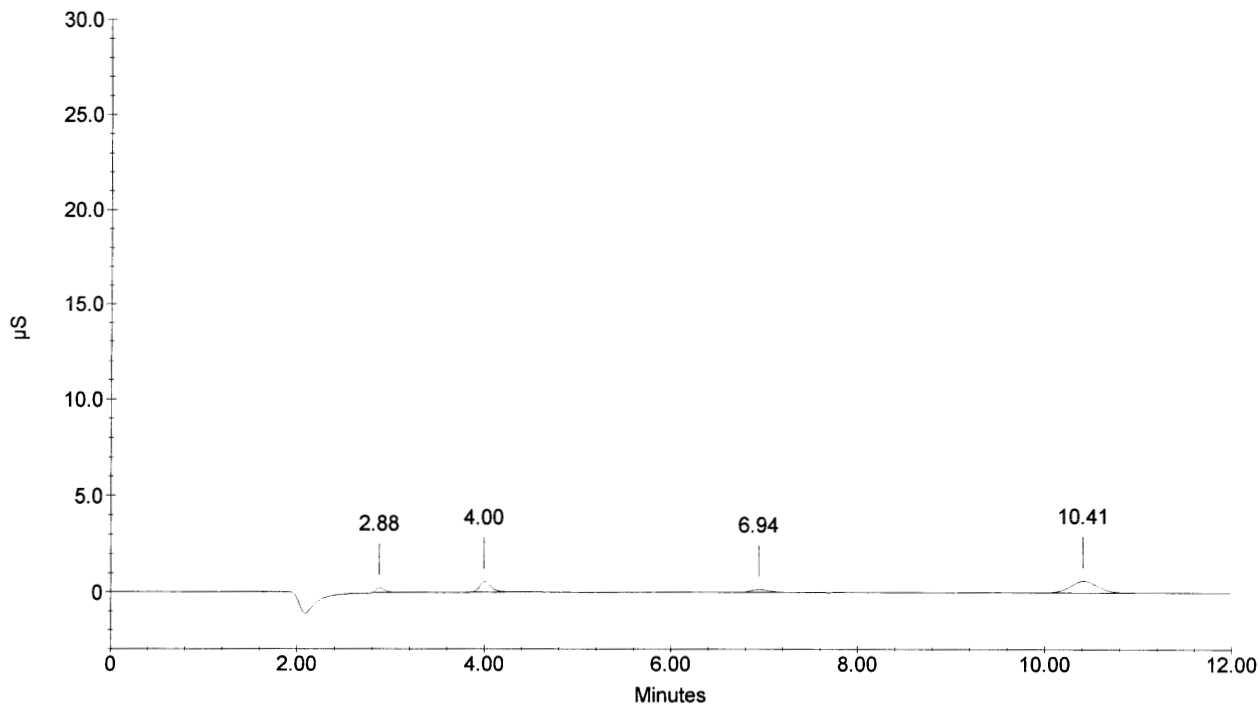
010230

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.88	FLUORIDE	2.188	2537	15839	1	-1.48
2	4.00	CHLORIDE NITRITE-N BROMIDE	6.205	5483	49052	1	-0.58
3	6.94	NITRATE-N PHOSPHATE-P	0.951	1473	19720	1	3.17
4	10.41	SULFATE	23.583✓	6182	127222	1	-0.10

0.00	---total(s)--- 32.927	211833
------	--------------------------	--------

243241



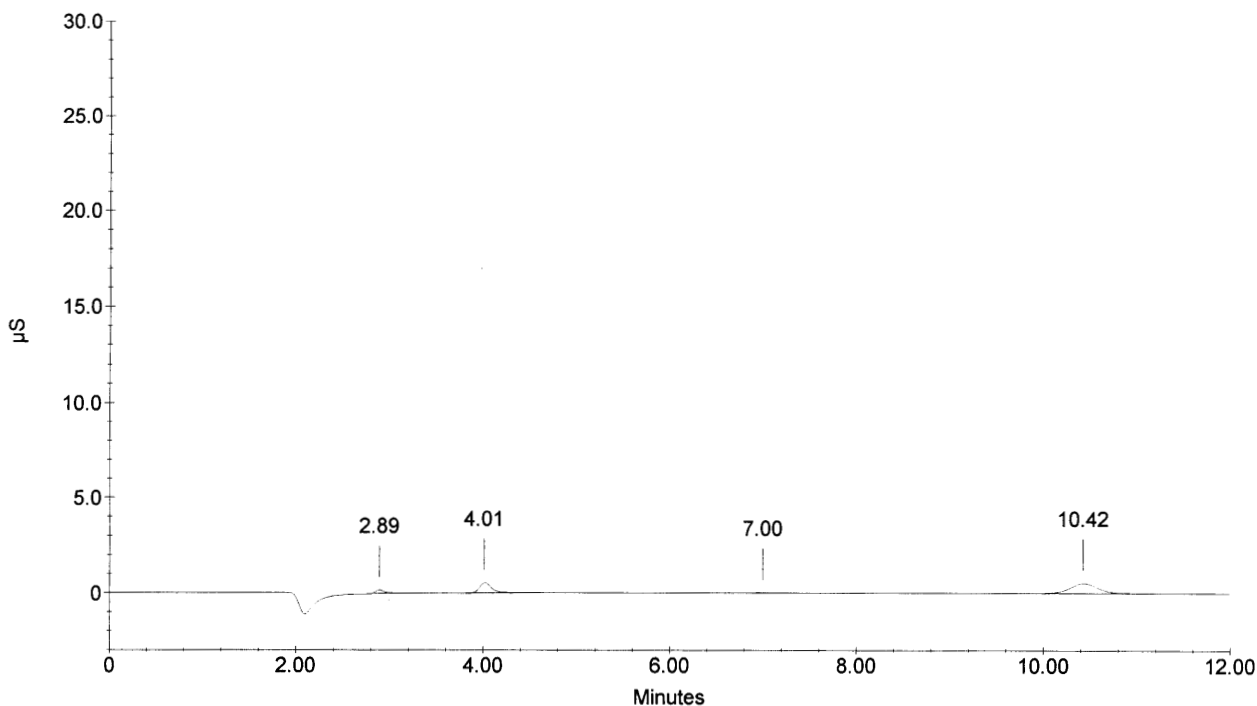
Sample Name : 243242
 Dilution Factor : 20.00
 Injection Number : 31
 Data File Name : c:\peaknet\data\040425\040425_031.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/26/04 1:32:23 AM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010231

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.89	FLUORIDE	1.733	1709	10333	1	-1.03
2	4.01	CHLORIDE NITRITE-N BROMIDE	6.330	5402	50036	1	-0.25
3	7.00	NITRATE-N PHOSPHATE-P	0.118	197	2439	1	3.96
4	10.42	SULFATE	20.707 ✓	5287	111630	1	0.03
0.00		---total(s)---			28.887		
					174438		

243242



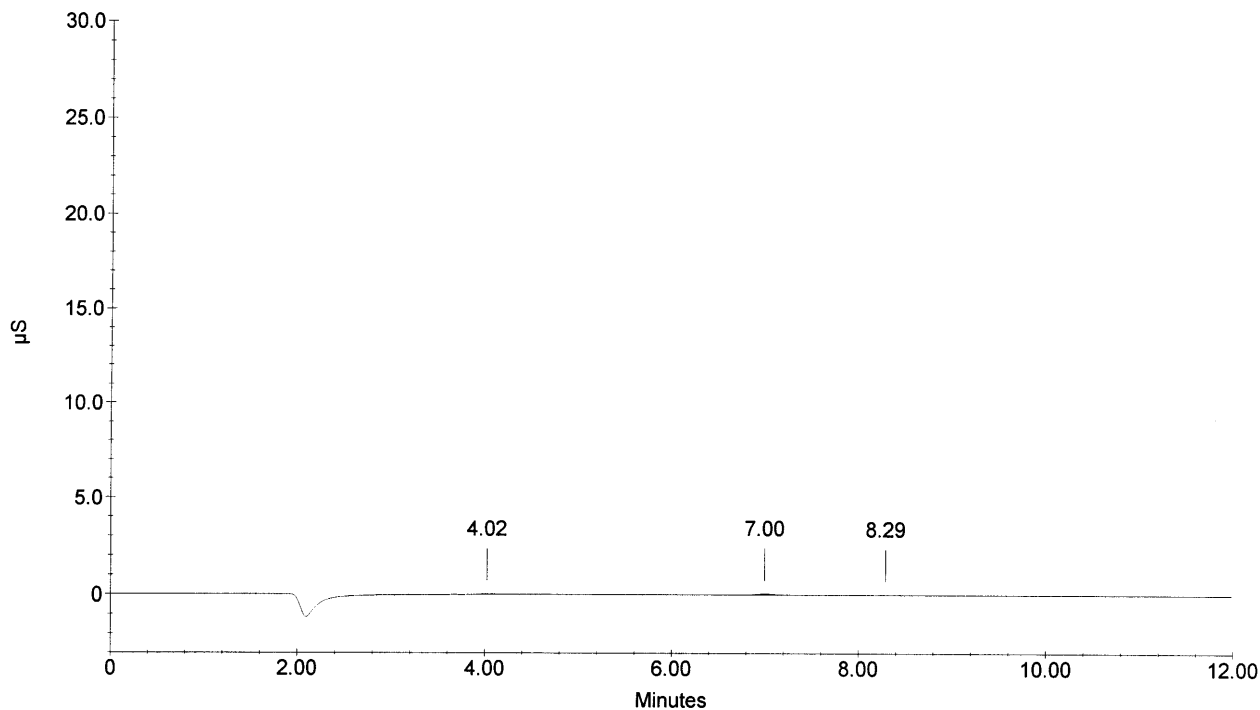
Sample Name : 243243
 Dilution Factor : 20.00
 Injection Number : 32
 Data File Name : c:\peaknet\data\040425\040425_032.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/26/04 1:47:04 AM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010232

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	4.02	CHLORIDE	0.266	250	2100	1	0.08
1	4.02	CHLORIDE	0.266	250	2100	1	0.08
		NITRITE-N					
		BROMIDE					
2	7.00	NITRATE-N	0.361	529	7484	1	3.96
3	8.29	PHOSPHATE-P	0.057	50	382	1	-4.71
		SULFATE					
0.00		---total(s)---					
		0.950		12065			

243243



Sample Name : CCV
 Dilution Factor : 20.00
 Injection Number : 33
 Data File Name : c:\peaknet\data\040425\040425_033.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

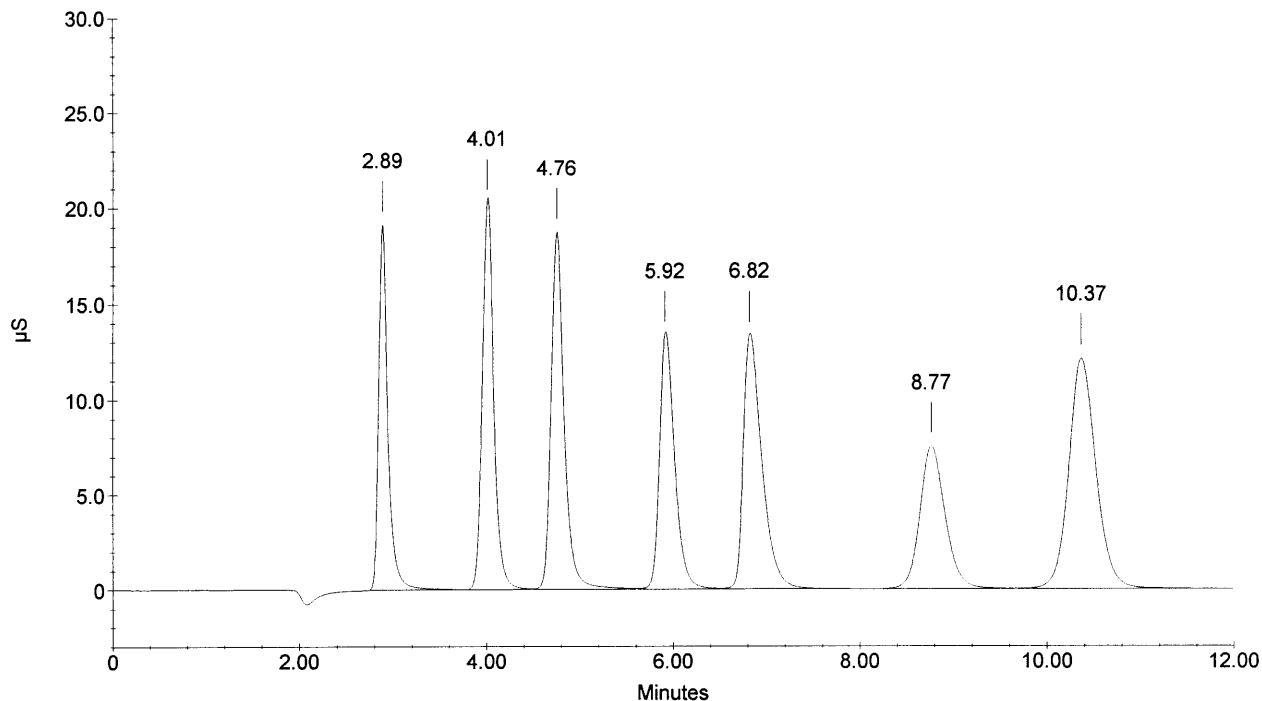
Date Time Collected : 4/26/04 2:01:44 AM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010233

Peak Information : All Components

Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	2.89	FLUORIDE	101.727	191015	1308952	1	-1.03
2	4.01	CHLORIDE	204.990	202382	1742337	2	-0.25
3	4.76	NITRITE-N	98.764	186900	1841916	2	-1.11
4	5.92	BROMIDE	411.380	133291	1520056	2	-0.39
5	6.82	NITRATE-N	86.729	133300	1859210	2	1.39
6	8.77	PHOSPHATE-P	196.499	75343	1415513	2	0.80
7	10.37	SULFATE	409.484	121285	2453249	2	-0.48
			---total(s)---				
0.00			1509.572		12141234		

CCV



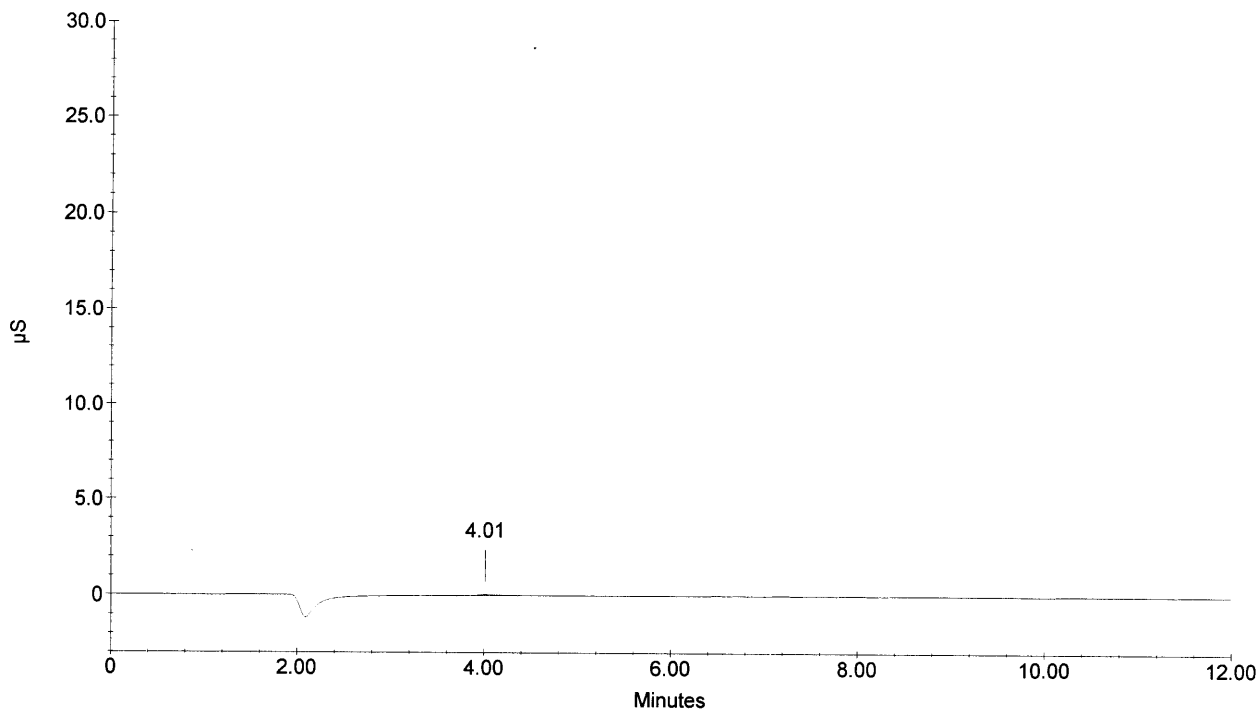
Sample Name : CCB
 Dilution Factor : 1.00
 Injection Number : 34
 Data File Name : c:\peaknet\data\040425\040425_034.DXD
 Method File Name : c:\peaknet\method\anions040420.met
 Schedule File Name : c:\peaknet\schedule\25apr04.sch

Date Time Collected : 4/26/04 2:16:24 AM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010234

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	BI. Code	%Delta
1	4.01	CHLORIDE	0.021	403	3357	1	-0.25
1	4.01	CHLORIDE	0.021	403	3357	1	-0.25
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
			---total(s)---				
0.00			0.043		6714		

CCB



Line	Sample	Sample Type	Level	Method	Data File	Dilution
1	0 PPM 147-08-IC4	Calibration St	1	anions040420.met	040310_001.dxd	1
2	0.1 PPM 147-07-IC4	Calibration St	2	anions040420.met	040310_002.dxd	1
3	0.5 PPM 147-06-IC4	Calibration St	3	anions040420.met	040310_003.dxd	1
4	1 PPM 147-05-IC4	Calibration St	4	anions040420.met	040310_004.dxd	1
5	5 PPM 147-04-IC4	Calibration St	5	anions040420.met	040310_005.dxd	1
6	10 PPM 147-03-IC4	Calibration St	6	anions040420.met	040310_006.dxd	1
7	15 PPM 147-02-IC4	Calibration St	7	anions040420.met	040310_007.dxd	1
8	20 PPM 147-01-IC4	Calibration St	8	anions040420.met	040310_008.dxd	1
9	ICV	Sample		anions040420.met	040310_009.dxd	20
10	ICB	Sample		anions040420.met	040310_010.dxd	1

010235

Default Method Path: C:\PEAKNET\METHOD

Default Data Path: c:\peaknet\data\040420A

Comment:

EPA300 & SW 846 9056

ICV/CCV ① Spex 25-145AS
(inorg# 4518)

DSpies
4/20/04

F 100 mg/L
Cl 200
NO₃N 90.4
Br 400
PO₄P 191
SO₄ 400

② Nitrite Std 146-01-IC4
TV = 101 mg/L

1. Component: FLUORIDE

Standard: External Fit Type: Cubic

Origin: Include Calibration: Area

$r^2 = 0.999978$

$Amt = 2.818379e-020 * Resp^3 +$

$-2.523882e-013 * Resp^2 +$

$4.134292e-006 * Resp + 0.04397$

2. Component: CHLORIDE

Standard: External Fit Type: Quadratic

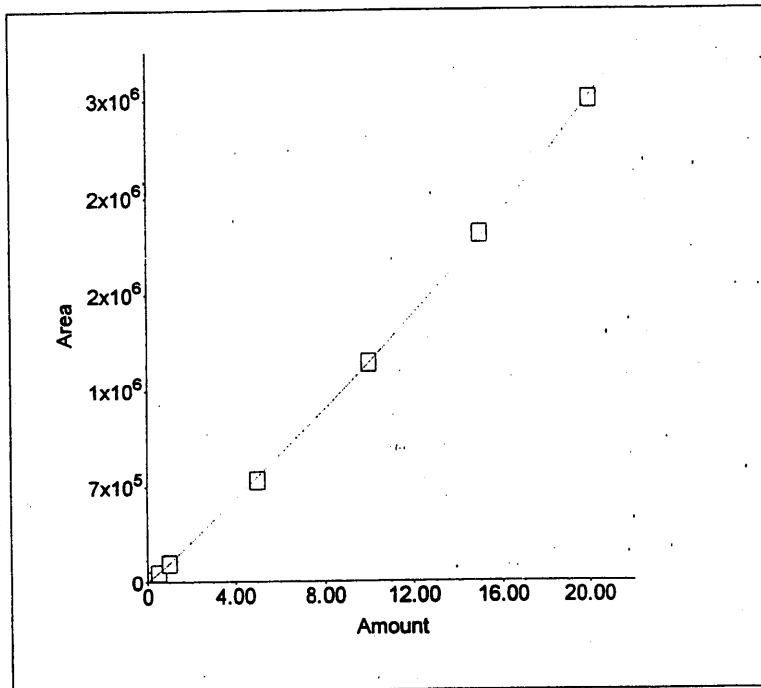
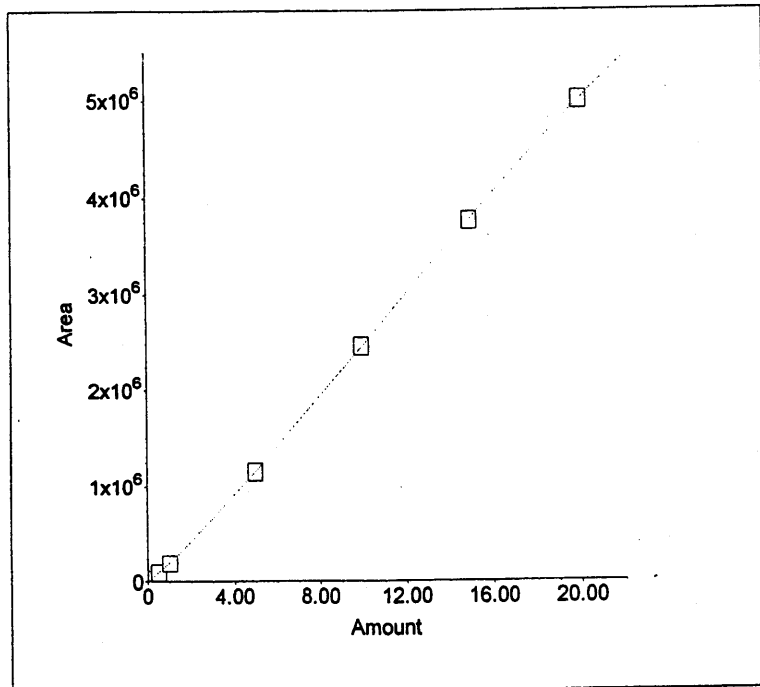
Origin: Force Calibration: Area

$r^2 = 0.999841$

$Amt = -2.614678e-013 * Resp^2 +$

$6.338169e-006 * Resp + 0$

010236



3. Component: NITRITE-N

Standard: External Fit Type: Quadratic

Origin: Force Calibration: Area

$r^2 = 0.999824$

$Amt = -1.112930e-014 * Resp^2 +$

$2.701499e-006 * Resp + 0$

4. Component: BROMIDE

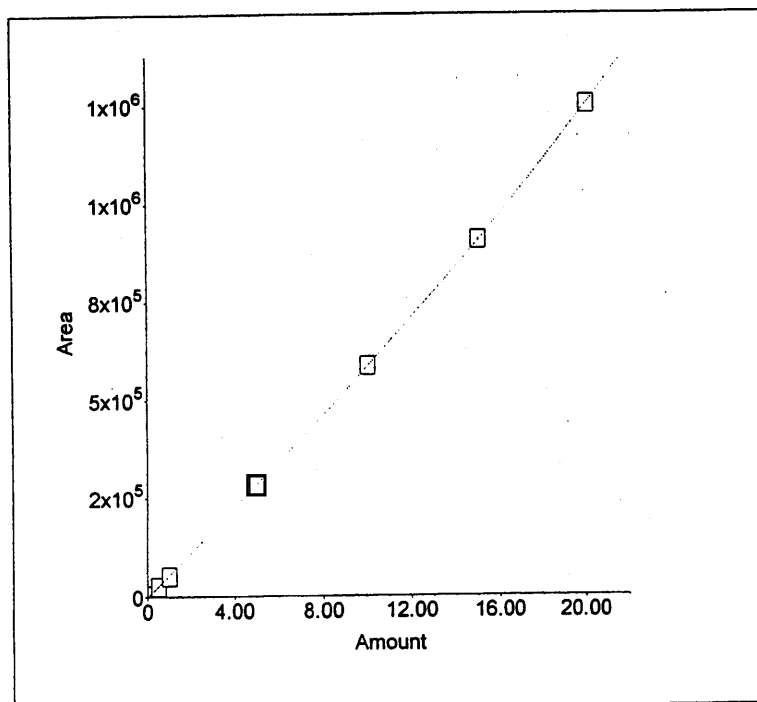
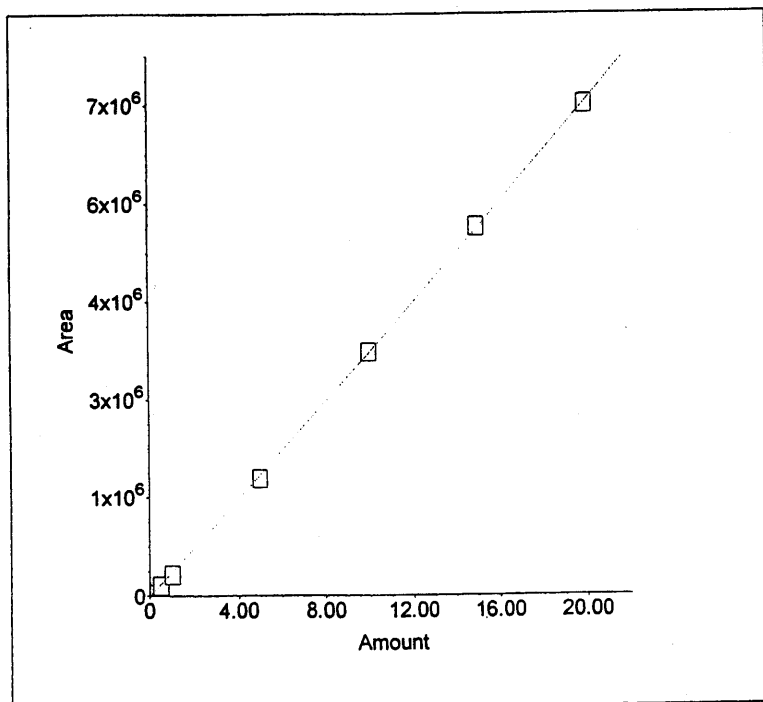
Standard: External Fit Type: Quadratic

Origin: Force Calibration: Area

$r^2 = 0.999975$

$Amt = -1.245935e-012 * Resp^2 +$

$1.542562e-005 * Resp + 0$



5. Component:NITRATE-N

Standard:External Fit Type:Quadratic

Origin:Force Calibration:Area

$r^2=0.999622$

Amt= $-4.257776e-014 \cdot \text{Resp}^2 + 2.411569e-006 \cdot \text{Resp} + 0$

6. Component:PHOSPHATE-P

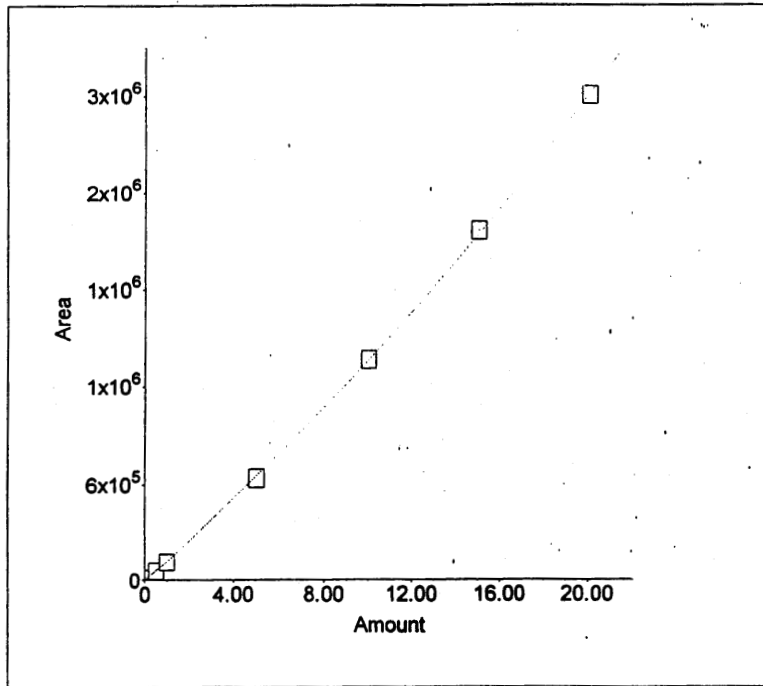
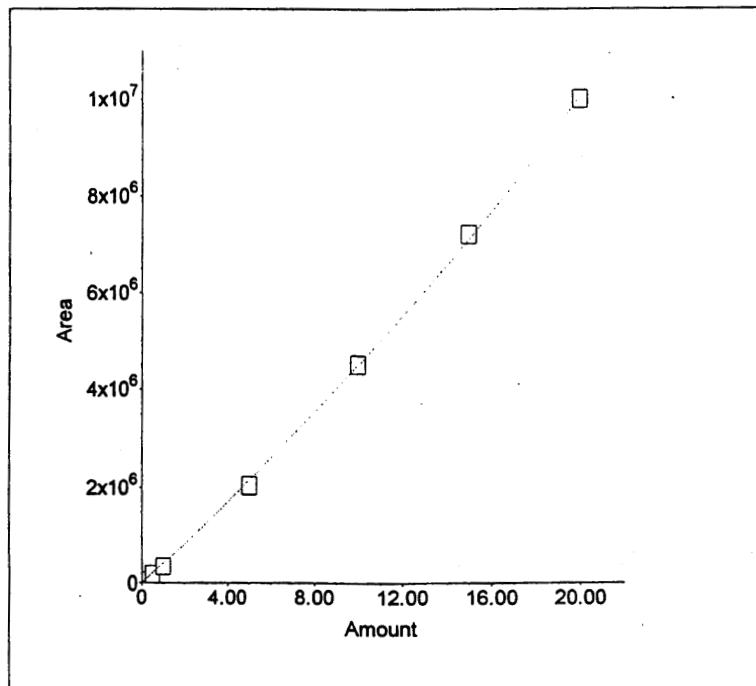
Standard:External Fit Type:Quadratic

Origin:Force Calibration:Area

$r^2=0.999897$

Amt= $-3.755264e-013 \cdot \text{Resp}^2 + 7.472485e-006 \cdot \text{Resp} + 0$

010237



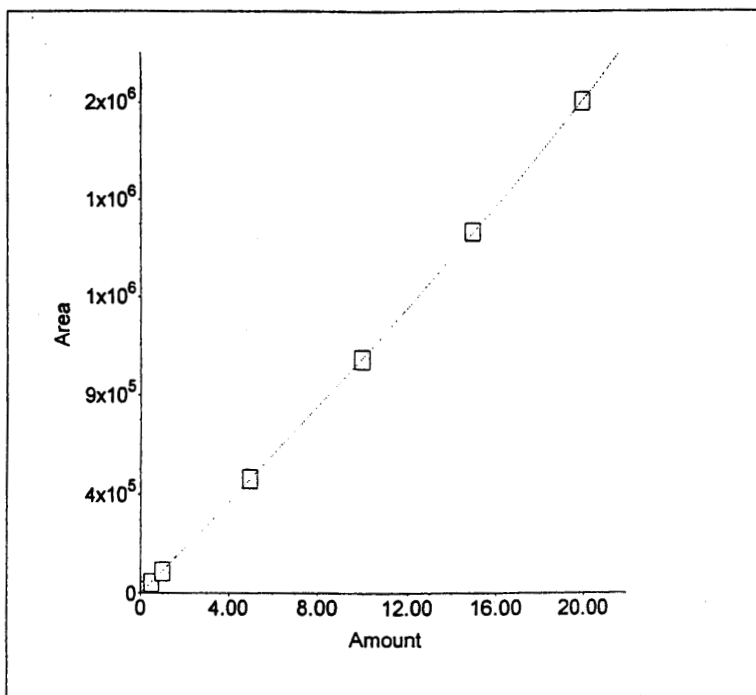
7. Component:SULFATE

Standard:External Fit Type:Quadratic

Origin:Force Calibration:Area

$r^2=0.999985$

Amt= $-3.966894e-013 \cdot \text{Resp}^2 + 9.318922e-006 \cdot \text{Resp} + 0$



Sample Name : 0 PPM 147-08-IC4

Dilution Factor : 1.00

Injection Number : 1

Data File Name : c:\peaknet\data\040420a\040310_001.DXD

Method File Name : c:\peaknet\method\anions040420.met

Schedule File Name : c:\peaknet\schedule\040420.sch

Date Time Collected : 4/20/04 9:53:51 PM

Date Time Updated : 4/20/04 10:08:25 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-#015724 AG14-#1018096

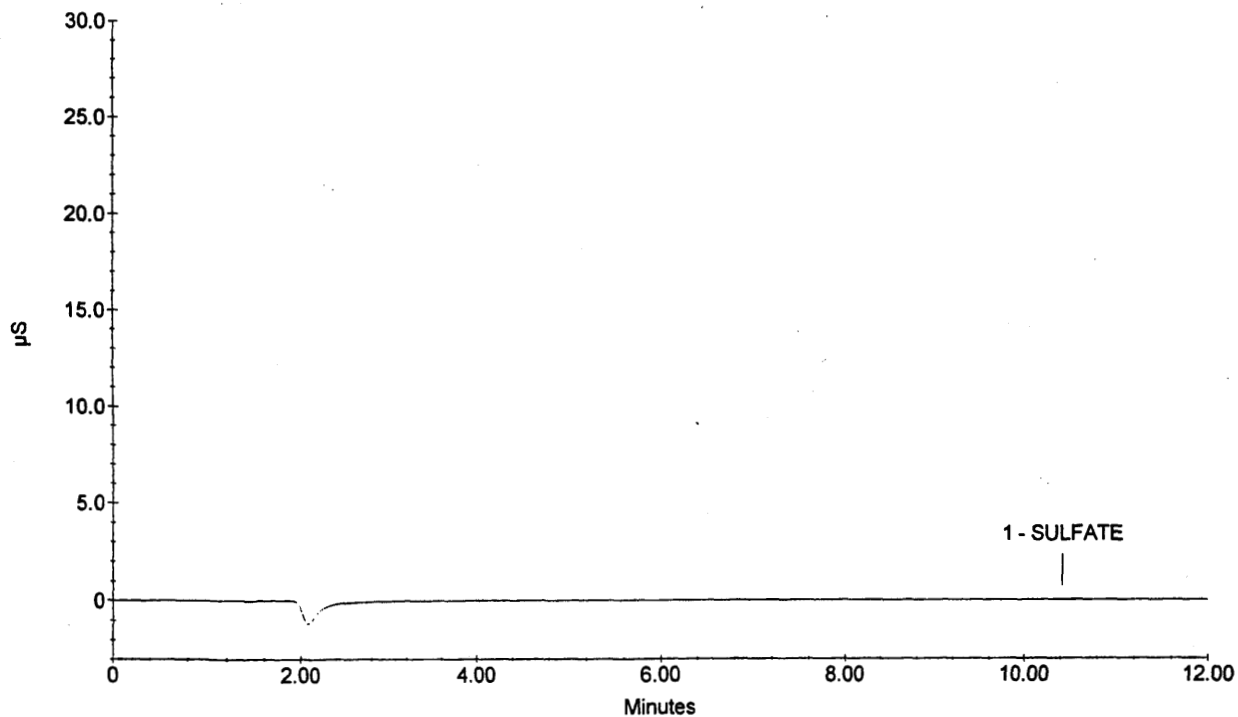
System Operator : RSS

010238

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	10.41	SULFATE CHLORIDE NITRITE-N BROMIDE NITRATE-N PHOSPHATE-P SULFATE	0.00	863	72
1	10.41	SULFATE	0.00	863	72

0 PPM 147-08-IC4



Sample Name : 0.1 PPM 147-07-IC4

Dilution Factor : 1.00

Injection Number : 2

Data File Name : c:\peaknet\data\040420a\040310_002.DXD

Method File Name : c:\peaknet\method\anions\040420.met

Schedule File Name : c:\peaknet\schedule\040420.sch

Date Time Collected : 4/20/04 10:08:29 PM

Date Time Updated : 4/20/04 10:23:04 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-#015724 AG14-#1018096

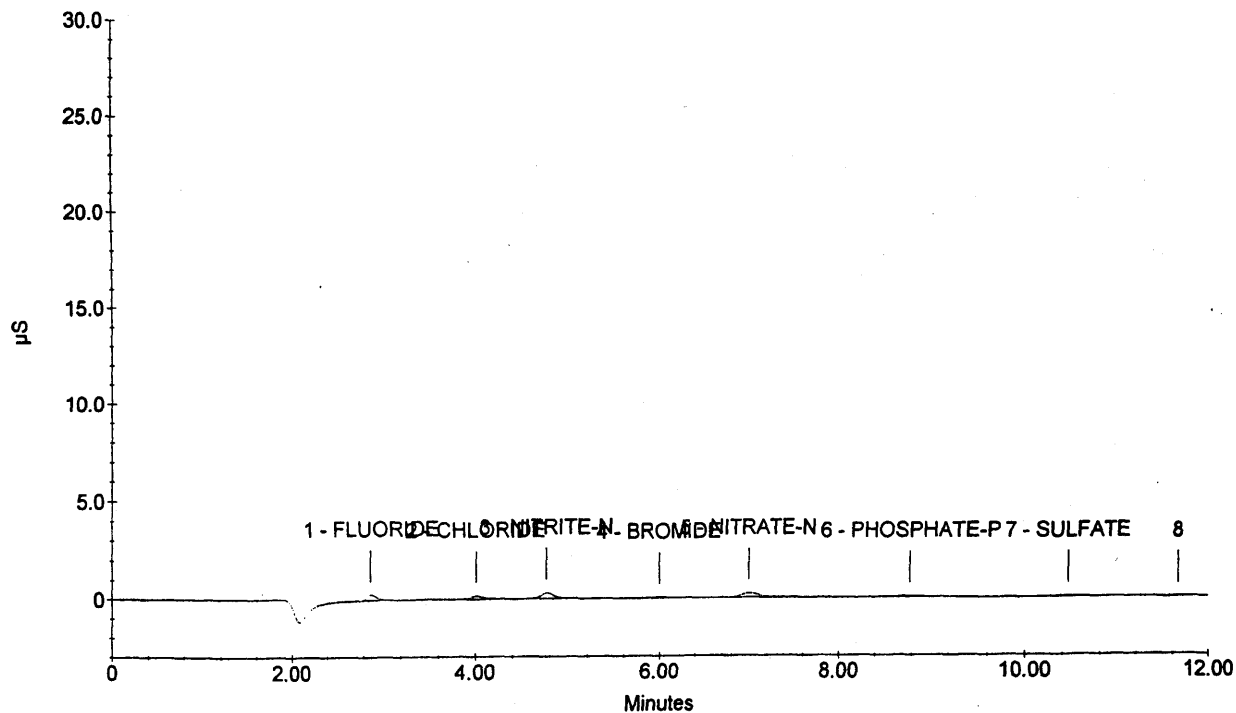
System Operator : RSS

010239

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.88	FLUORIDE	0.10	18319	2789
2	4.01	CHLORIDE	0.10	16811	1738
3	4.77	NITRITE-N	0.10	28889	3014
4	6.00	BROMIDE	0.10	5593	502
5	7.00	NITRATE-N	0.10	33049	2350
6	8.78	PHOSPHATE-P	0.10	11059	613
7	10.46	SULFATE	0.10	11158	528

0.1 PPM 147-07-IC4



Sample Name : 0.5 PPM 147-06-IC4

Dilution Factor : 1.00

Injection Number : 3

Data File Name : c:\peaknet\data\040420a\040310_003.DXD

Method File Name : c:\peaknet\method\anions040420.met

Schedule File Name : c:\peaknet\schedule\040420.sch

Date Time Collected : 4/20/04 10:23:10 PM

Date Time Updated : 4/20/04 10:37:43 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-#015724 AG14-#1018096

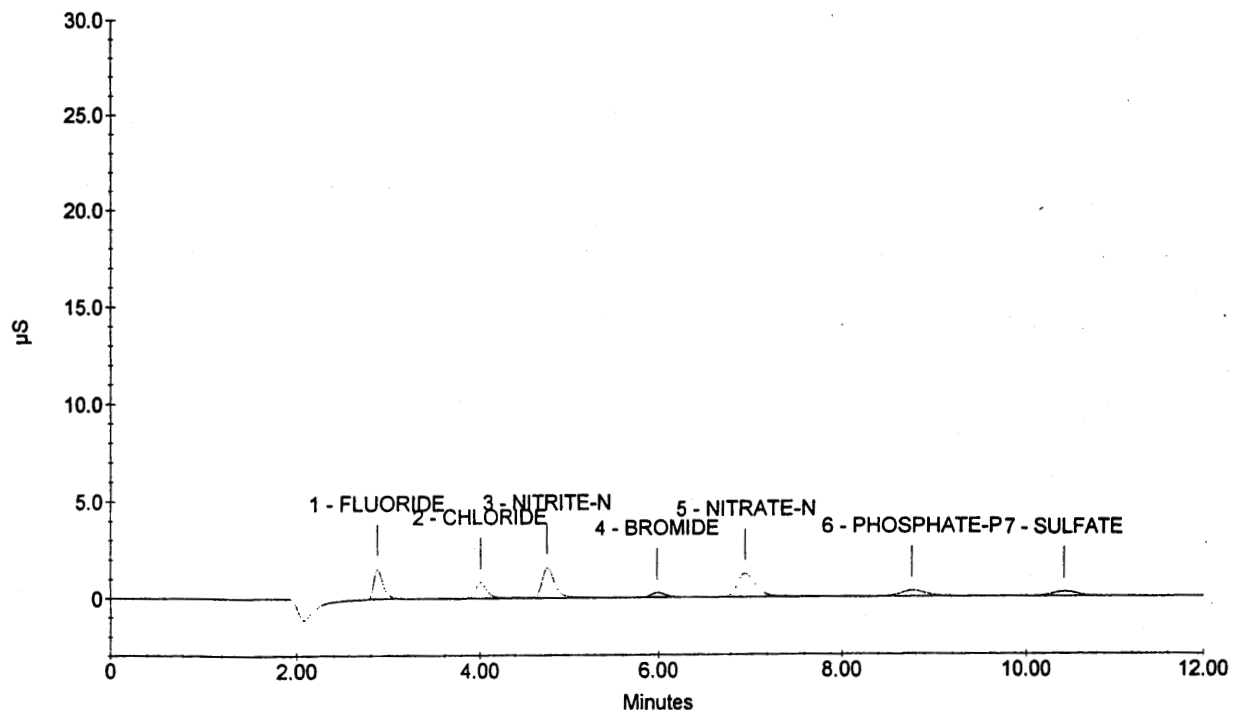
System Operator : RSS

010240

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.88	FLUORIDE	0.50	107119	15538
2	4.01	CHLORIDE	0.50	74993	8511
3	4.76	NITRITE-N	0.50	156006	15619
4	5.98	BROMIDE	0.50	30051	2518
5	6.96	NITRATE-N	0.50	173033	12269
6	8.76	PHOSPHATE-P	0.50	63628	3182
7	10.42	SULFATE	0.50	51323	2502

0.5 PPM 147-06-IC4



Sample Name : 1 PPM 147-05-IC4

Dilution Factor : 1.00

Injection Number : 4

Data File Name : c:\peaknet\data\040420a\040310_004.DXD

Method File Name : c:\peaknet\method\anions040420.met

Schedule File Name : c:\peaknet\schedule\040420.sch

Date Time Collected : 4/20/04 10:37:48 PM

Date Time Updated : 4/20/04 10:52:22 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-#015724 AG14-#1018096

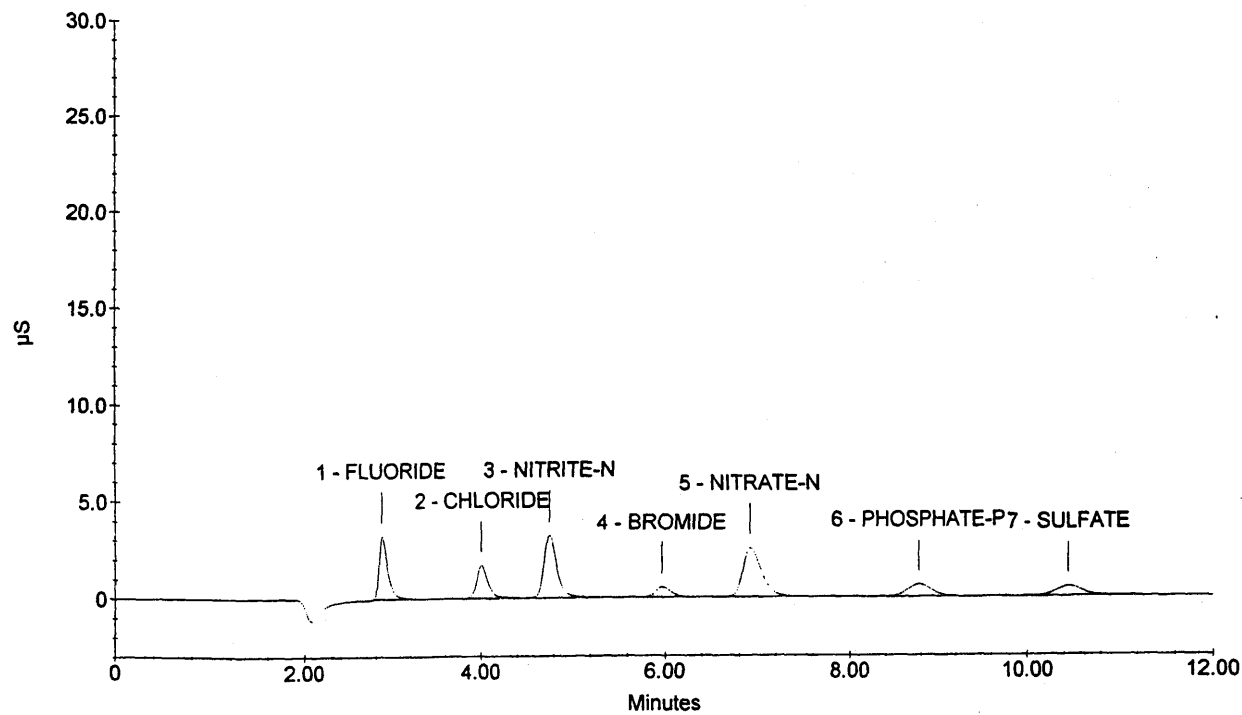
System Operator : RSS

010241

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.88	FLUORIDE	1.00	221360	32303
2	4.01	CHLORIDE	1.00	149962	16962
3	4.76	NITRITE-N	1.00	323570	32434
4	5.97	BROMIDE	1.00	60560	5149
5	6.92	NITRATE-N	1.00	355512	25118
6	8.77	PHOSPHATE-P	1.00	125936	6426
7	10.44	SULFATE	1.00	105133	5028

1 PPM 147-05-IC4



Sample Name : 5 PPM 147-04-IC4

Dilution Factor : 1.00

Injection Number : 5

Data File Name : c:\peaknet\data\040420a\040310_005.DXD

Method File Name : c:\peaknet\method\anions040420.met

Schedule File Name : c:\peaknet\schedule\040420.sch

Date Time Collected : 4/20/04 10:52:27 PM

Date Time Updated : 4/20/04 11:07:01 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-#015724 AG14-#1018096

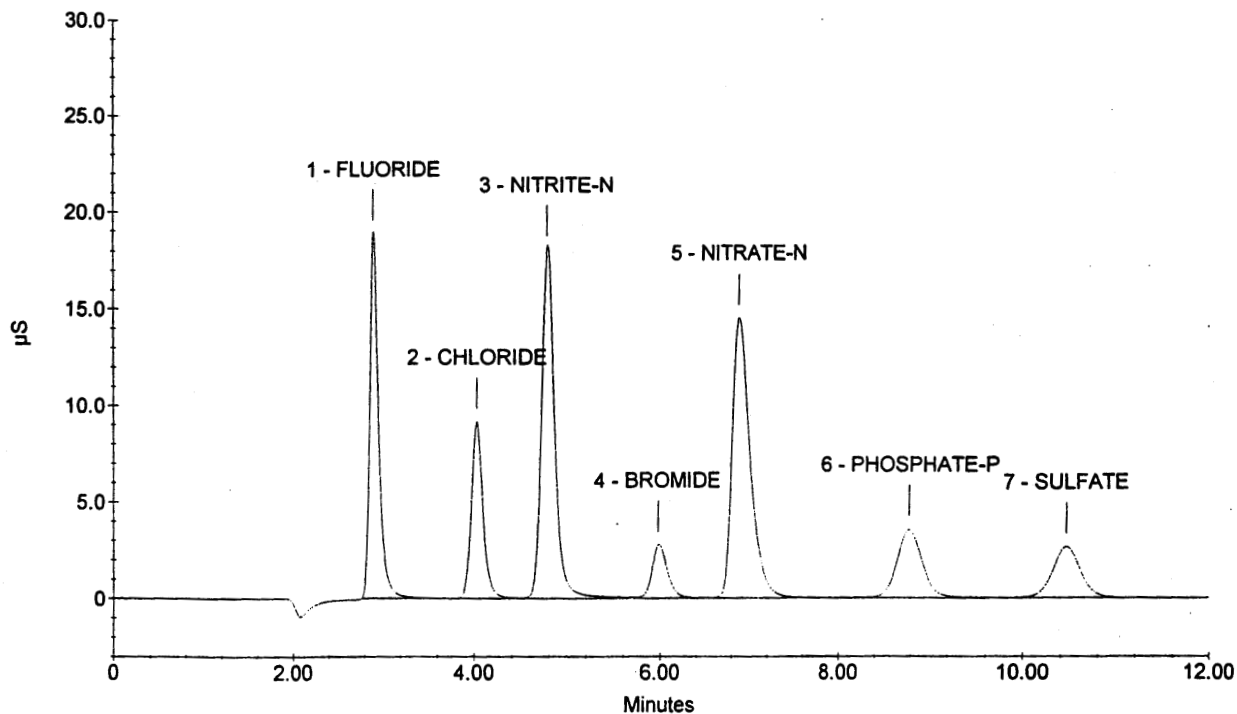
System Operator : RSS

010242

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.89	FLUORIDE	5.00	1280883	188409
2	4.02	CHLORIDE	5.00	788307	91335
3	4.77	NITRITE-N	5.00	1809370	180362
4	5.97	BROMIDE	5.00	330995	27375
5	6.86	NITRATE-N	5.00	2043782	144858
6	8.77	PHOSPHATE-P	5.00	676037	35132
7	10.45	SULFATE	5.00	549367	26190

5 PPM 147-04-IC4



Sample Name : 10 PPM 147-03-IC4

Dilution Factor : 1.00

Injection Number : 6

Data File Name : c:\peaknet\data\040420a\040310_006.DXD

Method File Name : c:\peaknet\method\anions\040420.met

Schedule File Name : c:\peaknet\schedule\040420.sch

Date Time Collected : 4/20/04 11:07:07 PM

Date Time Updated : 4/20/04 11:21:41 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-#015724 AG14-#1018096

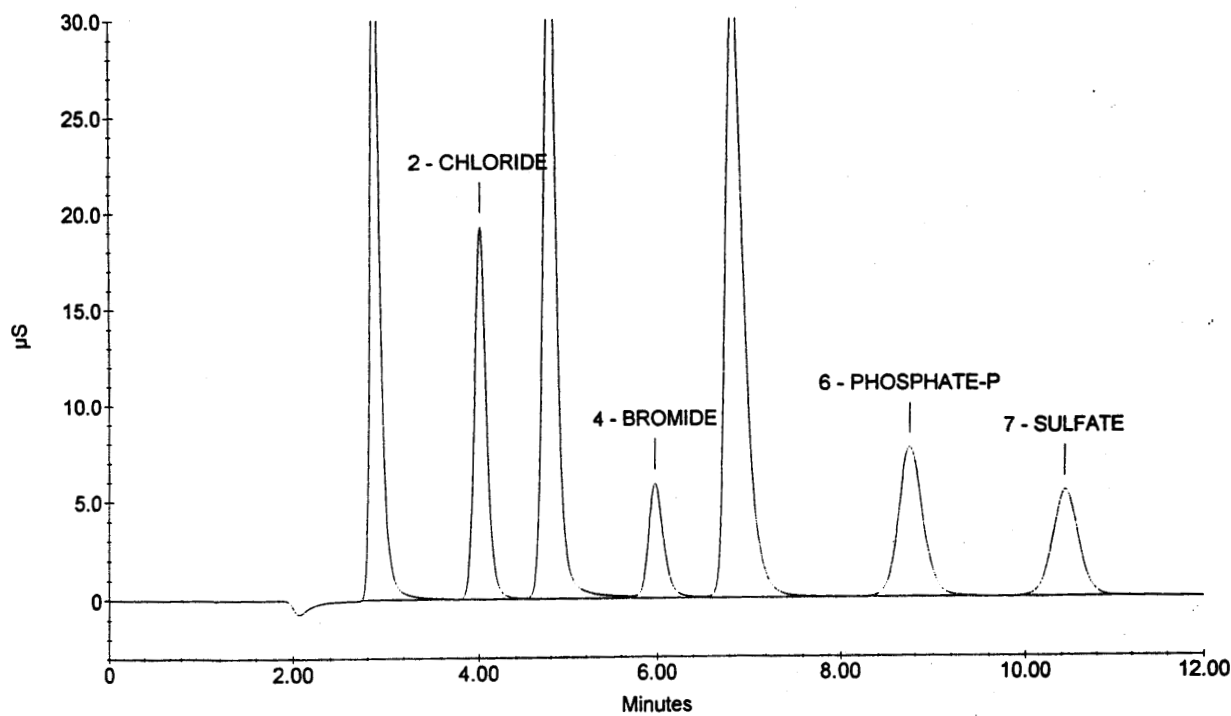
System Operator : RSS

010243

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.89	FLUORIDE	10.00	2737065	386731
2	4.02	CHLORIDE	10.00	1696803	192569
3	4.78	NITRITE-N	10.00	3778355	371173
4	5.97	BROMIDE	10.00	686832	58413
5	6.81	NITRATE-N	10.00	4519802	314669
6	8.74	PHOSPHATE-P	10.00	1441734	76461
7	10.42	SULFATE	10.00	1122694	54137

10 PPM 147-03-IC4



Sample Name : 15 PPM 147-02-IC4

Dilution Factor : 1.00

Injection Number : 7

Data File Name : c:\peaknet\data\040420a\040310_007.DXD

Method File Name : c:\peaknet\method\anions040420.met

Schedule File Name : c:\peaknet\schedule\040420.sch

Date Time Collected : 4/20/04 11:21:47 PM

Date Time Updated : 4/20/04 11:36:20 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-#015724 AG14-#1018096

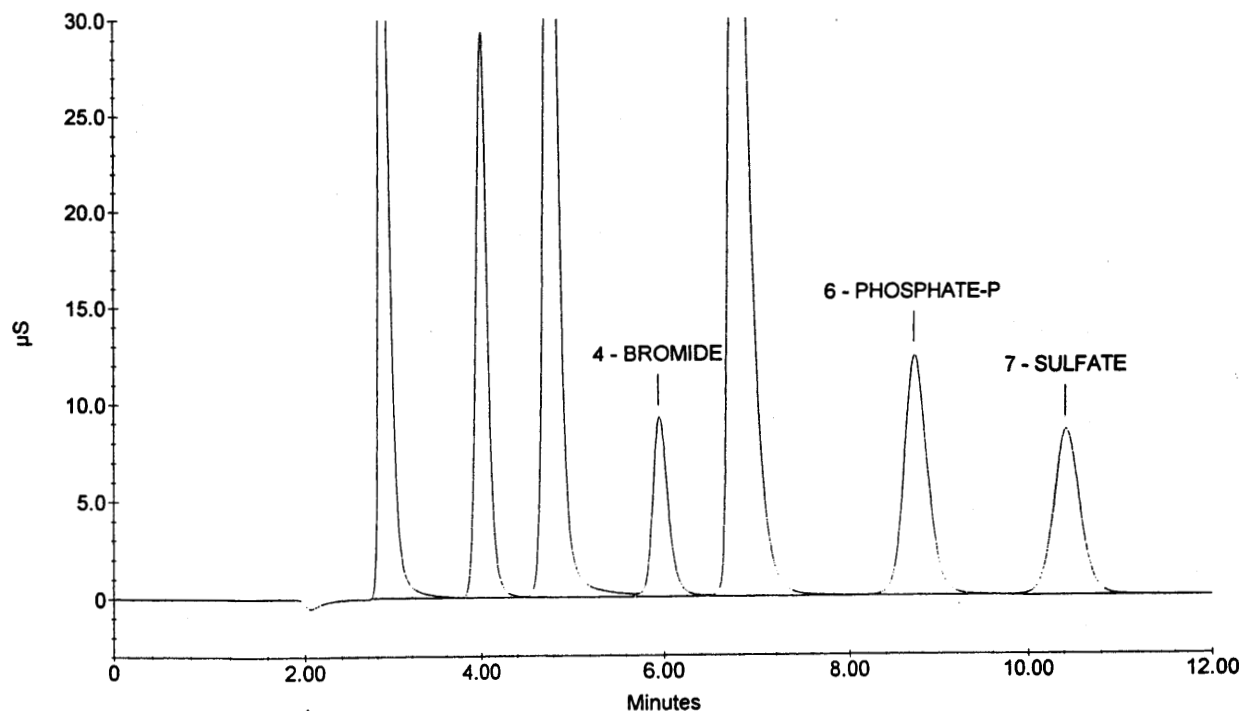
System Operator : RSS

010244

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.89	FLUORIDE	15.00	4177109	552888
2	4.02	CHLORIDE	15.00	2688431	293273
3	4.80	NITRITE-N	15.00	5730746	545022
4	5.94	BROMIDE	15.00	1066642	91268
5	6.77	NITRATE-N	15.00	7222347	496708
6	8.70	PHOSPHATE-P	15.00	2286699	122840
7	10.40	SULFATE	15.00	1745255	84660

15 PPM 147-02-IC4



Sample Name : 20 PPM 147-01-IC4

Dilution Factor : 1.00

Injection Number : 8

Data File Name : c:\peaknet\data\040420a\040310_008.DXD

Method File Name : c:\peaknet\method\anions040420.met

Schedule File Name : c:\peaknet\schedule\040420.sch

Date Time Collected : 4/20/04 11:36:25 PM

Date Time Updated : 4/20/04 11:50:59 PM

System Name : Dx-500

Detector Name : Conductivity Detector

Column Type : AS14-#015724 AG14-#1018096

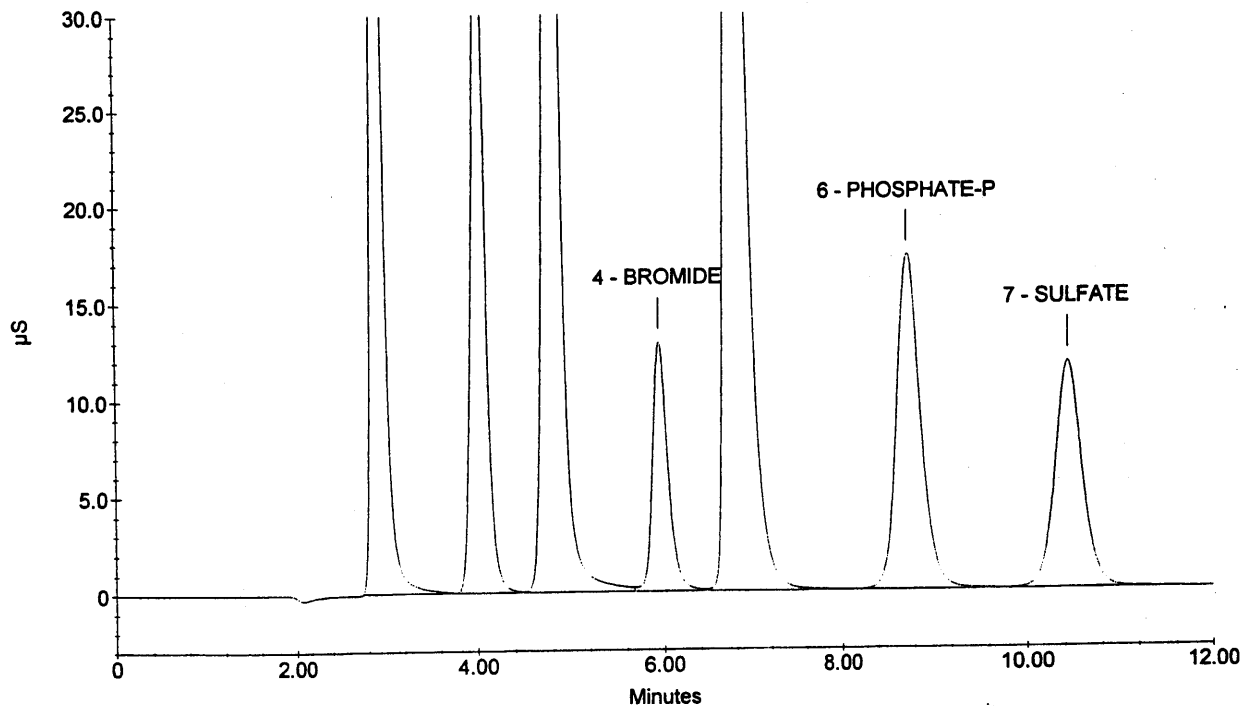
System Operator : RSS

010245

Peak Information : All Components

Peak Number	Peak Retention Time	Component Name	Concentration, ppm (ppm)	Peak Area	Peak Height
1	2.92	FLUORIDE	20.00	5544111	726338
2	4.02	CHLORIDE	20.00	3712925	382664
3	4.81	NITRITE-N	20.00	7616766	690331
4	5.94	BROMIDE	20.00	1469814	128470
5	6.73	NITRATE-N	20.00	10028721	676278
6	8.70	PHOSPHATE-P	20.00	3175648	172099
7	10.42	SULFATE	20.00	2386278	117297

20 PPM 147-01-IC4



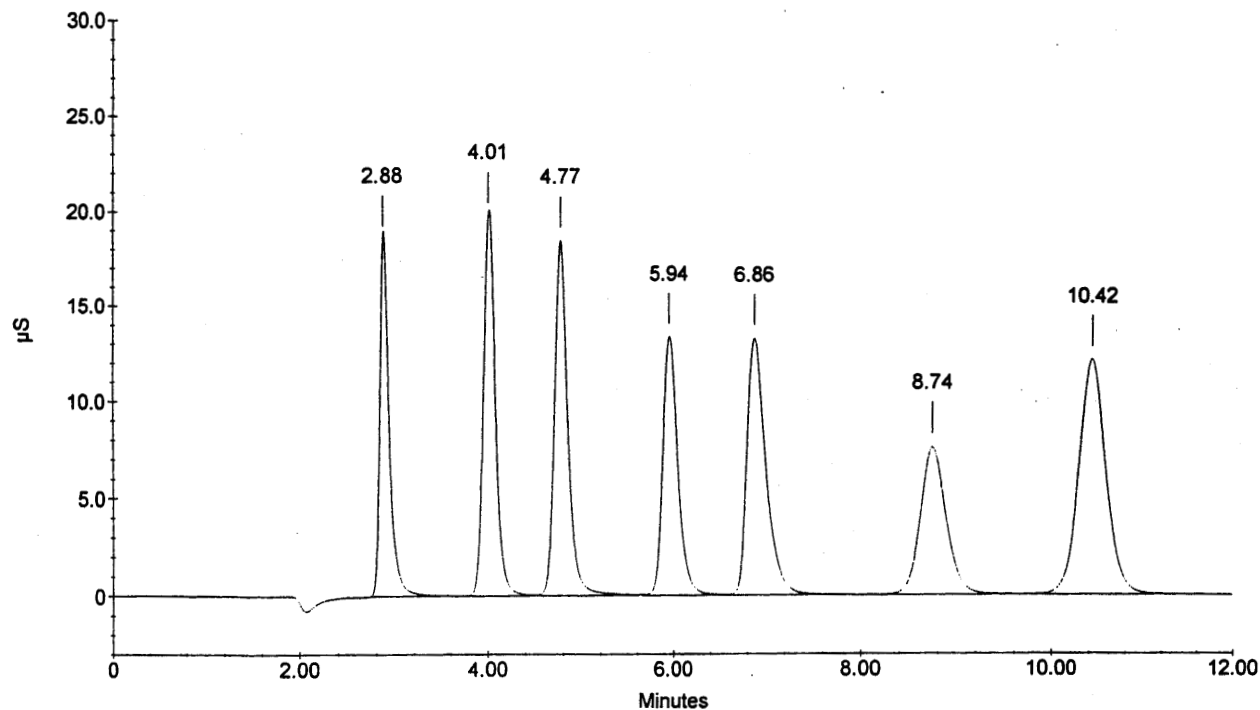
Sample Name : ICV
 Dilution Factor : 20.00
 Injection Number : 9
 Data File Name : c:\peaknet\data\040420a\040310_009.DXD
 Method File Name : ...ANIONS040420.met
 Schedule File Name : c:\peaknet\schedule\040420.sch

Date Time Collected : 4/20/04 11:51:04 PM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010246

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	2.88	FLUORIDE	101.700	185223	1308587	1	-1.48
2	4.01	CHLORIDE	204.513	197196	1737950	2	-0.25
3	4.77	NITRITE-N	98.361	184361	1834344	2	-0.83
4	5.94	BROMIDE	412.120	132987	1523236	2	0.06
5	6.86	NITRATE-N	87.014	132260	1865537	2	1.98
6	8.74	PHOSPHATE-P	197.191	75522	1420908	2	0.50
7	10.42	SULFATE	410.936	120646	2463101	2	0.03
			—total(s)—				
0.00			1511.834		12153662		

ICV



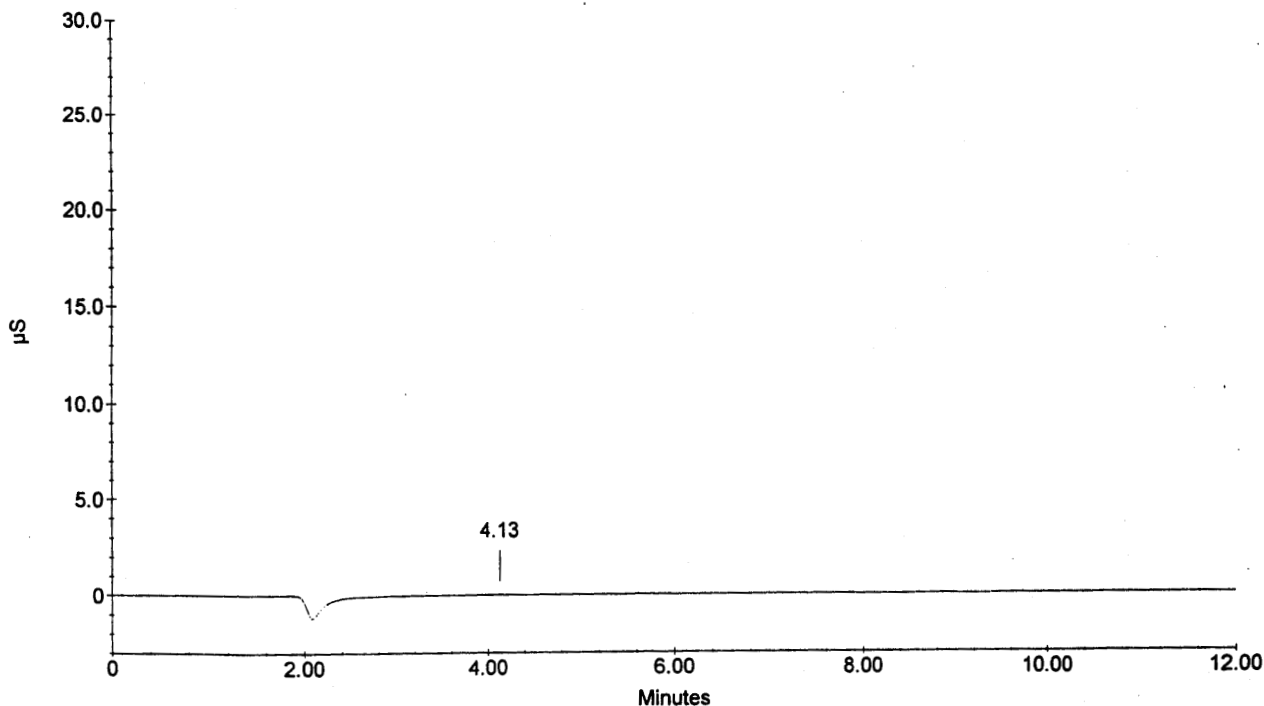
Sample Name : ICB
 Dilution Factor : 1.00
 Injection Number : 10
 Data File Name : c:\peaknet\data\040420a\040310_010.DXD
 Method File Name : ...ANIONS040420.met
 Schedule File Name : c:\peaknet\schedule\040420.sch

Date Time Collected : 4/21/04 12:05:43 AM
 System Name : Dx-500
 Detector Name : Conductivity Detector
 Column Type : AS14-#015724 AG14-#1018096
 System Operator : RSS

010247

Peak Information : All Components							
Pk. Num	Ret Time	Component Name	Concentration (ppm)	Height	Area	Bl. Code	%Delta
1	4.13	CHLORIDE	0.005	80	863	1	2.74
1	4.13	CHLORIDE	0.005	80	863	1	2.74
		NITRITE-N					
		BROMIDE					
		NITRATE-N					
		PHOSPHATE-P					
		SULFATE					
—total(s)—							
	0.00		0.011		1726		

ICB



010248

SOUTHWEST RESEARCH INSTITUTE

NUCLEAR PROJECT

CLIENT: Division 20

TASK ORDER: 040415-2

SRR: 25770

SDG: 243222

CASE: CNWRA

VTSR: April 14, 2004

PROJECT#: 06002.01.141

Certificates of Analysis

010249

**FISHER SCIENTIFIC
TRACEMETAL GRADE NITRIC ACID
CERTIFICATE OF ANALYSIS**

Catalog No. A509

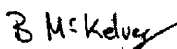
Lot No: 1104010

Release Date: January, 2004

Expiry Date: January, 2007

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

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



Dr. B. McKelvey
QA/QC Manager

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



Fisher Chemical

A Fisher Scientific Company

INORGANIC LABS/PAADCHEM LABS
 DATE RECEIVED: 06/10/04
 DATE EXPIRED: 01/01/2007
 DATE OPENED: 06/10/04
 INDRG: Y580-4585 PO: F53393

010250

**FISHER SCIENTIFIC
TRACEMETAL GRADE NITRIC ACID
CERTIFICATE OF ANALYSIS**

Catalog No. A506

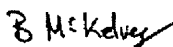
Lot No: 1104020

Release Date: February, 2004

Expiry Date: February, 2007

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

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



Dr. B. McKelvey
QA/QC Manager

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



Fisher Chemical

A Fisher Scientific Company

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 05/05/04
DATE EXPIRED: 08/01/2007
DATE OPENED: 05/05/04
INORG: 4558-4563, PO: F53373

010251

FISHER SCIENTIFIC
TRACEMETAL GRADE HYDROCHLORIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A508

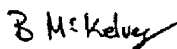
Lot No: 4103101

Release Date: January, 2004

Expiry Date: January, 2007

Tests	Units	Value
Assay	%	35%
Color	APHA	<10
Aluminum	ppb	<0.5
Antimony	ppb	<0.1
Arsenic	ppb	<0.1
Barium	ppb	<0.1
Beryllium	ppb	<0.1
Bismuth	ppb	<0.1
Boron	ppb	<0.5
Cadmium	ppb	<0.1
Calcium	ppb	<0.5
Chromium	ppb	<0.1
Cobalt	ppb	<0.1
Copper	ppb	<0.1
Iron	ppb	<0.5
Lead	ppb	<0.1
Lithium	ppb	<0.1
Magnesium	ppb	<0.5
Manganese	ppb	<0.1
Mercury	ppb	<0.2
Molybdenum	ppb	<0.1
Nickel	ppb	<0.1
Potassium	ppb	<0.1
Selenium	ppb	<0.1
Silver	ppb	<0.1
Sodium	ppb	<0.5
Strontium	ppb	<0.1
Thorium	ppb	<0.1
Tin	ppb	<0.1
Titanium	ppb	<0.1
Uranium	ppb	<0.1
Vanadium	ppb	<0.1
Zinc	ppb	<0.5
Zirconium	ppb	<0.1

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



Dr. B. McKelvey
 QA/QC Manager

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



Fisher Chemical

A Fisher Scientific Company

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 06/01/04
 DATE EXPIRED: 01/01/2007
 DATE OPENED: 06/01/04
 INORG: 4586-4591 PO: F53393

010252

FISHER SCIENTIFIC
TRACEMETAL GRADE HYDROCHLORIC ACID

CERTIFICATE OF ANALYSIS

Catalog No. A508

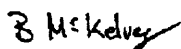
Lot No: 4103101

Release Date: January, 2004

Expiry Date: January, 2007

Tests	Units	Value
Assay	%	35%
Color	APHA	<10
Aluminum	ppb	<0.5
Antimony	ppb	<0.1
Arsenic	ppb	<0.1
Barium	ppb	<0.1
Beryllium	ppb	<0.1
Bismuth	ppb	<0.1
Boron	ppb	<0.5
Cadmium	ppb	<0.1
Calcium	ppb	<0.5
Chromium	ppb	<0.1
Cobalt	ppb	<0.1
Copper	ppb	<0.1
Iron	ppb	<0.5
Lead	ppb	<0.1
Lithium	ppb	<0.1
Magnesium	ppb	<0.5
Manganese	ppb	<0.1
Mercury	ppb	<0.2
Molybdenum	ppb	<0.1
Nickel	ppb	<0.1
Potassium	ppb	<0.1
Selenium	ppb	<0.1
Silver	ppb	<0.1
Sodium	ppb	<0.5
Strontium	ppb	<0.1
Thorium	ppb	<0.1
Tin	ppb	<0.1
Titanium	ppb	<0.1
Uranium	ppb	<0.1
Vanadium	ppb	<0.1
Zinc	ppb	<0.5
Zirconium	ppb	<0.1

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



Dr. B. McKelvey
 QA/QC Manager

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



Fisher Chemical

A Fisher Scientific Company

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 05/05/04
 DATE EXPIRED: 01/01/2007
 DATE OPENED: 05/05/04
 INDRG: 4552-4557 PO: F53373

010253

SPEXertificate™

Certificate of Reference Material

Catalog Number: SPIKE-1 **Lot No.:** 25-23AS
Description: Spike Sample Standard 1
Matrix: 5% Nitric Acid/tr Tartaric Acid - HF

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM	Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
Al	200	199.51	3101a	Pb	50	49.98	3128
As	200	199.89	3103a	Sb	50	50.02	3102a
Ba	200	199.68	3104a	V	50	49.95	3165
Se	200	200.10	3149	Zn	50	50.02	3168a
TL	200	200.07	3158	Cu	25	25.34	3114
Fe	100	99.91	3126a	Cr	20	20.04	3112a
Co	50	50.25	3113	Ag	5	5.00	3151
Mn	50	49.98	3132	Be	5	5.00	3105a
Ni	50	50.11	3136	Cd	5	4.99	3108

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

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

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

INORGANIC LABS/PAADCHEM LABS
 DATE RECEIVED: 10/31/03
 DATE EXPIRED: 10/31/04
 DATE OPENED: 11/3/03
 INORG: 4306 PO: PS2001
 PK

Report of Certification

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



SPEXertificate™

Certificate of Reference Material

Catalog Number: ICAL-1 **Lot No.:** 25-178AS
Description: Instrument Calibration Standard 1
Matrix: 5% Nitric Acid

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
Ca	5,000	4,984.92	3109a
K	5,000	4,990.26	3141a
Mg	5,000	4,991.82	3131a
Na	5,000	4,998.07	3152a

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

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

Date of Certification: MAR 22 2004 Certifying Officer: N. Kochertakota

INORGANIC LABS/EA/CHEM LABS
 DATE RECEIVED: 03/30/04
 DATE EXPIRED: 03/30/05
 DATE OPENED: 03/30/04
 INORG: 4514 PO: F53361

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



010257

**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**

Catalog Number: CGSC10-1and CGSC10-5

10,000 µg/mL Scandium IN 5% HNO₃ (abs)Lot Number: **T-SC02053**

Starting Material: Sc₂O₃
 Starting Material Purity: 99.999%
 Starting Material Lot No: 632-5721

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 09/24/03
 DATE EXPIRED: 10/01/2004 VOS
 DATE OPENED: 09/24/03
 INORG: 4262 PO: F52032

CERTIFIED CONCENTRATION: 10,047 ± 29 µg/mL

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

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

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

(\bar{x}) = mean x_i = individual results

n = number of measurements

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

Classical Wet Assay: 10,047 ± 29 µg/mL

Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 9994 ± 41 µg/mL

Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3148a.

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

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

Custom-Grade solutions tested for trace metallic impurities by ICP-MS were analyzed in an ULPA-Filtered Clean Room.

An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

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

M - checked by ICP-MS

O - checked by ICP-OES

i - spectral interference

n - not checked for

s - solution standard element

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

(over)

QA:KL Rev.0212000H

Quality Assurance Manager

Expires:

EXPIRES

01/22/04

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 -	<u>The length of time that a properly stored and packaged standard will remain within the specified uncertainty.</u> 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 -	<u>The date after which a standard solution should not be used.</u> 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 μ m 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 238090.

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

SPEXTM Certificate

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 $\pm 0.5\%$ of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: APR '04 Certifying Officer: N. Kocherakota

INORGANIC LABS/RADIOCHEM LABS
DATE RECEIVED: 5/17/04
DATE EXPIRED: 5/31/05
DATE OPENED: 5/11/04
INORG: 4564 PO: F53371

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



SPEXcertificate™

Certificate of Reference Material

Catalog Number: PLLI2-2X/2Y

Lot No. 10-12LI

Description: 1000 mg/L Lithium

Matrix: 2% HNO₃

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

Certified Value: 997.5 mg/L

Uncertainty Associated with Measurement: ± 3 mg/L

Certified Value is Traceable to: NIST SRM 3129a

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

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

Instrumentation Analysis By ICP spectrometer: 998 mg/L

Uncertified Properties:

Density: 1.014 @ 22.2 Degrees Celsius

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

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

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

Date of Certification: JAN '04

Certifying Officer: N. Kocherakota

DATE RECEIVED: 01/23/04
 DATE EXPIRED: 01/26/2005
 DATE OPENED: 01/23/04
 INORG: 4439
 PO: F52306

Report of Certification

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001 CERTIFIED

SPEXTM Certificate

Certificate of Reference Material

Catalog Number: PLMO9-2X/2Y/2T **Lot No.** 10-74MO
Description: 1000 mg/L Molybdenum
Matrix: H₂O

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

Certified Value: 998 mg/L
Uncertainty Associated with Measurement: +/-3.0mg/L
Certified Value is Traceable to: NIST SRM #3134

The CRM is prepared gravimetrically using high purity (NH₄)₆Mo₇(O)₂₄ Lot# 03011C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis. Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 998 mg/L

Method: Precipitation using 8 Hydroxy Quinoline, filter, dry and weigh as MoO₃ (C₉H₆NO)₂.

Instrumental Analysis by ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 0.9989 @ 23.7 Degrees Celsius

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

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

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

Date of Certification: JAN 04 **Certifying Officer:** N. Kocherakota

DATE RECEIVED: 01/23/04
 DATE EXPIRED: 01/30/2005
 DATE OPENED: 01/23/04
 INORG: 4490 PO: F58206

Report of Certification

010264

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
CERTIFIED

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 10/31/03
 DATE EXPIRED: 10/31/04
 DATE OPENED: 11/30/03
 INORG: 4307 PO: F50261

SPEXTM Certificate

Certificate of Reference Material

Catalog Number: PLP9-2X/2Y/2T

Lot No. 9-150P

Description: 1000 mg/L Phosphorus

Matrix: H₂O

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

Certified Value: 1002.5 mg/L

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

Certified Value is Traceable to: NIST SRM 3139a

The CRM is prepared gravimetrically using high purity (NH₄)H₂(PO₄) Lot# W1002B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1003 mg/L

Method: Precipitation using Magnesia Mixture. Filter, ignite, and weigh as Mg₂P₂O₇.

Instrumentation Analysis By ICP spectrometer: 1002 mg/L

Uncertified Properties:

Density: 0.9996 @ 24.0 Degrees Celsius

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

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

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

Date of Certification: OCT - - 2003

Certifying Officer: N. Kocherakota

Report of Certification

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
CERTIFIED

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

Always Providing Superior Quality . . . Unparalleled Service™

010267

SPEXTM Certificate

Certificate of Reference Material

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

Lot No. 10-07SI

Description: 1000 mg/L Silicon

Matrix: H₂O / 0.4% F-

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

Certified Value: 998.5 mg/L

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

Certified Value is Traceable to: NIST SRM #3150

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

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

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

Instrumentation Analysis By ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 1.010 @ 26.5 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.002	Cu	<0.001	Pb	<0.001
As	<0.001	Fe	0.020	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	<0.003	In	<0.001	Sr	<0.001
Ba	<0.001	K	<0.010	Sb	0.03
Be	<0.001	Li	<0.001	Ti	<0.001
Bi	<0.001	Mg	<0.001	Tl	<0.001
Ca	0.018	Mn	<0.001	V	<0.001
Cr	<0.002	Mo	<0.001	Zr	0.05
Cd	<0.001	Na	0.02	Zn	0.06
Co	<0.001	Ni	0.001		

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

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

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 09/05/03
 DATE EXPIRED: 08/30/2004
 DATE OPENED: 09/05/03
 INORG: 4230 FID: 55005

Report of Certification

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



SPEXTM Certificate

Certificate of Reference Material

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

Lot No. 10-38TI

Description: 1000 mg/L Titanium

Matrix: H₂O/ 0.24% F-

This ASSURANCE[®] certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods 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 #3162a

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

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1003 mg/L

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

Instrumentation Analysis By ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.001 @ 22.5 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.006	Cu	<0.10	Pb	<0.001
As	<0.001	Fe	<0.01	Rb	<0.001
Ag	<0.001	Ga	<0.001	Re	<0.001
B	0.003	In	<0.001	Si	0.52
Ba	<0.001	K	<0.01	Sr	0.001
Be	<0.001	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	<0.001	Tl	<0.001
Ca	0.013	Mn	<0.001	V	<0.001
Cr	<0.003	Mo	<0.001	Zr	0.01
Cd	<0.001	Na	0.02	Zn	0.03
Co	0.002	Ni	<0.001		

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

Date of Certification: AUG '03

Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 09/05/03
 DATE EXPIRED: 08/30/2004
 DATE OPENED: 09/05/03
 INFO: 4234 PU: F52805

Report of Certification

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



010271

SPEXTM Certificate

Certificate of Reference Material

Catalog Number: PLSR2-2X/2Y/2T **Lot No.** 9-166SR
Description: 1000 mg/L Strontium in 2% HNO₃
Matrix: 2% HNO₃

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

Certified Value: 1002.5 mg/L
Uncertainty Associated with Measurement: +/- 3 mg/L
Certified Value is Traceable to: NIST SRM 3153a

The CRM is prepared gravimetrically using high purity Strontium Carbonate Lot# 02001B. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis. Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1002 mg/L

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

Instrumentation Analysis By ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 1.010 @ 22.7 Degrees Celsius

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

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

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

Date of Certification: OCT -- 2003 **Certifying Officer:** N. Kocherakota

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 10/31/03
 DATE EXPIRED: 10/31/04
 DATE OPENED: 11/3/03
 INORG: 4308 PO: F53001

Report of Certification

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

**ISO 9001
CERTIFIED**

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
Always Providing Superior Quality . . . Unparalleled Service™

010273

SPXertificate™

Certificate of Reference Material

Catalog Number: PLSN5-2X/2Y/2T

Lot No. 10-87SN

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: 1003 mg/L

Uncertainty Associated with Measurement: ± 3.0 mg/L

Certified Value is Traceable to: NIST SRM 3161a

The CRM is prepared gravimetrically using high purity Tin Metal Lot# 05021C. 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 Hydroxide. Filter, ignite, and weigh as SnO₂.

Instrumental Analysis by ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.034 @24.8C 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	0.004
As	<0.20	Fe	0.18	Rb	<0.001
Ag	0.006	Ga	<0.001	Re	<0.001
B	<0.002	In	0.05	Si	0.20
Ba	0.004	K	<0.20	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	0.003
Bi	<0.001	Mg	0.004	Ti	0.009
Ca	0.02	Mn	0.003	Tl	<0.001
Cr	0.02	Mo	<0.001	V	<0.40
Cd	0.002	Na	0.02	Zr	<0.001
Co	0.007	Ni	0.06	Zn	0.05

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

Date of Certification: APR '04

Certifying Officer: N. Kocherakota

INORGANIC LABS/KADACHEM LABS
 DATE RECEIVED: 5/3/04
 DATE EXPIRED: 4/30/05
 DATE OPENED: 5/11/04
 INORG: 4565
 PO: F333H

Report of Certification

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



010275

SPEXTM Certificate

Certificate of Reference Material

Catalog Number: PLBI4-2X/2Y

Lot No. 10-68BI

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: 1001 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: 1000 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@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	0.006	Cu	0.002	Pb	0.009
As	<0.001	Fe	0.001	Re	<0.001
Ag	<0.001	Ga	<0.001	Rb	<0.001
B	<0.003	In	<0.001	Sr	<0.001
Ba	<0.001	K	0.002	Sb	0.002
Be	<0.001	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	0.006	Mg	0.002	V	<0.001
Cr	<0.001	Na	0.009	Zr	<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 $\pm 0.5\%$ of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: FEB '04

Certifying Officer: N. Kocherakota

INORGANIC LABS/REAGENT LABS
 DATE RECEIVED: 02/25/04
 DATE EXPIRED: 02/28/2005
 DATE OPENED: 02/25/04
 INORG: WTS
 PO: F50382

Report of Certification

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001

CERTIFIED

SPXcertificate™

Certificate of Reference Material

Catalog Number: PLLA2-2X/2Y **Lot No.** 10-27LA
Description: 1000 mg/L Lanthanum
Matrix: 2% HNO₃

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

Instrumentation Analysis By ICP spectrometer: 999 mg/L

Uncertified Properties:

Density: 1.010 @ 22.3 Degrees Celsius

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

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

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

Date of Certification: JAN '04 **Certifying Officer:** N. Kocherakota

DATE RECEIVED: 01/30/04
 DATE EXP. 01/30/05
 DATE OPENED: 01/23/04
 INDRG: 4438
 PO: F52306

Report of Certification

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



SPEXTM Certificate

Certificate of Reference Material

Catalog Number: PLY2-2X/2Y/2T

Lot No. 9-152Y

Description: 1,000 mg/L Yttrium

Matrix: 2% HNO₃

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

Certified Value: 1001.5 mg/L

Uncertainty Associated with Measurement: ± 3 mg/L

Certified Value is Traceable to: NIST SRM 3167a.

The CRM is prepared gravimetrically using high purity Yttrium Oxide Lot# 08001A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1002 mg/L

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

Instrumentation Analysis By ICP spectrometer: 1001 mg/L

Uncertified Properties:

Density: 1.010 @ 24.8 Degrees Celsius

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

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

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

Date of Certification: JAN 04

Certifying Officer: N. Kocherakota

DATE RECEIVED: 01/23/04
 DATE EXP. 01/30/05
 DATE OPENED: 01/23/04
 INDRG: 4441
 PD: F52306

Report of Certification

010280

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

ASTM Guide D6362-98

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

ISO Guide 35: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

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 the certifying organization.

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 35, 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 uncertainty of the certified value listed on the reverse of this document is the total uncertainty U .

$$U = 2U_c + B \text{ mg/L}$$

Where U_c = combined uncertainty components associated with volumetric and gravimetric factors, B is the uncertainty component of two independent methods of analysis (including the systematic and random uncertainties)

$$95\% \text{ confidence limits} = X \pm t_{0.05} \sqrt{2} U_c^2$$

where X = grand mean

$t_{0.05}$ = the percentile of the student's t distribution for $(k-1)$ degrees of freedom.

Certification Traveler Report:

All certified values reported were derived from the Traveler Report identified by the lot number of this CRM. For further information contact the certifying organization.

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.



SPEX Certificate TM*Certificate of Reference Material***Catalog Number:** PLPD3-2X/2Y**Lot No.** 10-108PD**Description:** 1000 mg/L Palladium**Matrix:** 10% HCl

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

Certified Value: 1002.5 mg/L**Uncertainty Associated with Measurement:** +/- 3 mg/L**Certified Value is Traceable to:** NIST SRM 3138

The CRM is prepared gravimetrically using high purity Palladium Powder Lot# 01021A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.**Classical Wet Assay:** 1002 mg/L**Method:** Precipitation using Glyoxime. Filter, dry, and weigh as Pd(C₄H₇O₂N₂)₂**Instrumental Analysis by ICP spectrometer:** 1003 mg/L**Uncertified Properties:****Density:** 1.017 @ 23.6 Degrees Celsius**Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:**

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

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

Date of Certification: Jan 04**Certifying Officer:** N. Kocherakota

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 01/13/04
 DATE EXPIRED: 01/15/2005
 DATE OPENED: 01/13/04
 INORG: 4417
 PO: F52299

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
CERTIFIED

010283

SPEXTMertificate

Certificate of Reference Material

Catalog Number: PLS9-2X/2Y/2T

Lot No. 8-74S

Description: 1000 mg/L Sulfur

Matrix: H₂O

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

Certified Value: 1003 mg/L

Uncertainty Associated with Measurement: ± 3 mg/L

Certified Value is Traceable to: NIST SRM 3154

The CRM is prepared gravimetrically using high purity Ammonium Sulfate Lot# 05891M. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1003 mg/L

Method: Precipitation using barium chloride, filter, ignite and weigh as BaSO₄.

Instrumentation Analysis By ICP spectrometer: 1003 mg/L

Uncertified Properties:

Density: 1.007 @ 23.6 Degrees Celsius

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

Element	mg/L	Element	mg/L	Element	mg/L
Al	<0.001	Cu	<0.001	Pb	0.002
As	<0.001	Fe	0.008	Rb	<0.001
Ag	<0.001	Ga	<0.001	Rc	<0.001
B	<0.004	In	<0.001	Sn	<0.001
Ba	<0.001	K	<0.001	Sr	<0.001
Be	<0.001	Li	<0.001	Sb	<0.001
Bi	<0.001	Mg	0.005	Ti	<0.002
Ca	0.009	Mn	<0.001	Tl	<0.001
Cr	<0.004	Mo	<0.001	V	<0.001
Cd	<0.001	Na	0.02	Zr	<0.001
Co	<0.001	Ni	<0.001	Zn	0.0075

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

Date of Certification: JUN '03

Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 06/30/03
 DATE EXPIRED: 06/30/2004
 DATE OPENED: 06/23/03
 INORG: 4140 PO: F59370

Report of Certification

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



203 Norcross Avenue • Metuchen, NJ 08840 USA
732-549-7144 • 1-800-LAB-SPEX • Fax: 732-603-9647
CRMSales@spexcsp.com • www.spexcsp.com
Always Providing Superior Quality . . . Unparalleled Service™

010285

SPEXcertificate™

Certificate of Reference Material

Catalog Number: PLTH2-2X/2Y

Lot No. 10-24TH

Description: 1000 mg/L Thorium

Matrix: 2% HNO₃

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for inorganic spectroscopic instrumentation such as ICPOES, DCP, AA, ICPMS, and XRF. It can be employed in USEPA, ASTM and other methods 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 standardized against Pb(NO₃)₂ NIST SRM #928.

Instrumentation Analysis By ICP spectrometer: 998 mg/L

Uncertified Properties:

Density: 1.010 @ 22.0 Degrees Celsius

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

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

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

Date of Certification: AUG '03

Certifying Officer: N. Kocherakota

INORGANIC LABS/KAUWHEN LABS
 DATE RECEIVED: 09/05/03
 DATE EXPIRED: 08/30/2004
 DATE OPENED: 09/05/03
 INORG: 4233
 PO: F52225

Report of Certification

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001 CERTIFIED

010287

SPEXertificate™*Certificate of Reference Material***Catalog Number:** PLU2-2X/2Y**Lot No.** 9-179U**Description:** 1000 mg/L Uranium**Matrix:** 2% HNO₃

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

Certified Value: 999.5 mg/L**Uncertainty Associated with Measurement:** +/- 3 mg/L**Certified Value is Traceable to:** NIST SRM 3164.

The CRM is prepared gravimetrically using high purity Uranium Oxide Lot# 04001D. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 999 mg/L**Method:** Evaporate to dryness. Ignite and weigh as U₃O₈.**Instrumentation Analysis By ICP spectrometer:** 1000 mg/L**Uncertified Properties:****Density:** 1.010 @ 23.6 Degrees Celsius**Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:**

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

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

Date of Certification:

JUN '03

Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 06/30/03
 DATE EXPIRED: 06/30/2004
 DATE OPENED: 06/23/03
 INFOG: 4139 PO: 552370

Report of Certification

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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SPEXTM Certificate

Certificate of Reference Material

Catalog Number: PLW9-2X/2Y

Lot No. 9-177W

Description: 1000 mg/L Tungsten

Matrix: H₂O

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

Certified Value: 1,000 mg/L

Uncertainty Associated with Measurement: ± 3 mg/L

Certified Value is Traceable to: NIST SRM 3163

The CRM is prepared gravimetrically using high purity Ammonium Tungstate Lot# 02001H. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis. Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

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

Instrumentation Analysis By ICP spectrometer: 1000 mg/L

Uncertified Properties:

Density: 0.9979 @ 23.7 Degrees Celsius

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

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

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

Date of Certification: AUG '03

Certifying Officer: N. Kocherakota

INORGANIC LABS/KADUHEM LABS
 DATE RECEIVED: 08/11/03
 DATE EXPIRED: 08/15/2004
 DATE OPENED: 08/13/03
 INORG: 4212
 PO: E52218

Report of Certification

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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Certificate of Reference Material

Catalog Number: PLZR2-2X/2Y/2T **Lot No.** 10-05ZR
Description: 1000 mg/L Zirconium
Matrix: 2% HNO₃

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

Certified Value: 997 mg/L
Uncertainty Associated with Measurement: +/- 3.0 mg/L
Certified Value is Traceable to: NIST SRM 3169

The CRM is prepared gravimetrically using high purity Zirconyl Nitrate Lot# 11011C. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

Method: Evaporate to dryness. Fume with Sulfuric Acid. Ignite and weigh as ZrO₂.

Instrumentation Analysis By ICP spectrometer: 997 mg/L

Uncertified Properties:

Density: 1.010 @ 23.6 Degrees Celsius

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

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

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

Date of Certification: APR 04 Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 5/7/04
 DATE EXPIRED: 4/30/05
 DATE OPENED: 5/11/04
 INQ# 4566 PO: F53321

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

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Certificate of Reference Material

Catalog Number: PLNA2-3X/3Y**Lot No.** U8-128NA**Description:** 10,000 mg/L Sodium**Matrix:** 5% HNO₃

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

Certified Value: 9998 mg/L**Uncertainty Associated with Measurement:** +/- 30 mg/L**Certified Value is Traceable to:** NIST SRM 3152a.

The CRM is prepared gravimetrically using high purity Sodium Carbonate Lot# 02021A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis.

Refer to side 2 for details of measurement uncertainties.**Classical Wet Assay:** 9998 mg/L**Method:** Evaporate to dryness. Fume with Sulfuric Acid. Ignite and weigh as Na₂SO₄.**Instrumentation Analysis By ICP spectrometer:** 9998 mg/L**Uncertified Properties:****Density:** 1.049 @ 23.9 Degrees Celsius**Trace Metallic Impurities in the Actual Solution via ICP / ICPMS Analysis:**

Element	mg/L	Element	mg/L	Element	mg/L
Al	0.02	Cu	0.003	Pb	<0.001
As	<0.003	Fe	0.03	Re	<0.001
Ag	<0.03	Ga	<0.001	Rb	<0.001
B	<0.03	In	<0.001	Sr	<0.002
Ba	0.03	K	0.14	Sb	<0.001
Be	<0.02	Li	<0.002	Sn	<0.001
Bi	<0.001	Mg	0.30	Ti	<0.004
Ca	0.52	Mn	0.008	Tl	<0.001
Cr	<0.004	Mo	<0.001	V	<0.001
Cd	<0.001	Ni	<0.002	Zr	<0.001
Co	<0.001			Zn	<0.03

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

Date of Certification: JAN '04**Certifying Officer:** N. Kocherakota

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 01/29/04
 DATE EXP. 01/29/05
 DATE OPENED: 01/29/04
 INORG: 4443
 PO: F52308

Report of Certification

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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Certificate of Reference Material

Catalog Number: ICV-2A **Lot No.:** 24-84AS
Description: Initial Calibration Verification Standard II
Matrix: 5% Nitric Acid

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM	Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
Ca	2,000	2,005.40	3109a	Ni	500	500.58	3136
K	2,000	1,997.89	3141a	V	500	504.23	3165
Mg	2,000	1,992.26	3131a	Cr	200	203.21	3112a
Na	2,000	1,992.99	3152a	Cu	200	199.75	3114
Al	1,000	1,005.90	3101a	Ag	100	100.46	3151
Ba	1,000	1,001.51	3104a	Be	100	100.04	3105a
Fe	1,000	1,003.17	3126a	Mn	100	100.64	3132
Co	500	505.10	3113	Zn	100	100.52	3168a

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

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

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

INORGANIC LABS/REDOX/HEM LABS
 DATE RECEIVED: 11/30/03
 DATE EXPIRED: 11/30/2004
 DATE OPENED: 11/21/03
 TMOB: 4328 PO: F52278

Report of Certification

010296

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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Certificate of Reference Material

010297

Catalog Number: PLSB7-2X/2Y/2T

Lot No. 10-43SB

Description: 1000 mg/L Antimony

Matrix: H₂O/0.6Tart.Acid/tr.HNO₃

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

Certified Value: 1004 mg/L

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

Certified Value is Traceable to: NIST SRM 3102a

The CRM is prepared gravimetrically using high purity Antimony Metal Lot# 04021A. The certified value listed is the average of values obtained by classical wet assay and ICP spectrometer analysis

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1005 mg/L

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

Instrumental Analysis by ICP spectrometer: 1002 mg/L

Uncertified Properties:

Density: 1.046 @ 25.5 Degrees Celsius

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

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

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

Date of Certification: NOV -- 2003

Certifying Officer: N. Kocherakota

INORGANIC LABS/ECADICHEM LABS
 DATE RECEIVED: 11/20/03
 DATE EXP. DATE: 11/20/2004
 DATE OPENED: 11/21/03
 INDRG: 4329
 PO: F52278

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

010298

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001

CERTIFIED

010299

SPEXertificate™

Certificate of Reference Material

Catalog Number: ICV-2C **Lot No.:** 24-85AS
Description: Initial Calibration Verification Standard II
Matrix: 5% Nitric Acid

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

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

Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ICP Spectrometer:

Element	Labeled (mg/L)	Measured (mg/L)	NIST SRM
As	500	497.85	3103a
Pb	500	495.41	3128
Se	500	501.98	3149
TL	500	501.89	3158
Cd	100	99.77	3108

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

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

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

INORGANIC LABS/KADACHEN LABS
DATE RECEIVED: 11/20/03
DATE EXPIRED: 11/20/04
DATE OPENED: 11/20/03
INORG: 4330 PO: F52078

Report of Certification

010300

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

Guide To The Expression Of Uncertainty In Measurement 1995

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

ASTM Guide D6362-98

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

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

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

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

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

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

Method of Preparation:

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

Homogeneity:

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

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

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

m = the sub-sampling mass

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

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

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

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

Certification Traveler Report:

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

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
CERTIFIED

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

Always Providing Superior Quality ... Unparalleled Service™

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 Statistical Principles."

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

Catalog Number: CGAL10-1 and CGAL10-5
 Lot Number: W-AL04008
 Starting Material: Al metal
 Starting Material Purity (%): 99.998460
 Starting Material Lot No: 607116
 Matrix: 5% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 08/26/03
 DATE EXPIRED: 09/01/2004
 DATE OPENED: 08/26/03
 INDRG: 4220 PO: F52224

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 10070 ± 31 µg/mL

Certified Density: 1.059 g/mL (measured at 22° C)

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

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

(\bar{x}) = mean

x_i = individual results

n = number of measurements

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

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

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

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

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

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

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

4.1 Assay Method #1 10006 ± 55 µg/mL

ICP Assay NIST SRM 3101a Lot Number: 992003

Assay Method #2 10070 ± 31 µg/mL

EDTA NIST SRM 928 Lot Number: 880710

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

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

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

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:

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

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

010303

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 26.98154; +3, 6; $\text{Al}(\text{H}_2\text{O})_6^{3+}$

Chemical Compatibility - Soluble in HCl , HNO_3 , HF and H_2SO_4 . Avoid neutral media. Soluble in strongly basic NaOH forming the $\text{Al}(\text{OH})_4^-$ 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 $\text{HCl} / \text{HNO}_3$); α - Al_2O_3 (Na_2CO_3 fusion in Pt°); γ - Al_2O_3 (Soluble in acids such as HCl); Ores (Carbonate fusion in Pt° followed by HCl dissolution); Organic Matrices (sulfuric/peroxide digestion or nitric / sulfuric / perchloric acid decomposition, or dry ash and dissolution in dilute HCl).

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at various)
ICP-OES 394.401 nm	0.05 / 0.006 $\mu\text{g/mL}$	1	atom	U, Ce
ICP-OES 396.152 nm	0.03 / 0.006 $\mu\text{g/mL}$	1	atom	<u>Mg</u> , Zr, Ce
ICP-OES 167.078 nm	0.1 / 0.009 $\mu\text{g/mL}$	1	ion	Fe
ICP-MS 27 amu	30 ppt	n/a	M	¹³ C ¹⁵ N, ¹³ C ¹⁴ N, ¹⁴ C ¹⁵ N, ¹⁵ N ¹⁶ O, ⁵⁴ Cr ³⁺ , ⁵⁶ Fe ³⁺

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

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

10.0 QUALITY STANDARD DOCUMENTATION

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

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

Members of IQ Net International Certification Network:

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

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

- Chemical Testing - Accredited A2LA Certificate Number 883.01



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

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

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

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

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2

DATE RECEIVED: 08/26/03

DATE EXPIRED: 09/01/2005 VDS

DATE OPENED: 08/26/03

INORG: 4020 PO: F52224

010304

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



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

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

Certification Date: February 13, 2003

Expiration Date:

EXPIRES
1/2004-

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

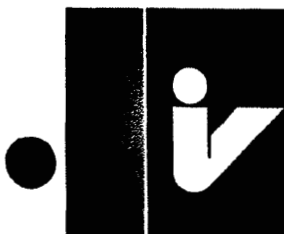
JoAnn Struthers

Certificate Approved By: Katalin Le, QC Supervisor

Katalin Le

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Paul Gaines



inorganic ventures / iv labs

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

certificate of analysis

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

- 2.0 DESCRIPTION OF CRM Custom-Grade 10000 µg/mL Calcium in 1.4% (abs) HNO₃

Catalog Number: CGCA10-1, CGCA10-2, and CGCA10-5
 Lot Number: W-CA03022
 Starting Material: CaO
 Starting Material Purity (%): 99.999389
 Starting Material Lot No: C27L01
 Matrix: 1.4% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
 DATE RECEIVED: 01/20/04
 DATE EXPIRED: 02/01/2005 V03
 DATE OPENED: 01/20/04
 INORG: 4436 PO: F52303

- 3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 9968 ± 18 µg/mL

Certified Density: 1.038 g/mL (measured at 22° C)

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

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

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

(\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 CRM certificate of analysis.)

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

- 4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

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

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

4.1 Assay Method #1 9968 ± 18 µg/mL
 ICP Assay NIST SRM 3109a Lot Number: 000622
 Assay Method #2 9973 ± 25 µg/mL
 EDTA NIST SRM 928 Lot Number: 880710

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

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

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

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:

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

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 40.078; +2; 6; $\text{Ca}(\text{H}_2\text{O})_6^{2+}$

Chemical Compatibility - Soluble in HCl and HNO_3 . Avoid H_2SO_4 , HF, H_3PO_4 and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicate, carbonate, hydroxide, oxide, fluoride, sulfate, oxalate, chromate, arsenate and tungstate in neutral aqueous media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO_3 / LDPE container.

Ca Containing Samples (Preparation and Solution) - Metal (best dissolved in diluted HNO_3), Ores (Carbonate fusion in Pt^{4+} 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 λ Dons.)
ICP-OES 393.366 nm	0.0002 / 0.00004 $\mu\text{g/mL}$	1	ion	U, Ce
ICP-OES 396.847 nm	0.0005 / 0.00006 $\mu\text{g/mL}$	1	ion	Th
ICP-OES 422.673 nm	0.01 / 0.001 $\mu\text{g/mL}$	1	atom	Ge
ICP-MS 44 amu	1200 ppt	n/a	M	^{40}Ar , ^{40}Ca , ^{44}Ti , ^{44}Ca , ^{88}Sr

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

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

10.0 QUALITY STANDARD DOCUMENTATION

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

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

Members of IQ Net International Certification Network:

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

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

- Chemical Testing - Accredited A2LA Certificate Number 883.01



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

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

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

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

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2

DATE RECEIVED: 01/20/04

DATE EXPIRED: 02/01/2005 vps

DATE OPENED: 01/20/04

INORG: 4436 PO: F52303

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010308



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

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

Certification Date: July 23, 2003

Expiration Date:

EXPIRES
12/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

JoAnn Struthers

Katalin Le

Paul Gaines

certificate of analysis

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

2.0 DESCRIPTION OF CRM Custom-Grade 10000 µg/mL Iron in 3.5% (abs) HNO₃

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Catalog Number:	CGFE10-1, CGFE10-2, and CGFE10-5
Lot Number:	W-FE03030
Starting Material:	Fe metal
Starting Material Purity (%):	99.999569
Starting Material Lot No	23166
Matrix:	3.5% (abs) HNO ₃
Certified Concentration:	10,016 ± 25 µg/mL
Certified Density:	1.050 g/mL (measured at 22° C)

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
 DATE RECEIVED: 02/25/04
 DATE EXPIRED: 02/25/05
 DATE OPENED: 02/25/04
 INORG: 4470
 PO: F53323

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:

$$\bar{X} = \frac{\sum x_i}{n}$$

\bar{X} = mean
 x_i = individual results
 n = number of measurements

$$s = \frac{\sum (x_i - \bar{X})^2}{n-1}$$

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 CRM 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.

Assay Method #1 10,031 ± 33 µg/mL
 ICP Assay NIST SRM 3126a Lot Number: 000606

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

01030 NA
9-15-94

4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

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

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

010311

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 55.847; +3; 6; $\text{Fe}(\text{H}_2\text{O})_6^{3+}$

Chemical Compatibility - Stable in HCl , HNO_3 , H_2SO_4 , HF and H_3PO_4 . Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

Fe Containing Samples (Preparation and Solution) - Metal (Soluble in HCl); Oxides (If the oxide has been at a high temperature then Na_2CO_3 fusion in Pt^* followed by HCl dissolution otherwise dissolve in dilute HCl); Ores (See Oxides above using only the fusion approach).

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at $\mu\text{g/L}$ concs.)
ICP-OES 238.204 nm	0.005 / 0.001 $\mu\text{g/mL}$	1	ion	<u>Ru</u> , Co
ICP-OES 239.562 nm	0.005 / 0.001 $\mu\text{g/mL}$	1	ion	Co, <u>V</u> , Cr
ICP-OES 259.940 nm	0.006 / 0.001 $\mu\text{g/mL}$	1	ion	Hf, Nb
ICP-MS 56 amu	970 ppt	n/a	M ⁺	³⁹ Ar ⁺ , ⁴¹ Ar ⁺ , ⁴² Ar ⁺ , ⁴³ Ar ⁺ , ⁴⁵ Ar ⁺ , ⁴⁷ Ar ⁺ , ⁴⁹ Ar ⁺ , ⁵¹ Ar ⁺ , ⁵³ Ar ⁺ , ⁵⁵ Ar ⁺ , ⁵⁷ Ar ⁺ , ⁵⁹ Ar ⁺ , ⁶¹ Ar ⁺ , ⁶³ Ar ⁺ , ⁶⁵ Ar ⁺ , ⁶⁷ Ar ⁺ , ⁶⁹ Ar ⁺ , ⁷¹ Ar ⁺ , ⁷³ Ar ⁺ , ⁷⁵ Ar ⁺ , ⁷⁷ Ar ⁺ , ⁷⁹ Ar ⁺ , ⁸¹ Ar ⁺ , ⁸³ Ar ⁺ , ⁸⁵ Ar ⁺ , ⁸⁷ Ar ⁺ , ⁸⁹ Ar ⁺ , ⁹¹ Ar ⁺ , ⁹³ Ar ⁺ , ⁹⁵ Ar ⁺ , ⁹⁷ Ar ⁺ , ⁹⁹ Ar ⁺ , ¹⁰¹ Ar ⁺ , ¹⁰³ Ar ⁺ , ¹⁰⁵ Ar ⁺ , ¹⁰⁷ Ar ⁺ , ¹⁰⁹ Ar ⁺ , ¹¹¹ Ar ⁺ , ¹¹³ Ar ⁺ , ¹¹⁵ Ar ⁺ , ¹¹⁷ Ar ⁺ , ¹¹⁹ Ar ⁺ , ¹²¹ Ar ⁺ , ¹²³ Ar ⁺ , ¹²⁵ Ar ⁺ , ¹²⁷ Ar ⁺ , ¹²⁹ Ar ⁺ , ¹³¹ Ar ⁺ , ¹³³ Ar ⁺ , ¹³⁵ Ar ⁺ , ¹³⁷ Ar ⁺ , ¹³⁹ Ar ⁺ , ¹⁴¹ Ar ⁺ , ¹⁴³ Ar ⁺ , ¹⁴⁵ Ar ⁺ , ¹⁴⁷ Ar ⁺ , ¹⁴⁹ Ar ⁺ , ¹⁵¹ Ar ⁺ , ¹⁵³ Ar ⁺ , ¹⁵⁵ Ar ⁺ , ¹⁵⁷ Ar ⁺ , ¹⁵⁹ Ar ⁺ , ¹⁶¹ Ar ⁺ , ¹⁶³ Ar ⁺ , ¹⁶⁵ Ar ⁺ , ¹⁶⁷ Ar ⁺ , ¹⁶⁹ Ar ⁺ , ¹⁷¹ Ar ⁺ , ¹⁷³ Ar ⁺ , ¹⁷⁵ Ar ⁺ , ¹⁷⁷ Ar ⁺ , ¹⁷⁹ Ar ⁺ , ¹⁸¹ Ar ⁺ , ¹⁸³ Ar ⁺ , ¹⁸⁵ Ar ⁺ , ¹⁸⁷ Ar ⁺ , ¹⁸⁹ Ar ⁺ , ¹⁹¹ Ar ⁺ , ¹⁹³ Ar ⁺ , ¹⁹⁵ Ar ⁺ , ¹⁹⁷ Ar ⁺ , ¹⁹⁹ Ar ⁺ , ²⁰¹ Ar ⁺ , ²⁰³ Ar ⁺ , ²⁰⁵ Ar ⁺ , ²⁰⁷ Ar ⁺ , ²⁰⁹ Ar ⁺ , ²¹¹ Ar ⁺ , ²¹³ Ar ⁺ , ²¹⁵ Ar ⁺ , ²¹⁷ Ar ⁺ , ²¹⁹ Ar ⁺ , ²²¹ Ar ⁺ , ²²³ Ar ⁺ , ²²⁵ Ar ⁺ , ²²⁷ Ar ⁺ , ²²⁹ Ar ⁺ , ²³¹ Ar ⁺ , ²³³ Ar ⁺ , ²³⁵ Ar ⁺ , ²³⁷ Ar ⁺ , ²³⁹ Ar ⁺ , ²⁴¹ Ar ⁺ , ²⁴³ Ar ⁺ , ²⁴⁵ Ar ⁺ , ²⁴⁷ Ar ⁺ , ²⁴⁹ Ar ⁺ , ²⁵¹ Ar ⁺ , ²⁵³ Ar ⁺ , ²⁵⁵ Ar ⁺ , ²⁵⁷ Ar ⁺ , ²⁵⁹ Ar ⁺ , ²⁶¹ Ar ⁺ , ²⁶³ Ar ⁺ , ²⁶⁵ Ar ⁺ , ²⁶⁷ Ar ⁺ , ²⁶⁹ Ar ⁺ , ²⁷¹ Ar ⁺ , ²⁷³ Ar ⁺ , ²⁷⁵ Ar ⁺ , ²⁷⁷ Ar ⁺ , ²⁷⁹ Ar ⁺ , ²⁸¹ Ar ⁺ , ²⁸³ Ar ⁺ , ²⁸⁵ Ar ⁺ , ²⁸⁷ Ar ⁺ , ²⁸⁹ Ar ⁺ , ²⁹¹ Ar ⁺ , ²⁹³ Ar ⁺ , ²⁹⁵ Ar ⁺ , ²⁹⁷ Ar ⁺ , ²⁹⁹ Ar ⁺ , ³⁰¹ Ar ⁺ , ³⁰³ Ar ⁺ , ³⁰⁵ Ar ⁺ , ³⁰⁷ Ar ⁺ , ³⁰⁹ Ar ⁺ , ³¹¹ Ar ⁺ , ³¹³ Ar ⁺ , ³¹⁵ Ar ⁺ , ³¹⁷ Ar ⁺ , ³¹⁹ Ar ⁺ , ³²¹ Ar ⁺ , ³²³ Ar ⁺ , ³²⁵ Ar ⁺ , ³²⁷ Ar ⁺ , ³²⁹ Ar ⁺ , ³³¹ Ar ⁺ , ³³³ Ar ⁺ , ³³⁵ Ar ⁺ , ³³⁷ Ar ⁺ , ³³⁹ Ar ⁺ , ³⁴¹ Ar ⁺ , ³⁴³ Ar ⁺ , ³⁴⁵ Ar ⁺ , ³⁴⁷ Ar ⁺ , ³⁴⁹ Ar ⁺ , ³⁵¹ Ar ⁺ , ³⁵³ Ar ⁺ , ³⁵⁵ Ar ⁺ , ³⁵⁷ Ar ⁺ , ³⁵⁹ Ar ⁺ , ³⁶¹ Ar ⁺ , ³⁶³ Ar ⁺ , ³⁶⁵ Ar ⁺ , ³⁶⁷ Ar ⁺ , ³⁶⁹ Ar ⁺ , ³⁷¹ Ar ⁺ , ³⁷³ Ar ⁺ , ³⁷⁵ Ar ⁺ , ³⁷⁷ Ar ⁺ , ³⁷⁹ Ar ⁺ , ³⁸¹ Ar ⁺ , ³⁸³ Ar ⁺ , ³⁸⁵ Ar ⁺ , ³⁸⁷ Ar ⁺ , ³⁸⁹ Ar ⁺ , ³⁹¹ Ar ⁺ , ³⁹³ Ar ⁺ , ³⁹⁵ Ar ⁺ , ³⁹⁷ Ar ⁺ , ³⁹⁹ Ar ⁺ , ⁴⁰¹ Ar ⁺ , ⁴⁰³ Ar ⁺ , ⁴⁰⁵ Ar ⁺ , ⁴⁰⁷ Ar ⁺ , ⁴⁰⁹ Ar ⁺ , ⁴¹¹ Ar ⁺ , ⁴¹³ Ar ⁺ , ⁴¹⁵ Ar ⁺ , ⁴¹⁷ Ar ⁺ , ⁴¹⁹ Ar ⁺ , ⁴²¹ Ar ⁺ , ⁴²³ Ar ⁺ , ⁴²⁵ Ar ⁺ , ⁴²⁷ Ar ⁺ , ⁴²⁹ Ar ⁺ , ⁴³¹ Ar ⁺ , ⁴³³ Ar ⁺ , ⁴³⁵ Ar ⁺ , ⁴³⁷ Ar ⁺ , ⁴³⁹ Ar ⁺ , ⁴⁴¹ Ar ⁺ , ⁴⁴³ Ar ⁺ , ⁴⁴⁵ Ar ⁺ , ⁴⁴⁷ Ar ⁺ , ⁴⁴⁹ Ar ⁺ , ⁴⁵¹ Ar ⁺ , ⁴⁵³ Ar ⁺ , ⁴⁵⁵ Ar ⁺ , ⁴⁵⁷ Ar ⁺ , ⁴⁵⁹ Ar ⁺ , ⁴⁶¹ Ar ⁺ , ⁴⁶³ Ar ⁺ , ⁴⁶⁵ Ar ⁺ , ⁴⁶⁷ Ar ⁺ , ⁴⁶⁹ Ar ⁺ , ⁴⁷¹ Ar ⁺ , ⁴⁷³ Ar ⁺ , ⁴⁷⁵ Ar ⁺ , ⁴⁷⁷ Ar ⁺ , ⁴⁷⁹ Ar ⁺ , ⁴⁸¹ Ar ⁺ , ⁴⁸³ Ar ⁺ , ⁴⁸⁵ Ar ⁺ , ⁴⁸⁷ Ar ⁺ , ⁴⁸⁹ Ar ⁺ , ⁴⁹¹ Ar ⁺ , ⁴⁹³ Ar ⁺ , ⁴⁹⁵ Ar ⁺ , ⁴⁹⁷ Ar ⁺ , ⁴⁹⁹ Ar ⁺ , ⁵⁰¹ Ar ⁺ , ⁵⁰³ Ar ⁺ , ⁵⁰⁵ Ar ⁺ , ⁵⁰⁷ Ar ⁺ , ⁵⁰⁹ Ar ⁺ , ⁵¹¹ Ar ⁺ , ⁵¹³ Ar ⁺ , ⁵¹⁵ Ar ⁺ , ⁵¹⁷ Ar ⁺ , ⁵¹⁹ Ar ⁺ , ⁵²¹ Ar ⁺ , ⁵²³ Ar ⁺ , ⁵²⁵ Ar ⁺ , ⁵²⁷ Ar ⁺ , ⁵²⁹ Ar ⁺ , ⁵³¹ Ar ⁺ , ⁵³³ Ar ⁺ , ⁵³⁵ Ar ⁺ , ⁵³⁷ Ar ⁺ , ⁵³⁹ Ar ⁺ , ⁵⁴¹ Ar ⁺ , ⁵⁴³ Ar ⁺ , ⁵⁴⁵ Ar ⁺ , ⁵⁴⁷ Ar ⁺ , ⁵⁴⁹ Ar ⁺ , ⁵⁵¹ Ar ⁺ , ⁵⁵³ Ar ⁺ , ⁵⁵⁵ Ar ⁺ , ⁵⁵⁷ Ar ⁺ , ⁵⁵⁹ Ar ⁺ , ⁵⁶¹ Ar ⁺ , ⁵⁶³ Ar ⁺ , ⁵⁶⁵ Ar ⁺ , ⁵⁶⁷ Ar ⁺ , ⁵⁶⁹ Ar ⁺ , ⁵⁷¹ Ar ⁺ , ⁵⁷³ Ar ⁺ , ⁵⁷⁵ Ar ⁺ , ⁵⁷⁷ Ar ⁺ , ⁵⁷⁹ Ar ⁺ , ⁵⁸¹ Ar ⁺ , 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11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010312



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

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

Certification Date: March 20, 2003

Expiration Date:

EXPIRES
1/1/2005

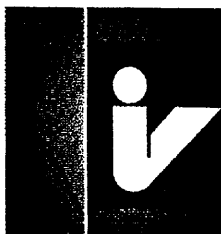
12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

JoAnn Struthers
Katalin Le
Paul Gaines



inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade 10000 µg/mL Potassium in 1.4% (abs) HNO₃

Catalog Number: CGK10-1, CGK10-2, and CGK10-5

Lot Number: W-K02111

Starting Material: KNO₃

Starting Material Purity (%): 99.997230

Starting Material Lot No K18J19

Matrix: 1.4% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 11/5/03 1/2
 DATE EXPIRED: 12/1/04 0/0
 DATE OPENED: 11/5/03
 INORG: 4320 PO: FS2258

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 9930 ± 9 µg/mL

Certified Density: 1.024 g/mL (measured at 22° C)

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

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

(\bar{x}) = mean

x_i = individual results

n = number of measurements

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

\sum = The summation of all significant estimated errors.

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

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

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

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

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

4.1 **Assay Method #1** 9926 ± 62 µg/mL

ICP Assay NIST SRM 3141a Lot Number: 891312

Assay Method #2 9930 ± 9 µg/mL

Gravimetric NIST SRM Lot Number: See Sec. 4.2

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

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

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

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:

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

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4°C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 29.0963; +1; (6); K⁺(aq)

(Coordination Number in parentheses is assumed, not certain.)

Chemical Compatibility - Soluble in HCl, HNO₃, H₂SO₄, and HF aqueous matrices. Avoid use of HClO₄ due to insolubility of the perchlorate. Stable with all metals and inorganic anions except ClO₄⁻.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

K Containing Samples (Preparation and Solution) - Metal (Dissolves very rapidly in water); Ores (Sodium carbonate fusion in P1⁺ 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/line view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at all concs.)
ICP-OES 766.490 nm	0.4 / 0.001 µg/mL	1	atom	2 nd order radiation from R.E.s on some optical designs
ICP-OES 771.531 nm	1.0 / 0.03 µg/mL	1	atom	2 nd order radiation from R.E.s on some optical designs
ICP-OES 404.721 nm	1.1 / 0.05 µg/mL	1	atom	<u>U</u> , <u>Ce</u>
ICP-MS 39 amu	10 ppt	nb	M ⁺	³⁹ ArH, ³⁹ Na ¹⁶ O, ³⁹ Se ⁺

- 8.0 **HAZARDOUS INFORMATION** - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.
- 9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.
- 10.0 **QUALITY STANDARD DOCUMENTATION**

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

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

Members of IQ Net International Certification Network:

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

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

- Chemical Testing - Accredited A2LA Certificate Number 883.01



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

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

10.4 **10CFR50 Appendix B - Nuclear Regulatory Commission**

- Domestic Licensing of Production and Utilization Facilities

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

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

11.0 **DATE OF CERTIFICATION AND PERIOD OF VALIDITY**



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

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

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 11/5/03
 DATE EXPIRED: 12/1/04
 DATE OPENED: 11/5/03
 INORG: 4320 PO: R52258

Certification Date: January 30, 2003

Expiration Date:

EXPIRES
 122004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010316

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

JoAnn Struthers
Katalin Le

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Paul Gaines

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 Statistical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade 10000 µg/mL Sodium in 1.4% (abs) HNO₃

Catalog Number: CGNA10-1, CGNA10-2, and CGNA10-5

Lot Number: T-NA03006

Starting Material: Na₂CO₃

Starting Material Purity (%): 99.999936

Starting Material Lot No 42095

Matrix: 1.4% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS Pg 1 of 2

DATE RECEIVED: 07/31/03

DATE EXPIRED: 08/01/2004 ver

DATE OPENED: 08/01/03

INORG: 4205 PO: F52391

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 10,005 ± 7 µg/mL

Certified Density: 1.032 g/mL (measured at 22° C)

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

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

\bar{x} = mean

x_i = individual results

n = number of measurements

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

$\sum s_i^2$ = The summation of all significant estimated errors

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

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

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

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

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

4.1 **Assay Method #1** 10,067 ± 75 µg/mL

ICP Assay NIST SRM 3152a Lot Number: 990907

Assay Method #2 10,005 ± 7 µg/mL

Gravimetric NIST SRM Lot Number: See Sec. 4.2

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

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>Q</u> Al < 0.00090	<u>M</u> Dy < 0.02499	<u>Q</u> Li < 0.00003	<u>M</u> Pr < 0.00125	<u>M</u> Te < 0.12494
<u>M</u> Sb < 0.00208	<u>M</u> Er < 0.02082	<u>M</u> Lu < 0.00167	<u>M</u> Re < 0.00417	<u>M</u> Tb < 0.00125
<u>M</u> As < 0.04165	<u>M</u> Eu < 0.01249	<u>Q</u> Mg 0.00015	<u>M</u> Rh < 0.00417	<u>M</u> Tl < 0.00417
<u>M</u> Ba < 0.04165	<u>M</u> Gd < 0.00417	<u>Q</u> Mn < 0.00003	<u>M</u> Rb < 0.00417	<u>M</u> Th < 0.00417
<u>Q</u> Be < 0.00020	<u>M</u> Ga < 0.00417	<u>Q</u> Hg < 0.01500	<u>M</u> Ru < 0.00833	<u>M</u> Tm < 0.00167
<u>M</u> Bi < 0.00167	<u>Q</u> Ge < 0.00150	<u>M</u> Mo < 0.00833	<u>M</u> Sm < 0.00417	<u>M</u> Sn < 0.02082
<u>Q</u> B < 0.00060	<u>Q</u> Au < 0.00300	<u>M</u> Nd < 0.00833	<u>Q</u> Sc < 0.00002	<u>Q</u> Ti < 0.00070
<u>M</u> Cd < 0.01249	<u>M</u> Hf < 0.00833	<u>Q</u> Ni < 0.00230	<u>Q</u> Se < 0.05000	<u>M</u> W < 0.04165
<u>Q</u> Ca 0.00160	<u>M</u> Ho < 0.00208	<u>M</u> Nb < 0.00208	<u>Q</u> Si < 0.00340	<u>M</u> U < 0.00833
<u>M</u> Ce < 0.02082	<u>M</u> In < 0.04165	<u>n</u> Os	<u>M</u> Ag < 0.00833	<u>Q</u> V < 0.00090
<u>M</u> Cs 0.00104	<u>M</u> Ir < 0.02082	<u>M</u> Pd < 0.02082	<u>S</u> Na	<u>M</u> Yb < 0.00417
<u>M</u> Cr < 0.02082	<u>Q</u> Fe < 0.00110	<u>Q</u> P < 0.04000	<u>M</u> Sr < 0.00208	<u>M</u> Y < 0.16658
<u>M</u> Co < 0.01249	<u>M</u> La < 0.00208	<u>M</u> Pt < 0.00833	<u>Q</u> S < 0.07200	<u>Q</u> Zn 0.00130
<u>Q</u> Cu < 0.00140	<u>M</u> Pb < 0.01249	<u>Q</u> K 0.00873	<u>M</u> Ta < 0.02915	<u>M</u> Zr < 0.02082

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:

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

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 22.98977; +1; (6); Na'(aq) largely ionic in nature (Coordination Number in parentheses is assumed, not certain.)

Chemical Compatibility - Soluble in HCl, HNO₃, H₂SO₄, and HF aqueous matrices. Stable with all metals and inorganic anions.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / 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 abncls.)
ICP-OES 589.595 nm	0.07 / 0.00009 µg/mL	1	atom	2 nd order radiation from R.E.s on some optical designs
ICP-OES 589.995 nm	0.03 / 0.006 µg/mL	1	atom	2 nd order radiation from R.E.s on some optical designs
ICP-OES 330.237 nm	2.0 / 0.09 µg/mL	1	atom	<u>Pd</u> , <u>Zn</u>
ICP-MS 23 amu	310 ppt	n/a	M'	⁴⁵ Ti ¹² , ⁴⁴ Ca ¹²

010319

- 8.0 **HAZARDOUS INFORMATION** - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.
- 9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.
- 10.0 **QUALITY STANDARD DOCUMENTATION**

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

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



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

- Chemical Testing - Accredited A2LA Certificate Number 883.01



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

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

10.4 **10CFR50 Appendix B - Nuclear Regulatory Commission**

- Domestic Licensing of Production and Utilization Facilities

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

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

11.0 **DATE OF CERTIFICATION AND PERIOD OF VALIDITY**



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

11.2 **Expiration Date** - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life.

Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: January 24, 2003

EXPIRES

Expiration Date: 01/22/04

INORGANIC LABS/RADCHEM LABS B-2042
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4205 PO: F52391

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010320

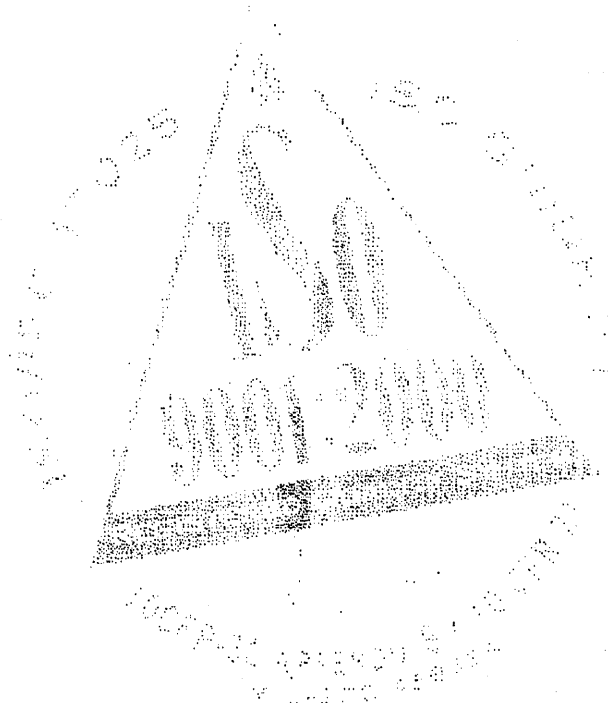
Certificate Prepared By: Debbie Newman, LIMS Administrator

Debbie Newman
Katalin Le

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Paul Gaines



010321



Certificate of Analysis

CUSTOM-GRADE SOLUTION
1000 µg/mL Lithium in 0.1% HNO₃ (abs)

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

 Lot Number: **W-LI02066**

 Starting Material:
 Starting Material Purity:
 Starting Material Lot No:

 Li₂CO₃
 99.999%
 1053

INORGANIC LABS/RADCHEM LABS

 DATE RECEIVED: 06/20/03

 DATE EXPIRED: 07/01/2004

 DATE OPENED: 06/22/03

 INORG: 4149 PO: E52370
CERTIFIED CONCENTRATION: 998 ± 2 µg/mL

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

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

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

 (\bar{x}) = mean

 x_i = individual results

 n = number of measurements

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

Classical Wet Assay: 998 ± 2 µg/mL

Method: Gravimetric as the Sulfate vs NIST weights #822/254143-94.

Instrument Analysis: 1000 ± 4 µg/mL

Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3129a.

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

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

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

<u>Q</u> Al <0.010	<u>M</u> Dy <0.00060	<u>S</u> Li	<u>M</u> Pr <0.000030	<u>Q</u> Te <0.0090
<u>M</u> Sb <0.000050	<u>M</u> Er <0.00050	<u>M</u> Lu <0.000040	<u>M</u> Re <0.00010	<u>M</u> Tb <0.000030
<u>Q</u> As <0.044	<u>M</u> Eu <0.00030	<u>Q</u> Mg <0.00010	<u>M</u> Rh <0.00010	<u>M</u> Tl <0.00010
<u>M</u> Ba <0.0010	<u>M</u> Gd <0.00010	<u>Q</u> Mn <0.00020	<u>M</u> Rb <0.00010	<u>M</u> Th <0.00010
<u>Q</u> Be <0.000050	<u>M</u> Ga <0.00010	<u>Q</u> Hg <0.0070	<u>M</u> Ru <0.00020	<u>M</u> Tm <0.000040
<u>M</u> Bi <0.000040	<u>M</u> Ge <0.00060	<u>M</u> Mo <0.00020	<u>M</u> Sm <0.00010	<u>M</u> Sn <0.00050
<u>Q</u> B <0.0060	<u>Q</u> Au <0.010	<u>M</u> Nd <0.00020	<u>M</u> Sc <0.0010	<u>Q</u> Ti <0.00030
<u>Q</u> Cd <0.0018	<u>M</u> Hf <0.00020	<u>Q</u> Ni <0.0040	<u>Q</u> Se <0.020	<u>M</u> W <0.0010
<u>Q</u> Ca 0.051	<u>M</u> Ho <0.000050	<u>M</u> Nb <0.000050	<u>Q</u> Si 0.023	<u>M</u> U <0.00020
<u>M</u> Ce <0.00050	<u>Q</u> In <0.030	<u>n</u> Os	<u>Q</u> Ag <0.0040	<u>Q</u> V <0.0010
<u>M</u> Cs 0.0018	<u>M</u> Ir <0.00050	<u>M</u> Pd <0.00050	<u>Q</u> Na <0.10	<u>M</u> Yb <0.00010
<u>Q</u> Cr <0.0020	<u>Q</u> Fe <0.0020	<u>Q</u> P <0.030	<u>Q</u> Sr <0.0010	<u>M</u> Y <0.0040
<u>M</u> Co <0.00030	<u>M</u> La <0.000050	<u>M</u> Pt <0.00020	<u>Q</u> S <0.050	<u>Q</u> Zn <0.030
<u>M</u> Cu <0.00060	<u>M</u> Pb <0.00030	<u>Q</u> K 0.0070	<u>M</u> Ta <0.00070	<u>M</u> Zr <0.00050

M - checked by ICP-MS

O - checked by ICP-OES

I - spectral interference

n - not checked for

s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.004 g/mL

(over)

QA:KL Rev.022403DN

Inorganic Ventures, Inc.

195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701

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

Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES

01/22/04

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 (JOA), 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 μ m 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

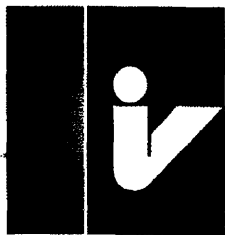
The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 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, 119018, 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

010323

**inorganic ventures / iv labs**

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade 1000 µg/mL Cadmium in 2% (abs) HNO₃

Catalog Number: CGCD1-1, CGCD1-2, and CGCD1-5
 Lot Number: W-CD01127
 Starting Material: Cd shot
 Starting Material Purity (%): 99.998904
 Starting Material Lot No: C14M30
 Matrix: 2% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
 DATE RECEIVED: 02/25/04
 DATE EXPIRED: 03/01/2005 VDS
 DATE OPENED: 02/25/04
 INORG: 4467 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1007 ± 2 µg/mL

Certified Density: 1.014 g/mL (measured at 22° C)

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

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

$$\text{Uncertainty } (\pm) = \frac{2(s_{\bar{x}})}{(n)^{1/2}}$$

(\bar{x}) = 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.)

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

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

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

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

4.1 **Assay Method #1** 1007 ± 2 µg/mL

EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 1005 ± 5 µg/mL

ICP Assay NIST SRM 3108 Lot Number: 890312

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

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>Q</u> Al < 0.00090	<u>M</u> Dy < 0.01191	<u>Q</u> Li < 0.00002	<u>M</u> Pr < 0.00060	<u>Q</u> Te < 0.00700
<u>M</u> Sb 0.00039	<u>M</u> Er < 0.00993	<u>M</u> Lu < 0.00079	<u>M</u> Re < 0.00199	<u>M</u> Tb < 0.00060
<u>M</u> As < 0.01985	<u>M</u> Eu < 0.00596	<u>Q</u> Mg 0.00002	<u>M</u> Rh < 0.00199	<u>M</u> Tl < 0.00199
<u>M</u> Ba < 0.01985	<u>M</u> Gd < 0.00199	<u>M</u> Mn < 0.00794	<u>M</u> Rb < 0.00199	<u>M</u> Th < 0.00199
<u>M</u> Be < 0.00099	<u>M</u> Ga < 0.00199	<u>Q</u> Hg < 0.01200	<u>M</u> Ru < 0.00397	<u>M</u> Tm < 0.00079
<u>M</u> Bi < 0.00079	<u>M</u> Ge < 0.01191	<u>M</u> Mo < 0.00397	<u>M</u> Sm < 0.00199	<u>M</u> Sn < 0.00993
<u>Q</u> B < 0.00900	<u>M</u> Au < 0.00596	<u>M</u> Nd < 0.00397	<u>M</u> Sc < 0.01985	<u>M</u> Ti < 0.09925
<u>s</u> Cd	<u>M</u> Hf < 0.00397	<u>Q</u> Ni < 0.00300	<u>M</u> Se < 0.01588	<u>M</u> W < 0.01985
<u>Q</u> Ca 0.00378	<u>M</u> Ho < 0.00099	<u>M</u> Nb < 0.00099	<u>Q</u> Si < 0.00340	<u>M</u> U < 0.00397
<u>M</u> Ce < 0.00993	<u>Q</u> In < 0.00200	<u>n</u> Os	<u>M</u> Ag < 0.00397	<u>M</u> V < 0.00397
<u>M</u> Cs < 0.00060	<u>M</u> Ir < 0.00993	<u>M</u> Pd 0.00691	<u>M</u> Na < 0.19849	<u>M</u> Yb < 0.00199
<u>M</u> Cr < 0.00993	<u>Q</u> Fe < 0.00110	<u>Q</u> P < 0.00300	<u>M</u> Sr < 0.00099	<u>M</u> Y < 0.07940
<u>M</u> Co < 0.00596	<u>M</u> La < 0.00099	<u>M</u> Pt < 0.00397	<u>Q</u> S < 0.03000	<u>Q</u> Zn 0.00040
<u>M</u> Cu < 0.01191	<u>M</u> Pb < 0.00596	<u>Q</u> K 0.00015	<u>M</u> Ta < 0.01389	<u>M</u> 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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 112.41; +2; 4; $\text{Cd}_2(\text{OH})(\text{aq})^{2+}$ and $\text{Cd}(\text{OH})(\text{aq})^{+}$

Chemical Compatibility - Stable in HCl , HNO_3 , H_2SO_4 , and HF . Avoid basic media forming insoluble carbonate and hydroxide.

Stable with most metals and inorganic anions in acidic media. The sulfide, carbonate, oxalate, phosphate, and cyanide are insoluble in water and soluble in HCl , HNO_3 , and NH_4OH . The chloride, bromide and iodide are soluble in water. Cd , as one of the few iodides soluble in ethanol. All compounds of Cd are soluble in excess NaI , due to the formation of the complex ion, CdI_4^{2-} .

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5 % HNO_3 /LDPE container.

Cd Containing Samples (Preparation and Solution) - Metal (soluble in HNO_3); Oxides (Soluble in HCl or HNO_3); Ores (Dissolve in HCl / HNO_3 , then take to fumes with H_2SO_4 . The silica and lead sulfate are filtered off after addition of water.); Organic based (dry ash at 450°C and dissolve ash in HCl) (sulfuric/peroxide acid digestion).

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

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at $\mu\text{g/L}$ concs.)
ICP-OES 214.438 nm	0.003 / 0.0003 $\mu\text{g/mL}$	1	ion	Pt, Ir
ICP-OES 228.802 nm	0.003 / 0.0003 $\mu\text{g/mL}$	1	atom	Co, Ir, <u>As</u> , Pt
ICP-OES 226.502 nm	0.003 / 0.0003 $\mu\text{g/mL}$	1	ion	Ir
ICP-MS 111 amu	11 ppt	n/a	M	¹⁰⁷ Mo ¹⁰⁸ O

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

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

10.0 **QUALITY STANDARD DOCUMENTATION**

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

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

Members of IQ Net International Certification Network:

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

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

- Chemical Testing - Accredited A2LA Certificate Number 883.01

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

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

10.4 **10CFR50 Appendix B - Nuclear Regulatory Commission**

- Domestic Licensing of Production and Utilization Facilities

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

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

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2

DATE RECEIVED: 02/25/04

DATE EXPIRED: 03/01/2005 WS

DATE OPENED: 02/25/04

INORG: 4467 PO: F52323

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 24, 2003

Expiration Date: **EXPIRES**
12/2005

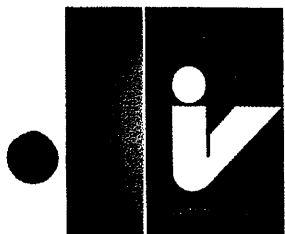
12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

John Struthers
Katalin Le
Paul Gaines



inorganic ventures / iv labs

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

certificate of analysis

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

- 2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Cobalt in 2% (abs) HNO₃

Catalog Number: CGCO1-1, CGCO1-2, and CGCO1-5
 Lot Number: W-QC001114
 Starting Material: Co powder
 Starting Material Purity (%): 99.995670
 Starting Material Lot No: 22897
 Matrix: 2% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
 DATE RECEIVED: 02/25/04
 DATE EXPIRED: 03/01/2005 W03
 DATE OPENED: 02/25/04
 INORG: 4408 PU: F52323

- 3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1002 ± 3 µg/mL
 Certified Density: 1.016 g/mL (measured at 22° C)

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

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

$$\text{Uncertainty } (\pm) = \frac{2(t_{\alpha/2, n-1})S}{(n)^{1/2}}$$

(\bar{x}) = 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.)

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

- 4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

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

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

4.1 Assay Method #1 998 ± 4 µg/mL
 ICP Assay NIST SRM 3181 Lot Number: 000630
 Assay Method #2 1002 ± 3 µg/mL
 EDTA NIST SRM 928 Lot Number: 880710

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

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

Q Al	0.00025	M Dy	< 0.02419	Q Li	0.00001	M Pr	< 0.00121	M Te	< 0.12097
M Sb	< 0.00202	M Er	< 0.02016	M Lu	< 0.00161	M Re	< 0.00403	M Tb	< 0.00121
Q As	< 0.10000	M Eu	< 0.01210	Q Mg	0.00045	M Rh	< 0.00403	M Tl	< 0.00403
M Ba	< 0.04032	M Gd	< 0.00403	Q Mn	0.00003	M Rb	< 0.00403	M Th	< 0.00403
M Be	< 0.00202	M Ga	< 0.00403	Q Hg	< 0.05000	M Ru	< 0.00807	M Tm	< 0.00161
M Bi	< 0.00161	M Ge	< 0.02419	M Mo	< 0.00807	M Sm	< 0.00403	M Sn	< 0.02016
Q B	< 0.04000	M Au	< 0.01210	M Nd	< 0.00807	M Sc	< 0.04032	M Ti	< 0.20162
M Cd	< 0.01210	M Hf	< 0.00807	Q Ni	< 0.02000	M Se	< 0.03226	M W	< 0.04032
Q Ca	0.00325	M Ho	< 0.00202	M Nb	< 0.00202	Q Si	< 0.00400	M U	< 0.00807
M Ce	< 0.02016	M In	< 0.04032	n Os		M Ag	< 0.00807	M V	< 0.00807
M Cs	< 0.00121	M Ir	< 0.02016	M Pd	< 0.02016	Q Na	0.00138	M Yb	< 0.00403
M Cr	< 0.02016	Q Fe	0.00875	n P		M Sr	< 0.00202	M Y	< 0.16129
s Co		M La	< 0.00202	M Pt	< 0.00807	n S		M Zn	< 0.08065
M Cu	< 0.02419	M Pb	< 0.01210	Q K	0.03000	M Ta	< 0.02823	M Zr	< 0.02016

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:

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

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 58.9332; +2; 6; $\text{Co}(\text{H}_2\text{O})_6^{2+}$

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	0.01/0.02 µg/mL	1	ion	Eg. W, Ta
ICP-OES 228.616 nm	0.01/0.01 µg/mL	1	ion	
ICP-OES 237.862 nm	0.01/0.02 µg/mL	1	ion	W, Re, Al, Ta
ICP-MS 59 amu	2 ppt	n/a	M	⁴⁴ Ca ⁴⁰ O ⁴ H, ⁴⁴ Ar ⁴⁰ O ⁴ H, ⁴⁴ Ar ⁴⁰ Na, ⁴⁴ Ca ⁴⁰ O, ⁴⁴ Mg ⁴⁰ Cl

- 8.0 **HAZARDOUS INFORMATION** - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.
- 9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.
- 10.0 **QUALITY STANDARD DOCUMENTATION**

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

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

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

- Chemical Testing - Accredited A2LA Certificate Number 883.01



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

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

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

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

11.0 **DATE OF CERTIFICATION AND PERIOD OF VALIDITY**



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

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

Certification Date: August 28, 2003

Expiration Date:

EXPIRES
1/1/2005

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 v03
DATE OPENED: 02/25/04
INORG: 4468 PO: F52323

010330

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

JoAnn Struthers

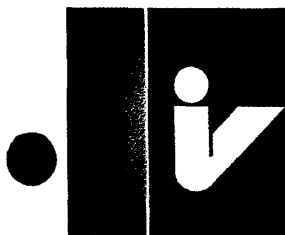
Certificate Approved By: Katalin Le, QC Supervisor

Katalin Le

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Paul Gaines

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 Statistical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade 1000 µg/mL Manganese in 2% (abs) HNO₃

Catalog Number: CGMN1-1, CGMN1-2, and CGMN1-5
 Lot Number: W-MN02036
 Starting Material: Mn pieces
 Starting Material Purity (%): 99.995300
 Starting Material Lot No: 21563
 Matrix: 2% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
 DATE RECEIVED: 01/20/04
 DATE EXPIRED: 02/01/2005 V03
 DATE OPENED: 01/20/04
 INORG: 4434 PO: F52301

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1000 ± 2 µg/mL

Certified Density: 1.014 g/mL (measured at 22° C)

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

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

(\bar{x}) = mean

x_i = individual results

n = number of measurements

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

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

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

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

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

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

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

4.1 **Assay Method #1** 1000 ± 2 µg/mL

ICP Assay NIST SRM 3132 Lot Number: 890903

Assay Method #2 1003 ± 3 µg/mL

EDTA NIST SRM 928 Lot Number: 880710

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

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>Q</u> Al 0.00221	<u>M</u> Dy < 0.02471	<u>Q</u> Li 0.00020	<u>M</u> Pr < 0.00124	<u>M</u> Te < 0.12355
<u>M</u> Sb < 0.00206	<u>M</u> Er < 0.02059	<u>M</u> Lu < 0.00165	<u>M</u> Re < 0.00412	<u>M</u> Tb < 0.00124
<u>M</u> As < 0.04118	<u>M</u> Eu < 0.01236	<u>Q</u> Mg 0.03350	<u>M</u> Rh < 0.00412	<u>M</u> Tl < 0.00412
<u>M</u> Ba < 0.04118	<u>M</u> Gd < 0.00412	<u>s</u> Mn	<u>M</u> Rb < 0.00412	<u>M</u> Th < 0.00412
<u>M</u> Be < 0.00206	<u>Q</u> Ga < 0.05000	<u>i</u> Hg	<u>M</u> Ru < 0.00824	<u>M</u> Tm < 0.00185
<u>M</u> Bi < 0.00165	<u>Q</u> Ge < 0.00300	<u>M</u> Mo < 0.00824	<u>M</u> Sm < 0.00412	<u>M</u> Sn < 0.02059
<u>Q</u> B 0.00295	<u>M</u> Au < 0.01236	<u>M</u> Nd < 0.00824	<u>M</u> Sc < 0.04118	<u>M</u> Ti < 0.20592
<u>M</u> Cd < 0.01236	<u>M</u> Hf < 0.00824	<u>M</u> Ni < 0.03295	<u>M</u> Se < 0.03295	<u>M</u> W < 0.04118
<u>Q</u> Ca 0.00340	<u>M</u> Ho < 0.00206	<u>M</u> Nb < 0.00206	<u>Q</u> Si 0.00275	<u>M</u> U < 0.00824
<u>M</u> Ce < 0.02059	<u>M</u> In < 0.04118	<u>n</u> Os	<u>M</u> Ag < 0.00824	<u>M</u> V < 0.00824
<u>M</u> Cs < 0.00124	<u>M</u> Ir < 0.02059	<u>M</u> Pd < 0.02059	<u>Q</u> Na 0.00225	<u>M</u> Yb < 0.00412
<u>M</u> Cr < 0.02059	<u>Q</u> Fe < 0.01000	<u>i</u> P	<u>M</u> Sr < 0.00206	<u>M</u> Y < 0.16474
<u>M</u> Co < 0.01236	<u>M</u> La < 0.00206	<u>M</u> Pt < 0.00824	<u>i</u> S	<u>Q</u> Zn 0.00250
<u>M</u> Cu < 0.02471	<u>M</u> Pb < 0.01236	<u>Q</u> K 0.00105	<u>M</u> Ta < 0.02883	<u>M</u> Zr < 0.02059

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:

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

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 54.9380; +2; 6; $\text{Mn}(\text{H}_2\text{O})_6^{2+}$

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 effects)
ICP-OES 257.610nm	0.0014 / 0.00002 $\mu\text{g/mL}$	1	ion	Ce, W, Re
ICP-OES 259.373 nm	0.0016 / 0.00002 $\mu\text{g/mL}$	1	ion	U, Ta, Mo, Fe, Nb
ICP-OES 260.569 nm	0.0021 / 0.00002 $\mu\text{g/mL}$	1	ion	Co
ICP-MS 55 amu	10 ppt	n/a	M'	$^{40}\text{Ar}^{14}\text{N}^+\text{H}$, $^{39}\text{K}^{16}\text{O}$, $^{35}\text{Cl}^{16}\text{O}$, $^{40}\text{Ar}^{14}\text{N}$, $^{39}\text{Ar}^{16}\text{O}$, $^{39}\text{Ar}^{18}\text{O}^+\text{H}$, $^{39}\text{Ar}^{16}\text{O}^+\text{H}$, $^{35}\text{Cl}^{18}\text{O}^+\text{H}$, $^{23}\text{Na}^{32}\text{S}$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

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

Members of IQ Net International Certification Network:

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

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

- Chemical Testing - Accredited A2LA Certificate Number 883.01



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

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

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

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

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2

DATE RECEIVED: 01/20/04

DATE EXPIRED: 02/01/2005 VDS

DATE OPENED: 01/20/04

INORG: 4434 PO: F52301

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 04, 2003

Expiration Date: **EXPIRES**
12/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

JoAnn Struthers
Katalin Le
Paul Gaines

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**CUSTOM-GRADE SOLUTION****1000 µg/mL Vanadium in 1.4% HNO₃ (abs)**

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

Lot Number: **T-V02032**

Starting Material:
 Starting Material Purity:
 Starting Material Lot No:

Vanadium Pentoxide
 99.999%
 46

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 11/5/03DATE EXPIRED: 12/1/2004 *OR*DATE OPENED: 11/5/03INORG: 4321 PO: F52258**CERTIFIED CONCENTRATION: 990 ± 2 µg/mL**

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

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

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

 \bar{x} = mean x_i = individual results

n = number of measurements

 $\sum s_i$ = The summation of all significant estimated errors.**Classical Wet Assay: 993 ± 4 µg/mL**

Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 990 ± 2 µg/mL

Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3165.

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

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

Custom-Grade solutions tested for trace metallic impurities by ICP-MS were analyzed in an ULPA-Filtered Clean Room.

An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

M	Al	0.0095	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	0.042	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	M	Mg	0.0089	M	Rh	<0.00010	M	Ti	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	i	Mn		M	Rb	<0.00010	M	Th	<0.00010
M	Be	<0.000050	M	Ga	<0.00010	i	Hg		M	Ru	<0.00020	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00060	M	Mo	0.016	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	M	Sc	<0.0010	M	Tl	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	Q	Ni	<0.050	Q	Se	<0.40	M	W	0.00055
Q	Ca	<0.010	M	Ho	<0.000050	M	Nb	0.00024	Q	Si	<0.030	M	U	0.0011
M	Ce	<0.00050	Q	In	<0.070	n	Os		M	Ag	0.00044	s	V	
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	Q	Na	<0.090	M	Yb	<0.00010
Q	Cr	<0.020	Q	Fe	<0.050	i	P		M	Sr	<0.000050	M	Y	<0.0040
Q	Co	<0.050	M	La	<0.000050	M	Pt	<0.00020	n	S		M	Zn	0.0041
M	Cu	<0.00060	M	Pb	<0.00030	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS

O - checked by ICP-OES

i - spectral interference

n - not checked for

s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): **1.015 g/mL**

(over)

QA:KLW, 08/22/02DK

Quality Assurance Manager

EXPIRES

Expires:

12/2004

QUALITY STANDARD DOCUMENTATION

1. ISO 9001 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 Guide 25 A2LA Accredited (Certificate Number 0883-01)
3. MIL-STD-45662A
4. 10CFR50 Appendix B
5. 10CFR21

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 μ m 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

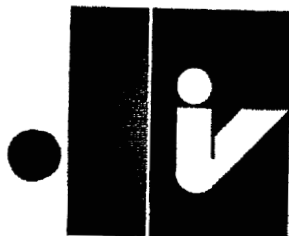
All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799

FAX 1-732-901-1903

E-MAIL IVtech@ivstandards.com

010337

**inorganic ventures / iv labs**

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

certificate of analysis

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

- 2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Zinc in 1.4% (abs) HNO₃

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

Lot Number: W-ZN02018

Starting Material: Zn shot

Starting Material Purity (%): 99.999889

Starting Material Lot No J17L26

Matrix: 1.4% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 11/5/03

DATE EXPIRED: 12/1/2004

DATE OPENED: 11/5/03

INORG: 4319 PO: F52258

- 3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1006 ± 3 µg/mL

Certified Density: 1.011 g/mL (measured at 22° C)

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

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

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2(s_{\bar{x}})}{(n)^{1/2}}$$

$s_{\bar{x}}$ = 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

1. "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)

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

4.1 Assay Method #1 1002 ± 6 µg/mL

ICP Assay NIST SRM 3168a Lot Number: 001402

Assay Method #2 1006 ± 3 µg/mL

EDTA NIST SRM 928 Lot Number: 880710

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

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>Q</u> Al < 0.00200	<u>M</u> Dy < 0.02440	<u>Q</u> Li 0.00001	<u>M</u> Pr < 0.00122	<u>M</u> Te < 0.12198
<u>M</u> Sb < 0.00203	<u>M</u> Er < 0.02033	<u>M</u> Lu < 0.00163	<u>M</u> Re < 0.00407	<u>M</u> Tb < 0.00122
<u>M</u> As < 0.04066	<u>M</u> Eu < 0.01220	<u>Q</u> Mg 0.00011	<u>M</u> Rh < 0.00407	<u>M</u> Tl < 0.00407
<u>M</u> Ba < 0.04066	<u>M</u> Gd < 0.00407	<u>M</u> Mn < 0.01626	<u>M</u> Rb < 0.00407	<u>M</u> Th < 0.00407
<u>M</u> Be < 0.00203	<u>M</u> Ga < 0.00407	<u>Q</u> Hg < 0.01000	<u>M</u> Ru < 0.00813	<u>M</u> Tm < 0.00163
<u>M</u> Bi < 0.00163	<u>M</u> Ge < 0.02440	<u>M</u> Mo < 0.00813	<u>M</u> Sm < 0.00407	<u>M</u> Sn < 0.02033
<u>Q</u> B 0.00015	<u>M</u> Au < 0.01220	<u>M</u> Nd < 0.00813	<u>M</u> Sc < 0.04066	<u>M</u> Ti < 0.20331
<u>M</u> Cd < 0.01220	<u>M</u> Hf < 0.00813	<u>Q</u> Ni 0.00009	<u>M</u> Se < 0.03253	<u>M</u> W < 0.04066
<u>Q</u> Ca 0.00022	<u>M</u> Ho < 0.00203	<u>M</u> Nb < 0.00203	<u>Q</u> Si < 0.00400	<u>M</u> U < 0.00813
<u>M</u> Ce < 0.02033	<u>M</u> In < 0.04066	<u>n</u> Os	<u>M</u> Ag < 0.00813	<u>M</u> V < 0.00813
<u>M</u> Cs < 0.00122	<u>M</u> Ir < 0.02033	<u>M</u> Pd < 0.02033	<u>Q</u> Na 0.00055	<u>M</u> Yb < 0.00407
<u>Q</u> Cr < 0.00100	<u>Q</u> Fe 0.00005	<u>Q</u> P < 0.00300	<u>M</u> Sr < 0.00203	<u>M</u> Y < 0.16264
<u>M</u> Co < 0.01220	<u>M</u> La < 0.00203	<u>M</u> Pt < 0.00813	<u>Q</u> S < 0.02000	<u>s</u> Zn
<u>Q</u> Cu < 0.00050	<u>M</u> Pb < 0.01220	<u>Q</u> K 0.00018	<u>M</u> Ta < 0.02846	<u>M</u> Zr < 0.02033

M - Checked by ICP-MS Q - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:

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

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

010340

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 02, 2003

Expiration Date:

EXPIRES
12/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

JoAnn Struthers
Katalin Le
Paul Gaines

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 11/5/03 2 of 2
DATE EXPIRED: 12/1/2004 OR
DATE OPENED: 11/5/03
INORG: 4319 PO: F52208



inorganic ventures / iv labs

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

certificate of analysis

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

2.0 DESCRIPTION OF CRM Custom-Grade 10000 µg/mL Magnesium In 1.4% (abs) HNO₃

Catalog Number: CGMG10-1 and CGMG10-5

Lot Number: T-MG03006

Starting Material: Mg metal

Starting Material Purity (%): 99.9968

Starting Material Lot No RML91191

Matrix: 1.4% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
 DATE RECEIVED: 07/31/03
 DATE EXPIRED: 08/01/2004 V05
 DATE OPENED: 08/01/03
 INORG: 4204 PO: F52391

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 9921 ± 20 µg/mL

Certified Density: 1.050 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

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

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

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$\sum s_i^2$ = The summation of all significant estimated errors.

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

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

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

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

4.1 Assay Method #1 9998 ± 20 µg/mL

EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 9921 ± 20 µg/mL

ICP Assay NIST SRM 3131a Lot Number: 991107

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

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

Q Al	0.02454	M Dy	< 0.02455	Q Li	0.00797	M Pr	< 0.00123	M Te	< 0.12275
M Sb	0.00306	M Er	< 0.02046	M Lu	< 0.00164	M Re	< 0.00409	M Tb	< 0.00123
M As	< 0.04092	M Eu	< 0.01228	S Mg		M Rh	< 0.00409	M Tl	< 0.00409
M Ba	< 0.04092	M Gd	< 0.00409	M Mn	< 0.01637	M Rb	< 0.00409	M Th	< 0.00409
Q Be	< 0.00017	M Ga	< 0.00409	Q Hg	< 0.00900	M Ru	< 0.00818	M Tm	< 0.00164
M Bi	< 0.00164	M Ge	< 0.02455	M Mo	< 0.00818	M Sm	< 0.00409	M Sn	< 0.02046
Q B	0.00871	M Au	< 0.01228	M Nd	< 0.00818	M Sc	< 0.04092	Q Ti	0.10206
M Cd	< 0.01228	M Hf	< 0.00818	Q Ni	0.01404	M Se	< 0.03273	M W	< 0.04092
Q Ca	0.01070	M Ho	< 0.00205	M Nb	< 0.00205	Q Si	0.03186	M U	< 0.00818
M Ce	< 0.02046	M In	< 0.04092	n Os		M Ag	< 0.00818	M V	< 0.00818
M Cs	< 0.00123	M Ir	< 0.02046	M Pd	< 0.02046	Q Na	0.01817	M Yb	< 0.00409
Q Cr	0.02315	Q Fe	0.02487	Q P	< 0.01600	M Sr	< 0.00205	M Y	< 0.16367
M Co	< 0.01228	M La	< 0.00205	M Pt	< 0.00818	n S		Q Zn	0.01892
Q Cu	0.00672	Q Pb	0.03236	Q K	< 0.05000	M Ta	< 0.02864	M Zr	< 0.02046

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 24.305; +2; 6; $\text{Mg}(\text{H}_2\text{O})_6^{2+}$

Chemical Compatibility - Soluble in HCl , HNO_3 , and H_2SO_4 , avoid HF , H_3PO_4 , and neutral to basic media. Stable with most metals and inorganic anions forming insoluble silicates, carbonates, hydroxides, oxides, and tungstates in neutral and slightly acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-10% HNO_3 / LDPE container.

Mg Containing Samples (Preparation and Solution) - Metal (Best dissolved in diluted HNO_3); Oxide (Readily soluble in above compatible aqueous acidic solutions); Ores (Carbonate fusion in Pt^{H} 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 $\mu\text{g/mL}$	1	ion	Th
ICP-OES 280.270 nm	0.0003 / 0.00005 $\mu\text{g/mL}$	1	ion	U, V
ICP-OES 285.213 nm	0.002 / 0.00003 $\mu\text{g/mL}$	1	atom	U, Hf, Cr, Zr
ICP-MS 24 amu	42 ppt	n/a	M'	$^6\text{Li}^+\text{O}$, $^{47}\text{Ti}^{+2}$, $^{40}\text{Ca}^{+2}$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

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

Members of **IQ Net International Certification Network:**

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

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

- Chemical Testing - Accredited A2LA Certificate Number 883.01



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

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

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

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

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2

DATE RECEIVED: 07/31/03

DATE EXPIRED: 08/01/2004 V02

DATE OPENED: 08/01/03

INORG: 4204 PO: F52391

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



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

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

Certification Date: August 28, 2002

Expiration Date: **EXPIRES**
01/22/04

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

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

Debbie Newman
Katalin Le
Paul Gaines

010345

**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% HNO₃ (abs)
 Catalog Number: CGAG1-1, CGAG1-2 and CGAG1-5

Lot Number: **T-AG02015**

Starting Material:
 Starting Material Purity:
 Starting Material Lot No:

Silver Metal
 99.999%
 F15102

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 08/26/03
 DATE EXPIRED: 09/01/2004 V03
 DATE OPENED: 08/26/03
 INORG: 4222 PO: E52224

CERTIFIED CONCENTRATION: 1001 ± 2 µg/mL

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

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

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

 (\bar{x}) = mean x_i = individual results

n = number of measurements

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

Classical Wet Assay: 1004 ± 3 µg/mL
 Method: Volhard Titration vs NIST SRM 999a Potassium Chloride

Instrument Analysis: 1001 ± 2 µg/mL
 Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3151.

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

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

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

Q	Al	<0.00010	M	Dy	<0.00060	Q	Li	<0.000030	M	Pr	<0.000030	Q	Te	<0.030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
Q	As	<0.0050	M	Eu	<0.00030	Q	Mg	<0.000040	M	Rh	<0.00010	M	Ti	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	Q	Mn	<0.00030	M	Rb	<0.00010	M	Th	<0.00010
Q	Be	<0.00050	M	Ga	<0.00010	Q	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
Q	B	<0.0020	Q	Au	<0.012	M	Nd	<0.00020	M	Sc	<0.0010	Q	Tl	<0.00070
Q	Cd	<0.0020	M	Hf	<0.00020	Q	Ni	<0.0070	Q	Se	<0.036	M	W	<0.0010
Q	Ca	<0.000050	M	Ho	<0.000050	M	Nb	<0.000050	Q	Si	<0.0030	M	X	<0.00020
M	Ce	<0.00050	Q	In	<0.020	n	Os		s	Ag		M	V	<0.00020
M	Ce	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	Q	Na	<0.090	M	Yb	<0.00010
Q	Cr	<0.0020	Q	Fe	<0.00070	Q	P	<0.030	M	Sr	<0.000050	M	Y	<0.0040
M	Co	<0.00030	M	La	<0.000050	Q	Pt	<0.00020	Q	S	<0.020	Q	Zn	<0.0010
M	Cu	<0.00060	M	Pb	<0.00030	Q	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. 002102208

Quality Assurance Manager

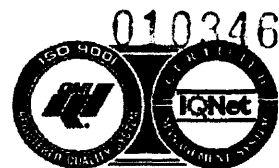
Expires:

EXPIRES**1/2004**

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 μ m 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


inorganic ventures / iv labs

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

certificate of analysis

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

2.0 **DESCRIPTION OF CRM** Custom-Grade 1000 µg/mL Arsenic in 1.4% (abs) HNO₃

Catalog Number: CGAS1-1, CGAS1-2, and CGAS1-5
 Lot Number: W-AS02022
 Starting Material: POLYCRYSTALLINE LUMP
 Starting Material Purity (%): 99.998994
 Starting Material Lot No: 23115
 Matrix: 1.4% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS 1 of 2

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1014 ± 3 µg/mL

Certified Density: 1.012 g/mL (measured at 22° C)

DATE RECEIVED: 01/20/04
 DATE EXPIRED: 02/01/2005 VMS
 DATE OPENED: 01/20/04
 INORG: 4433 PU: F52301

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:

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

$$\text{Uncertainty } (\pm) = \frac{2(s_{\bar{x}})}{(n)^{1/2}}$$

(\bar{x}) = 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 1014 ± 3 µg/mL (Avg 2 runs)
 ICP Assay NIST SRM 3103a Lot Number: 891003
 Assay Method #2 1008 µg/mL
 Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>Q</u> Al 0.00038	<u>M</u> Dy < 0.01596	<u>Q</u> Li 0.00009	<u>M</u> Pr < 0.00080	<u>M</u> Te < 0.07978
<u>Q</u> Sb < 0.01000	<u>M</u> Er < 0.01330	<u>M</u> Lu < 0.00106	<u>Q</u> Re < 0.01000	<u>M</u> Tb < 0.00080
<u>s</u> As	<u>M</u> Eu < 0.00798	<u>Q</u> Mg 0.00009	<u>M</u> Rh < 0.00266	<u>M</u> Tl < 0.00266
<u>M</u> Ba < 0.02660	<u>M</u> Gd < 0.00266	<u>Q</u> Mn < 0.00003	<u>M</u> Rb < 0.00266	<u>M</u> Th < 0.00266
<u>M</u> Be < 0.00133	<u>M</u> Ga < 0.00266	<u>Q</u> Hg < 0.01200	<u>M</u> Ru < 0.00532	<u>M</u> Tm < 0.00106
<u>M</u> Bi < 0.00106	<u>M</u> Ge < 0.01596	<u>M</u> Mo < 0.00532	<u>M</u> Sm < 0.00266	<u>Q</u> Sn 0.00049
<u>Q</u> B < 0.01200	<u>M</u> Au < 0.00798	<u>M</u> Nd < 0.00532	<u>M</u> Sc < 0.02660	<u>M</u> Ti < 0.13297
<u>M</u> Cd < 0.00798	<u>M</u> Hf < 0.00532	<u>M</u> Ni < 0.02128	<u>M</u> Se < 0.02128	<u>M</u> W < 0.02660
<u>Q</u> Ca 0.00189	<u>M</u> Ho < 0.00133	<u>Q</u> Nb < 0.00200	<u>Q</u> Si 0.00415	<u>M</u> U < 0.00532
<u>M</u> Ce < 0.01330	<u>M</u> In < 0.02660	<u>n</u> Os	<u>M</u> Ag < 0.00532	<u>M</u> V < 0.00532
<u>M</u> Cs < 0.00080	<u>M</u> Ir < 0.01330	<u>M</u> Pd < 0.01330	<u>Q</u> Na 0.00159	<u>M</u> Yb < 0.00266
<u>M</u> Cr < 0.01330	<u>Q</u> Fe < 0.00110	<u>Q</u> P < 0.00260	<u>M</u> Sr < 0.00133	<u>M</u> Y < 0.10638
<u>M</u> Co < 0.00798	<u>M</u> La < 0.00133	<u>M</u> Pt < 0.00532	<u>Q</u> S < 0.02500	<u>Q</u> Zn 0.00057
<u>M</u> Cu < 0.01596	<u>M</u> Pb < 0.00798	<u>Q</u> K 0.00132	<u>M</u> Ta < 0.01862	<u>M</u> Zr < 0.01330

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:

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

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 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_2PO_4 , H_2SO_4 , and HF aqueous matrices water and NH_4OH . It is stable with most inorganic anions (forms arsenate when boiled with chromate) but many cationic metals form the insoluble arsenates under pH neutral conditions. When fluorinated and / or under acidic conditions arsenate formation is typically not a problem at moderate to low concentrations.

Stability - 2-100 ppb levels stable for months alone or mixed with other elements at equivalent levels in 1% HNO_3 / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO_3 / LDPE container.

As Containing Samples (Preparation and Solution) - As^0 (soluble in 1:1 H_2O / HNO_3) Oxides (the oxide exists in crystalline and amorphous forms where the amorphous form is more water soluble. The oxides typically dissolve in dilute acidic solutions when boiled); Minerals (One gram of powdered 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 all concs.)
ICP-OES 189.042 nm	0.05 / 0.005 $\mu\text{g/mL}$	1	atom	Cr
ICP-OES 193.696 nm	0.1 / 0.01 $\mu\text{g/mL}$	1	atom	V, Ge
ICP-OES 228.812 nm	0.1 / 0.01 $\mu\text{g/mL}$	1	atom	Cd, Pt, Ir, Co
ICP-MS 75 amu	20 ppt	n/a	M	$^{35}\text{Ar}^{35}\text{Cl}$, $^{55}\text{Co}^{55}\text{O}$, $^{75}\text{Ar}^{75}\text{H}$, $^{75}\text{Ar}^{75}\text{Cl}$, $^{85}\text{Ar}^{85}\text{K}$, $^{140}\text{Nd}^{140}\text{Sm}$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

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

Members of IQ Net International Certification Network:

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

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

- Chemical Testing - Accredited A2LA Certificate Number 883.01

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

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

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

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

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2

DATE RECEIVED: 01/20/04

DATE EXPIRED: 02/01/2005 Y03

DATE OPENED: 01/20/04

INORG: 4433 PQ: F52301



11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010350



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

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

Certification Date: May 01, 2003

Expiration Date: **EXPIRES**
12 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

JoAnn Struthers
Katalin Le
Paul Gaines



inorganic ventures / iv labs

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

certificate of analysis

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

- 2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Lead in 0.35% (abs) HNO₃

Catalog Number: CGPB1-1, CGPB1-2, and CGPB1-5
 Lot Number: W-PB02114
 Starting Material: Pb(NO₃)₂
 Starting Material Purity (%): 99.999974
 Starting Material Lot No: 22150
 Matrix: 0.35% (abs) HNO₃

- 3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1006 ± 2 µg/mL

Certified Density: 1.002 g/mL (measured at 22° C)

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

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

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2(s_{\bar{x}})}{(n)^{1/2}}$$

$s_{\bar{x}}$ = The summation of all significant estimated errors

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

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

- 4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

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

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

- 4.1 Assay Method #1 1005 ± 2 µg/mL
 ICP Assay NIST SRM 3128 Lot Number: 991504
 Assay Method #2 1006 ± 2 µg/mL
 EDTA NIST SRM 928 Lot Number: 880710

INORGANIC LABS/RADCHEM LABS 162
 DATE RECEIVED: 11/3/03
 DATE EXPIRED: 11/1/04
 DATE OPENED: 11/3/03
 INORG: 4313
 PO: F52258

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

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>Q</u> Al < 0.00270	<u>M</u> Dy < 0.01193	<u>Q</u> Li < 0.00002	<u>M</u> Pr < 0.00060	<u>M</u> Te < 0.05965
<u>M</u> Sb < 0.00099	<u>M</u> Er < 0.00994	<u>M</u> Lu < 0.00080	<u>M</u> Re < 0.00199	<u>M</u> Tb < 0.00060
<u>M</u> As < 0.01989	<u>M</u> Eu < 0.00597	<u>Q</u> Mg 0.00008	<u>Q</u> Rh < 0.00900	<u>Q</u> Tl 0.00130
<u>M</u> Ba < 0.01989	<u>M</u> Gd < 0.00199	<u>M</u> Mn < 0.00795	<u>M</u> Rb < 0.00199	<u>M</u> Th < 0.00199
<u>M</u> Be < 0.00099	<u>M</u> Ga < 0.00199	<u>Q</u> Hg < 0.01500	<u>M</u> Ru < 0.00398	<u>M</u> Tm < 0.00080
<u>Q</u> Bi < 0.02000	<u>M</u> Ge < 0.01193	<u>M</u> Mo < 0.00398	<u>M</u> Sm < 0.00199	<u>M</u> Sn < 0.00994
<u>Q</u> B < 0.04000	<u>M</u> Au < 0.00597	<u>M</u> Nd < 0.00398	<u>M</u> Sc < 0.01989	<u>M</u> Ti < 0.09942
<u>M</u> Cd < 0.00597	<u>M</u> Hf < 0.00398	<u>M</u> Ni < 0.01591	<u>M</u> Se < 0.01591	<u>M</u> W < 0.01989
<u>Q</u> Ca 0.00009	<u>M</u> Ho < 0.00099	<u>M</u> Nb < 0.00099	<u>Q</u> Si < 0.00340	<u>M</u> U < 0.00398
<u>M</u> Ce < 0.00994	<u>M</u> In < 0.01989	<u>n</u> Os	<u>M</u> Ag < 0.00398	<u>M</u> V < 0.00398
<u>M</u> Cs < 0.00060	<u>M</u> Ir < 0.00994	<u>M</u> Pd < 0.00994	<u>Q</u> Na < 0.00600	<u>M</u> Yb < 0.00199
<u>M</u> Cr < 0.00994	<u>Q</u> Fe 0.00011	<u>Q</u> P < 0.00500	<u>M</u> Sr < 0.00099	<u>M</u> Y < 0.07954
<u>M</u> Co < 0.00597	<u>M</u> La < 0.00099	<u>M</u> Pt < 0.00398	<u>Q</u> S < 0.10000	<u>M</u> Zn < 0.03977
<u>M</u> Cu < 0.01193	<u>s</u> Pb	<u>Q</u> K < 0.00180	<u>M</u> Ta < 0.01392	<u>M</u> 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 $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 207.2; +2; 6; $\text{Pb}(\text{H}_2\text{O})_6^{2+}$

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 α levels)
ICP-OES 168.215 nm	0.03 / 0.003 $\mu\text{g/mL}$	1	ion	Co
ICP-OES 220.353 nm	0.04 / 0.006 $\mu\text{g/mL}$	1	ion	Bi, Nb
ICP-OES 217.000 nm	0.09 / 0.03 $\mu\text{g/mL}$	1	atom	W, Ir, Hf, Sb, Th
ICP-MS 208 amu	5 ppt	n/a	M'	$^{187}\text{Pb}^{+10}$, $^{187}\text{Os}^{+10}$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

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

Members of IQ Net International Certification Network:

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

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

- Chemical Testing - Accredited A2LA Certificate Number 883.01



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

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

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

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

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010354



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

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

INORGANIC LABS/RADCHEM LABS 2 of 2
 DATE RECEIVED: 11/13/03
 DATE EXPIRED: 11/13/04
 DATE OPENED: 11/13/03
 INORG: 4313 PO: F52258

Certification Date: January 23, 2003

Expiration Date: **EXPIRES**
 1/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

JoAnn Struthers
Katalin Le
Paul Gaines

010355

**inorganic ventures / iv labs**

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

certificate of analysis

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

- 2.0 **DESCRIPTION OF CRM** Custom-Grade 1000 µg/mL Antimony In 0.7% (abs) HNO₃ / 3% Tartaric Acid

Catalog Number: CGSB1-1, CGSB1-2 and CGSB1-5
 Lot Number: W-SB02078
 Starting Material: Sb shot
 Starting Material Purity (%): 99.989188
 Starting Material Lot No: D17L24
 Matrix: 0.7% (abs) HNO₃ / 3% Tartaric Acid

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1005 ± 2 µg/mL
Certified Density: 1.019 g/mL (measured at 22° C)

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

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

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

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$\sum s_i^2$ = The summation of all significant estimated errors

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

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

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

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

- 4.1 **Assay Method #1** 1005 ± 2 µg/mL (Avg 2 runs)
 ICP Assay NIST SRM 3102a Lot Number: 990707
Assay Method #2 1000 µg/mL
 Gravimetric NIST SRM Lot Number: See Sec. 4.2

INORGANIC LABS/RADCHEM LABS Pg 1 of 2
 DATE RECEIVED: 02/25/04
 DATE EXPIRED: 03/01/2005 V103
 DATE OPENED: 02/25/04
 INORG: 4464 PO: F52323

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

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>Q</u> Al 0.04519	<u>M</u> Dy < 0.00597	<u>Q</u> Li 0.00004	<u>M</u> Pr < 0.00030	<u>M</u> Te < 0.02983
<u>S</u> Sb	<u>M</u> Er < 0.00497	<u>M</u> Lu < 0.00040	<u>M</u> Re < 0.00099	<u>M</u> Tb < 0.00030
<u>M</u> As < 0.00994	<u>M</u> Eu < 0.00298	<u>Q</u> Mg 0.00171	<u>M</u> Rh < 0.00099	<u>M</u> Tl 0.00040
<u>Q</u> Ba 0.00003	<u>M</u> Gd < 0.00099	<u>Q</u> Mn 0.00321	<u>M</u> Rb < 0.00099	<u>M</u> Th < 0.00099
<u>Q</u> Be < 0.00001	<u>M</u> Ga < 0.00099	<u>Q</u> Hg < 0.01500	<u>M</u> Ru < 0.00199	<u>M</u> Tm < 0.00040
<u>M</u> Bi 0.00170	<u>M</u> Ge < 0.00597	<u>M</u> Mo < 0.00199	<u>M</u> Sm < 0.00099	<u>M</u> Sn 0.00050
<u>Q</u> B 0.00100	<u>M</u> Au < 0.00298	<u>M</u> Nd < 0.00199	<u>Q</u> Sc < 0.00016	<u>Q</u> Ti 0.00131
<u>M</u> Cd < 0.00298	<u>M</u> Hf < 0.00199	<u>Q</u> Ni 0.00100	<u>M</u> Se < 0.49711	<u>M</u> W < 0.00994
<u>Q</u> Ca 0.00884	<u>M</u> Ho < 0.00050	<u>M</u> Nb < 0.00050	<u>Q</u> Si 0.00502	<u>M</u> U < 0.00199
<u>Q</u> Ce < 0.00300	<u>M</u> In < 0.00994	<u>n</u> Os	<u>M</u> Ag < 0.00199	<u>M</u> V < 0.00199
<u>M</u> Cs < 0.00030	<u>M</u> Ir < 0.00497	<u>M</u> Pd < 0.00497	<u>Q</u> Na 0.00362	<u>M</u> Yb < 0.00099
<u>Q</u> Cr 0.00954	<u>Q</u> Fe 0.01306	<u>Q</u> P < 0.04000	<u>M</u> Sr < 0.00050	<u>M</u> Y < 0.03977
<u>M</u> Co < 0.00298	<u>Q</u> La < 0.00120	<u>M</u> Pt < 0.00199	<u>i</u> S	<u>Q</u> Zn 0.00141
<u>Q</u> Cu 0.00321	<u>M</u> Pb 0.00060	<u>Q</u> K 0.01004	<u>M</u> Ta < 0.00696	<u>M</u> 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 $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 121.75; +3; 6; $\text{Sb}(\text{O})\text{C}_2\text{H}_3\text{O}_6^{+}$

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 at 4000s.)
ICP-OES 206.833 nm	0.03 / 0.003 $\mu\text{g/mL}$	1	atom	<u>La</u> , Cr, Ge, Hf
ICP-OES 217.581 nm	0.05 / 0.005 $\mu\text{g/mL}$	1	atom	<u>Nb</u> , W, Re, Fe,
ICP-OES 231.147 nm	0.06 / 0.006 $\mu\text{g/mL}$	1	atom	Ni, Co, Pt
ICP-MS 121 amu	5 ppt	n/a	M	$^{102}\text{Pd}^{+}$, $^{91}\text{Y}^{+}$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

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

Members of IQ Net International Certification Network:

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

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

- Chemical Testing - Accredited A2LA Certificate Number 883.01

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

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

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

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



INORGANIC LABS/RADCHEM LABS Pg. 2 of 2

DATE RECEIVED: 02/25/04
 DATE EXPIRED: 03/01/2005 VOS
 DATE OPENED: 02/25/04
 INORG: 4464 PO: F52323

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



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

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

Certification Date: July 23, 2003

Expiration Date: **EXPIRES**
12/2005

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 Gaines



inorganic ventures / iv labs

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

certificate of analysis

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

2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Selenium in 1.4% (abs) HNO₃

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

Lot Number: T-SE01102

Starting Material: Se shot

Starting Material Purity (%): 99.9971

Starting Material Lot No C09L08

Matrix: 1.4% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
 DATE RECEIVED: 06/20/03
 DATE EXPIRED: 07/01/2004
 DATE OPENED: 06/23/03
 INORG: 4152 PO: F52370

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 995 ± 3 µg/mL

Certified Density: 1.010 g/mL (measured at 22° C)

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

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

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

\bar{x} = 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 #1 995 ± 3 µg/mL (Avg. 2 runs)

ICP Assay NIST SRM 3149 Lot Number: 992106

Assay Method #2 1002 µg/mL

Gravimetric NIST SRM Lot Number: See Sec. 4.2

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

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>Q</u> Al 0.00017	<u>M</u> Dy < 0.01196	<u>Q</u> Li < 0.00003	<u>M</u> Pr < 0.00060	<u>M</u> Te < 0.05981
<u>M</u> Sb 0.00160	<u>M</u> Er < 0.00997	<u>M</u> Lu < 0.00080	<u>Q</u> Re < 0.00900	<u>M</u> Tb < 0.00060
<u>Q</u> As < 0.00500	<u>M</u> Eu < 0.00598	<u>Q</u> Mg < 0.00003	<u>M</u> Rh < 0.00199	<u>M</u> Tl < 0.00199
<u>M</u> Ba < 0.01994	<u>M</u> Gd < 0.00199	<u>M</u> Mn < 0.00798	<u>M</u> Rb < 0.00199	<u>M</u> Th < 0.00199
<u>Q</u> Be < 0.00009	<u>M</u> Ga < 0.00199	<u>Q</u> Hg 0.01950	<u>Q</u> Ru 0.00220	<u>M</u> Tm < 0.00080
<u>M</u> Bi < 0.00080	<u>M</u> Ge < 0.01196	<u>Q</u> Mo < 0.00400	<u>M</u> Sm < 0.00199	<u>M</u> Sn < 0.00997
<u>Q</u> B < 0.00006	<u>M</u> Au < 0.00598	<u>M</u> Nd < 0.00399	<u>M</u> Sc < 0.01994	<u>M</u> Ti < 0.09969
<u>M</u> Cd < 0.00598	<u>M</u> Hf < 0.00399	<u>Q</u> Ni < 0.00090	<u>S</u> Se	<u>M</u> W < 0.01994
<u>Q</u> Ca 0.00200	<u>M</u> Ho < 0.00100	<u>Q</u> Nb < 0.00400	<u>Q</u> Si 0.00055	<u>M</u> U < 0.00399
<u>M</u> Ce < 0.00997	<u>M</u> In < 0.01994	<u>n</u> Os	<u>M</u> Ag 0.00070	<u>M</u> V < 0.00399
<u>M</u> Cs < 0.00060	<u>M</u> Ir < 0.00997	<u>M</u> Pd < 0.00997	<u>Q</u> Na 0.00355	<u>M</u> Yb < 0.00199
<u>M</u> Cr < 0.00997	<u>Q</u> Fe 0.00060	<u>Q</u> P < 0.00300	<u>M</u> Sr < 0.00100	<u>M</u> Y < 0.07975
<u>M</u> Co < 0.00598	<u>M</u> La < 0.00100	<u>M</u> Pt < 0.00399	<u>Q</u> S 0.00500	<u>M</u> Zn < 0.03988
<u>M</u> Cu < 0.01196	<u>M</u> Pb < 0.00598	<u>Q</u> K 0.00070	<u>M</u> Ta < 0.01396	<u>Q</u> Zr < 0.00040

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:

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

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

010361

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 78.96; +4; 6; H_2SeO_4

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 λ Doncs.)
ICP-OES 196.026 nm	0.08 / 0.006 $\mu\text{g/mL}$	1	atom	Fe
ICP-OES 203.985 nm	0.2 / 0.05 $\mu\text{g/mL}$	1	atom	Sb, Ir, Cr, Ta
ICP-OES 206.279 nm	0.3 / 0.16 $\mu\text{g/mL}$	1	atom	Cr, <u>Pt</u>
ICP-MS 82 amu	200 ppt	n/a	M'	$^{13}\text{C}^{16}\text{O}_2$

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

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

10.0 QUALITY STANDARD DOCUMENTATION

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de 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 79-2 of 3

DATE RECEIVED: 06/20/03

DATE EXPIRED: 07/01/2004 VES

DATE OPENED: 06/23/03

INORG: 4152 PO: F52370

010362

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



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

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

Certification Date: November 27, 2002

Expiration Date: **EXPIRES**
01/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Debbie Newman, QA Administrator

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Debbie Newman
Katalin Le
Paul Gaines



inorganic ventures / iv labs

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

certificate of analysis

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

- 2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Thallium in 0.5% (abs) HNO₃

Catalog Number: CGTL1-1, CGTL1-2, and CGTL1-5
 Lot Number: W-QTL01094
 Starting Material: TLNO₃
 Starting Material Purity (%): 99.996539
 Starting Material Lot No: 22928
 Matrix: 0.5% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
 DATE RECEIVED: 01/20/04
 DATE EXPIRED: 02/01/2005 v03
 DATE OPENED: 01/20/04
 INORG: 4435 PO: F52301

- 3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1001 ± 4 µg/mL

Certified Density: 1.002 g/mL (measured at 22° C)

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

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

$$\text{Uncertainty } (\pm) = \frac{2t(\bar{s})}{(n)^{1/2}}$$

(\bar{x}) = mean

x_i = individual results

n = number of measurements

\bar{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 1001 ± 4 µg/mL (Avg 2 runs)

ICP Assay NIST SRM 3158 Lot Number: 993012

- Assay Method #2 1000 µg/mL

Gravimetric NIST SRM Lot Number: See Sec. 4.2

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

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>M</u> Al < 0.01000	<u>M</u> Dy < 0.00600	<u>Q</u> Li < 0.00002	<u>M</u> Pr < 0.00030	<u>M</u> Te < 0.03000
<u>M</u> Sb < 0.00050	<u>M</u> Er < 0.00500	<u>M</u> Lu < 0.00040	<u>M</u> Re < 0.00100	<u>M</u> Tb < 0.00030
<u>M</u> As < 0.01000	<u>M</u> Eu < 0.00300	<u>Q</u> Mg 0.00012	<u>M</u> Rh < 0.00100	<u>s</u> Tl
<u>M</u> Ba < 0.01000	<u>M</u> Gd < 0.00100	<u>M</u> Mn < 0.00400	<u>M</u> Rb < 0.00100	<u>M</u> Th < 0.00100
<u>M</u> Be < 0.00050	<u>M</u> Ga < 0.00100	<u>Q</u> Hg < 0.01200	<u>M</u> Ru < 0.00200	<u>M</u> Tm < 0.00040
<u>M</u> Bi < 0.00040	<u>M</u> Ge < 0.00600	<u>M</u> Mo < 0.00200	<u>M</u> Sm < 0.00100	<u>M</u> Sn < 0.00500
<u>Q</u> B < 0.00140	<u>M</u> Au < 0.00300	<u>M</u> Nd < 0.00200	<u>M</u> Sc < 0.01000	<u>M</u> Ti < 0.05000
<u>Q</u> Cd 0.00150	<u>M</u> Hf < 0.00200	<u>M</u> Ni < 0.00800	<u>M</u> Se < 0.00800	<u>M</u> W < 0.01000
<u>Q</u> Ca 0.00085	<u>M</u> Ho < 0.00050	<u>M</u> Nb < 0.00050	<u>Q</u> Si < 0.00340	<u>M</u> U < 0.00200
<u>M</u> Ce < 0.00500	<u>M</u> In < 0.01000	<u>n</u> Os	<u>M</u> Ag 0.04000	<u>M</u> V < 0.00200
<u>M</u> Cs < 0.00030	<u>M</u> Ir < 0.00500	<u>M</u> Pd < 0.00500	<u>Q</u> Na 0.00050	<u>M</u> Yb < 0.00100
<u>M</u> Cr < 0.00500	<u>Q</u> Fe 0.00030	<u>Q</u> P < 0.00260	<u>M</u> Sr < 0.00050	<u>M</u> Y < 0.04000
<u>M</u> Co < 0.00300	<u>M</u> La < 0.00050	<u>M</u> Pt < 0.00200	<u>Q</u> S < 0.03000	<u>Q</u> Zn 0.00110
<u>M</u> Cu < 0.00600	<u>M</u> Pb 0.00210	<u>Q</u> K < 0.00180	<u>M</u> Ta < 0.00700	<u>M</u> Zr < 0.00500

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 204.383; +1; 6; $\text{Ti}(\text{H}_2\text{O})_6^{3+}$.

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.

Ti Containing Samples (Preparation and Solution) - Metal (Best dissolved in HNO_3 , which forms chiefly the Ti^{3+} ion.); Oxide (The thalious oxide is readily soluble in water. The thallic oxide requires high levels of acid); Ores (Carbonate fusion in P^{3+} 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 400nm)
ICP-OES 190.864 nm	0.04 / 0.004 $\mu\text{g/mL}$	1	ion	V, Ti
ICP-OES 276.787 nm	0.1 / 0.01 $\mu\text{g/mL}$	1	atom	Ta, V, Fe, Cr
ICP-OES 351.924 nm	0.2 / 0.02 $\mu\text{g/mL}$	1	atom	Th, Ce, Zr
ICP-MS 205 amu	2 ppt	n/a	M+	¹⁸ Os ¹⁶ O

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

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

10.0 QUALITY STANDARD DOCUMENTATION

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

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

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (OQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (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 2 of 2

DATE RECEIVED: 01/20/04

DATE EXPIRED: 02/01/2005 v03

DATE OPENED: 01/20/04

INORG: 4435 PO: F52301

010366

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 09, 2003

Expiration Date: **EXPIRES**
12/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Debbie Newman, Production Manager

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Debbie Newman
Katalin Le
Paul Gaines

010367



Certificate of Analysis

CUSTOM-GRADE SOLUTION
1000 µg/mL Lanthanum in 1.4% HNO₃ (abs)

Catalog Number: CGLA1-1 and CGLA1-5

 Lot Number: **T-QLA01057**

 Starting Material:
 Starting Material Purity:
 Starting Material Lot No:

 Lanthanum Oxide
 99.999%
 LA-0-5-017

INORGANIC LABS/RADCHEM LABS

 DATE RECEIVED: 08/26/03
 DATE EXPIRED: 09/01/2004
 DATE OPENED: 08/26/03
 INORG: 4221 PO: F53324
CERTIFIED CONCENTRATION: 1002 ± 3 µg/mL

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

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

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

 (\bar{x}) = mean

 x_i = individual results

 n = number of measurements

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

Classical Wet Assay: 1002 ± 3 µg/mL

Method: EDTA Titration vs NIST SRM 928 Lead Nitrate.

Instrument Analysis: 1007 ± 3 µg/mL

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

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

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

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

<u>Q</u> Al <0.040	<u>M</u> Dy <0.00060	<u>M</u> Li <0.0010	<u>Q</u> Pr <0.020	<u>M</u> Te <0.0030
<u>M</u> Sb <0.000050	<u>M</u> Er 0.0010	<u>M</u> Lu 0.000040	<u>M</u> Re <0.00010	<u>M</u> Tb <0.000030
<u>M</u> As <0.0010	<u>M</u> Eu <0.00030	<u>M</u> Mg <0.0030	<u>M</u> Rh <0.00010	<u>M</u> Tl <0.00010
<u>Q</u> Ba <0.020	<u>M</u> Gd 0.039	<u>M</u> Mn <0.00040	<u>M</u> Rb <0.00010	<u>M</u> Th <0.00010
<u>M</u> Be <0.000050	<u>M</u> Ga <0.00010	<u>Q</u> Hg <0.030	<u>M</u> Ru <0.00020	<u>M</u> Tm <0.000040
<u>M</u> Bi <0.000040	<u>M</u> Ge <0.00060	<u>M</u> Mo <0.00020	<u>M</u> Sm 0.00040	<u>M</u> Sn <0.00050
<u>Q</u> B <0.020	<u>M</u> Au <0.00030	<u>M</u> Nd 0.00020	<u>M</u> Sc <0.0010	<u>M</u> Ti <0.0050
<u>M</u> Cd <0.00030	<u>M</u> Hf <0.00020	<u>Q</u> Ni <0.050	<u>Q</u> Se <0.40	<u>M</u> W <0.0010
<u>Q</u> Ca <0.010	<u>M</u> Ho 0.00010	<u>M</u> Nb <0.000050	<u>Q</u> Si <0.020	<u>M</u> U <0.00020
<u>i</u> Ce	<u>Q</u> In <0.030	<u>n</u> Os	<u>M</u> Ag <0.00020	<u>M</u> V <0.00020
<u>n</u> Cs	<u>M</u> Ir <0.00050	<u>M</u> Pd <0.00050	<u>Q</u> Na <0.090	<u>M</u> Yb <0.00010
<u>M</u> Cr <0.00050	<u>Q</u> Fe <0.050	<u>Q</u> P <0.050	<u>M</u> Sr <0.000050	<u>M</u> Y <0.0040
<u>M</u> Co <0.00030	<u>s</u> La	<u>M</u> Pt <0.00020	<u>n</u> S	<u>M</u> Zn <0.0020
<u>M</u> Cu <0.00060	<u>M</u> Pb <0.00030	<u>n</u> K	<u>M</u> Ta <0.00070	<u>M</u> Zr <0.00050

M - checked by ICP-MS

O - checked by ICP-OES

i - spectral interference

n - not checked for

s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.009 g/mL

(over)

QA:KSL Rev.121702DM

Inorganic Ventures, Inc.

195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701

Orders: 800-869-6799 • FAX (732) 901-1903

Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES

1/2004-

QUALITY STANDARD DOCUMENTATION1. **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 μ m 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@lvstandards.com



inorganic ventures / iv labs

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

certificate of analysis

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

- 2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Palladium in 3.3% (abs) HCL

Catalog Number: CGPD1-1 and CGPD1-5
 Lot Number: W-PD02019
 Starting Material: Pd(NO₃)₂
 Starting Material Purity (%): 99.999248
 Starting Material Lot No: 11974A-00
 Matrix: 3.3% (abs) HCL

INORGANIC LABS/RADCHEM LABS Pg. 4 of 2
 DATE RECEIVED: 03/01/04
 DATE EXPIRED: 03/01/2005 YMS
 DATE OPENED: 03/01/04
 INORG: 4477 PO: F52323

- 3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 994 ± 3 µg/mL

Certified Density: 1.022 g/mL (measured at 22° C)

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

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

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

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$\sum s_i^2$ = The summation of all significant estimated errors

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

- 4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

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

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

- 4.1 Assay Method #1 994 ± 3 µg/mL (Avg 2 runs)

ICP Assay NIST SRM 3138 Lot Number: 990207

- Assay Method #2 1000 µg/mL

Gravimetric NIST SRM Lot Number: See Sec. 4.2

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

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

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>Q</u> Al 0.00400	<u>M</u> Dy < 0.00060	<u>Q</u> Li < 0.04000	<u>M</u> Pr < 0.00003	<u>Q</u> Te < 0.01300
<u>Q</u> Sb < 0.00500	<u>M</u> Er < 0.00050	<u>M</u> Lu < 0.00004	<u>M</u> Re < 0.00010	<u>M</u> Tb < 0.00003
<u>Q</u> As < 0.01400	<u>M</u> Eu < 0.00030	<u>Q</u> Mg < 0.01100	<u>Q</u> Rh < 0.00600	<u>M</u> Tl < 0.00010
<u>M</u> Ba < 0.00100	<u>M</u> Gd < 0.00010	<u>Q</u> Mn < 0.00650	<u>M</u> Rb < 0.00010	<u>M</u> Th < 0.00010
<u>Q</u> Be < 0.00009	<u>M</u> Ga < 0.00010	<u>Q</u> Hg < 0.01100	<u>Q</u> Ru < 0.00200	<u>M</u> Tm < 0.00004
<u>M</u> Bi < 0.00004	<u>M</u> Ge < 0.00060	<u>M</u> Mo < 0.00020	<u>M</u> Sm < 0.00010	<u>Q</u> Sn < 0.00700
<u>Q</u> B < 0.00090	<u>Q</u> Au < 0.00300	<u>M</u> Nd < 0.00020	<u>Q</u> Sc < 0.00009	<u>Q</u> Ti < 0.00100
<u>Q</u> Cd < 0.00600	<u>M</u> Hf < 0.00020	<u>Q</u> Ni 0.01800	<u>M</u> Se < 0.00080	<u>M</u> W < 0.00100
<u>Q</u> Ca 0.00700	<u>M</u> Ho < 0.00005	<u>M</u> Nb < 0.00005	<u>Q</u> Si 0.00600	<u>M</u> U < 0.00020
<u>M</u> Ce < 0.00050	<u>Q</u> In < 0.03300	<u>n</u> Os	<u>Q</u> Ag < 0.00670	<u>M</u> V < 0.00020
<u>M</u> Cs < 0.00003	<u>M</u> Ir < 0.00050	<u>S</u> Pd	<u>Q</u> Na 0.01500	<u>M</u> Yb < 0.00010
<u>Q</u> Cr 0.00450	<u>Q</u> Fe 0.04600	<u>Q</u> P 0.00600	<u>M</u> Sr < 0.00005	<u>M</u> Y < 0.00400
<u>M</u> Co < 0.00030	<u>M</u> La < 0.00005	<u>Q</u> Pt < 0.00600	<u>Q</u> S < 0.02500	<u>Q</u> Zn < 0.00060
<u>Q</u> Cu 0.00360	<u>M</u> Pb < 0.00030	<u>Q</u> K < 0.02000	<u>M</u> Ta < 0.00070	<u>M</u> Zr < 0.00050

M - Checked by ICP-MS Q - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:

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

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

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

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 106.42; +2; 6; $\text{Pd}(\text{H}_2\text{O})_6^{2+}$

Chemical Compatibility - Stable in HCl , HNO_3 , H_2SO_4 , HF , H_3PO_4 . Avoid basic media. Stable with most metals and inorganic anions in acidic media. Avoid contact with water soluble organics such as aldehydes since Pd^{2+} is easily reduced.

Stability - 2-100 ppb levels. 2ppb Pd is stable for 1 day in 1% HNO_3 /LDPE container. 10 ppb is stable for 3 days in 1% HNO_3 /LDPE container. 100 ppb is stable for 6 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 all concs.)
ICP-OES 340.458 nm	0.04 / 0.003 µg/mL	1 atom		Ce, Th, Zr
ICP-OES 368.470 nm	0.05 / 0.007 µg/mL	1 atom		
ICP-OES 229.691 nm	0.07 / 0.004 µg/mL	1 ion		Co
ICP-MS 105 amu	2 ppt	n/a	M'	$^{63}\text{Ar}^{63}\text{Cu}$, $^{65}\text{Y}^{65}\text{O}$

- 8.0 **HAZARDOUS INFORMATION** - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.
- 9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.
- 10.0 **QUALITY STANDARD DOCUMENTATION**

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

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

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

Members of IQ Net International Certification Network:

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

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

- Chemical Testing - Accredited A2LA Certificate Number 883.01



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

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

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

10.4 **10CFR50 Appendix B - Nuclear Regulatory Commission**

- Domestic Licensing of Production and Utilization Facilities

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

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

11.0 **DATE OF CERTIFICATION AND PERIOD OF VALIDITY**



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

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

Certification Date: March 14, 2003

Expiration Date:

EXPIRES

01/12/05

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
 DATE RECEIVED: 03/01/04
 DATE EXPIRED: 03/01/2005 VO
 DATE OPENED: 03/01/04
 INORG: 4477 PO: F52323

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

010372

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

JoAnn Struthers

Katalin Le

Paul Gaines

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 Statistical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Sulfur in H₂O

Catalog Number: CGS1-1 and CGS1-5
 Lot Number: W-QS01098
 Starting Material: H₂SO₄
 Starting Material Purity (%): 99.999965
 Starting Material Lot No: N38818
 Matrix: H₂O

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 11/5/03 1 of 2
 DATE EXPIRED: 12/1/2004 DR
 DATE OPENED: 11/5/03
 INORG: 4317 PO: F52258

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1010 ± 2 µg/mL

Certified Density: 1.000 g/mL (measured at 22° C)

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

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

(\bar{x}) = mean

x_i = individual results

n = number of measurements

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

$\sum s_i^2$ = The summation of all significant estimated errors.

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

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

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

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

□ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 Assay Method #1 998 ± 8 µg/mL
 ICP Assay NIST SRM 3154 Lot Number: 892205
 Assay Method #2 1010 ± 2 µg/mL
 Acidimetric NIST SRM 84k Lot Number: 84k

- 4.2 BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 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 $\mu\text{g/mL}$

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm .

<u>Q</u> Al 0.00025	<u>M</u> Dy < 0.01197	<u>Q</u> Li < 0.00016	<u>M</u> Pr < 0.00060	<u>M</u> Te < 0.05984
<u>M</u> Sb < 0.00100	<u>M</u> Er < 0.00997	<u>M</u> Lu < 0.00080	<u>M</u> Re < 0.00200	<u>M</u> Tb < 0.00060
<u>M</u> As < 0.01995	<u>M</u> Eu < 0.00598	<u>Q</u> Mg < 0.00004	<u>M</u> Rh < 0.00200	<u>M</u> Tl < 0.00200
<u>M</u> Ba < 0.01995	<u>M</u> Gd < 0.00200	<u>M</u> Mn < 0.00798	<u>M</u> Rb < 0.00200	<u>M</u> Th < 0.00200
<u>Q</u> Be < 0.00200	<u>M</u> Ga < 0.00200	<u>Q</u> Hg < 0.01100	<u>M</u> Ru < 0.00399	<u>M</u> Tm < 0.00080
<u>M</u> Bi < 0.00080	<u>M</u> Ge < 0.01197	<u>M</u> Mo < 0.00399	<u>M</u> Sm < 0.00200	<u>M</u> Sn < 0.00997
<u>Q</u> B < 0.00990	<u>M</u> Au < 0.00598	<u>M</u> Nd < 0.00399	<u>M</u> Sc < 0.01995	<u>M</u> Ti < 0.09974
<u>M</u> Cd < 0.00598	<u>M</u> Hf < 0.00399	<u>Q</u> Ni < 0.00230	<u>Q</u> Se < 0.00620	<u>M</u> W < 0.01995
<u>Q</u> Ca 0.00020	<u>M</u> Ho < 0.00100	<u>M</u> Nb < 0.00100	<u>Q</u> Si < 0.00410	<u>M</u> U < 0.00399
<u>M</u> Ce < 0.00997	<u>M</u> In < 0.01995	<u>n</u> Os	<u>M</u> Ag < 0.00399	<u>M</u> V < 0.00399
<u>M</u> Cs < 0.00060	<u>M</u> Ir < 0.00997	<u>M</u> Pd < 0.00997	<u>Q</u> Na < 0.00010	<u>M</u> Yb < 0.00200
<u>M</u> Cr < 0.00997	<u>Q</u> Fe 0.00015	<u>Q</u> P < 0.00480	<u>M</u> Sr < 0.00100	<u>M</u> Y < 0.07979
<u>M</u> Co < 0.00598	<u>M</u> La < 0.00100	<u>M</u> Pt < 0.00399	<u>s</u> S	<u>Q</u> Zn 0.00125
<u>M</u> Cu < 0.01197	<u>M</u> Pb < 0.00598	<u>Q</u> K < 0.00170	<u>M</u> Ta < 0.01396	<u>M</u> Zr < 0.00997

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Kept tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 32.066; +6; 6; ($\text{O}=\text{S}(\text{OH})_2$).

Chemical Compatibility - Soluble in HCl , HNO_3 , H_2PO_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 powdered sample is fused in a Pt crucible with 20 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 $\mu\text{g/L}$ concs.)
ICP-OES	166.669 nm	0.2 / 0.19 $\mu\text{g/mL}$	1	atom	Si, B
ICP-OES	182.034 nm	0.3 / 0.024 $\mu\text{g/mL}$	1	atom	
ICP-OES	143.328 nm	0.4 / 0.035 $\mu\text{g/mL}$	1	atom	
ICP-MS	32 amu	30,000 ppt	n/a	M	$^{16}\text{O}_2$, $^{14}\text{N}^{16}\text{O}$, $^{15}\text{N}^{16}\text{O}$, $^{14}\text{N}^{17}\text{O}$, $^{15}\text{N}^{17}\text{O}$

8.0 **HAZARDOUS INFORMATION** - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

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.

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 11/5/03 *242*
 DATE EXPIRED: 12/1/2004 *DR*
 DATE OPENED: 11/5/03
 INORG: 4317 PD: F52258

Certification Date: August 27, 2003

Expiration Date: **EXPIRES**
 12/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant
 Certificate Approved By: Katalin Le, QC Supervisor
 Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

JoAnn Struthers
Katalin Le
Paul Gaines

010377



Certificate of Analysis

CUSTOM-GRADE SOLUTION

Catalog Number: CGTH1-1 and CGTH1-5

1000 µg/mL Thorium in 3% HNO₃ (abs)

Lot Number: T-TH01059

Starting Material:
Starting Material Purity:
Starting Material Lot No:

Thorium Nitrate
99.999%
C01L32

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 10/08/03
DATE EXPIRED: 11/01/2004
DATE OPENED: 10/08/03
INORG: 4283 PO: F52240

CERTIFIED CONCENTRATION: 1001 ± 3 µg/mL

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

$$\text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

(x̄) = mean

x_i = individual results

n = number of measurements

Σs_i = The summation of all significant estimated errors.

Classical Wet Assay: 1001 ± 3 µg/mL

Method: EDTA Titration vs NIST SRM Lead Nitrate.

Instrument Analysis: 1002 ± 4 µg/mL

Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3159.

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by ICP-MS were analyzed in an ULPA-Filtered Clean Room.

An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

Q Al <0.00090	M Dy 0.0062	Q Li <0.000030	M Pr 0.00037	Q Te <0.031
M Sb <0.000050	M Er <0.00050	M Lu <0.000040	M Re <0.00010	M Tb <0.000030
Q As <0.014	M Eu <0.00030	Q Mg <0.000060	M Rh <0.00010	M Tl <0.00010
M Ba 0.0050	M Gd 0.0054	Q Mn <0.0000030	M Rb <0.00010	s Th
Q Be <0.00020	M Ga <0.00010	Q Hg	M Ru <0.00020	M Tm <0.000040
M Bi <0.000040	M Ge <0.00060	M Mo <0.00020	M Sm 0.0095	M Sn <0.00050
Q B <0.00060	M Au <0.00030	M Nd 0.0026	M Sc <0.0010	Q Ti <0.00092
Q Cd <0.0045	M Hf <0.00020	Q Ni <0.0023	M Se <0.010	M W <0.0010
Q Ca <0.030	M Ho 0.00022	M Nb <0.000050	Q Si <0.0034	M U 0.074
M Ce <0.00050	Q In <0.0020	Q Os	M Ag <0.00020	M V <0.00020
M Cs <0.000030	M Ir <0.00050	M Pd <0.00050	Q Na <0.00010	M Yb <0.00010
Q Cr <0.00080	Q Fe <0.0011	i P	M Sr <0.000050	M Y <0.0040
M Co <0.00030	M La <0.000050	M Pt <0.00020	Q S <0.072	Q Zn <0.00058
M Cu <0.00060	M Pb <0.00030	Q K <0.0017	M Ta <0.00070	M Zr 0.0085

M - checked by ICP-MS

O - checked by ICP-OES

i - spectral interference

n - not checked for

s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.022 g/mL

QA:KL Rev. 09/02/03

(over)

Inorganic Ventures, Inc.

195 Lehigh Avenue • Suite 4 • Lakewood, NJ 08701

Orders: 800-669-6799 • FAX (732) 901-1903

Technical Support: 800-569-6799

Quality Assurance Manager

EXPIRES

01/02/04

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 (SI), 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/IEC 17025-1999 "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 Licensing 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 -	<u>The length of time that a properly stored and packaged standard will remain within the specified uncertainty.</u> 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 -	<u>The date after which a standard solution should not be used.</u> 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 μ m 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

010379

**inorganic ventures / iv labs**

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
 phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
 e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s)), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade 1000 µg/mL Uranium In 1% (abs) HNO₃

Catalog Number: CGU1-1 and CGU1-5
 Lot Number: W-U01059
 Starting Material: UO₂(NO₃)2.6H₂O
 Starting Material Purity (%): 99.994419
 Starting Material Lot No: RB0018
 Matrix: 1% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
 DATE RECEIVED: 02/25/04
 DATE EXPIRED: 03/01/2005 V01
 DATE OPENED: 02/25/04
 INORG: 4473 PD: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 997 ± 2 µg/mL

Certified Density: 1.021 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2(s_{\bar{x}})}{(n)^{1/2}}$$

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** 997 ± 2 µg/mL

ICP Assay NIST SRM 3164 Lot Number: 891509

Assay Method #2 1000 µg/mL

Gravimetric NIST SRM Lot Number: See Sec. 4.2

- 4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.
- 4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>M</u> Al 0.05166	<u>M</u> Dy < 0.01494	<u>M</u> Li < 0.02490	<u>M</u> Pr < 0.00075	<u>M</u> Te < 0.07470
<u>M</u> Sb < 0.00125	<u>M</u> Er < 0.01245	<u>M</u> Lu < 0.00100	<u>M</u> Re < 0.00249	<u>M</u> Tb 0.00003
<u>M</u> As < 0.02490	<u>M</u> Eu < 0.00747	<u>M</u> Mg < 0.07470	<u>M</u> Rh < 0.00249	<u>M</u> Tl < 0.00249
<u>M</u> Ba < 0.02490	<u>M</u> Gd 0.00310	<u>M</u> Mn 0.00083	<u>M</u> Rb < 0.00249	<u>M</u> Th < 0.00249
<u>M</u> Be < 0.00125	<u>M</u> Ga < 0.00249	<u>I</u> Hg	<u>M</u> Ru < 0.00498	<u>M</u> Tm < 0.00100
<u>M</u> Bi < 0.00100	<u>M</u> Ge < 0.01494	<u>M</u> Mo 0.00093	<u>M</u> Sm 0.00010	<u>Q</u> Sn < 0.10000
<u>M</u> B < 0.17429	<u>M</u> Au < 0.00747	<u>M</u> Nd < 0.00498	<u>M</u> Sc < 0.02490	<u>M</u> Ti 0.00258
<u>M</u> Cd 0.00103	<u>M</u> Hf < 0.00498	<u>M</u> Ni < 0.01992	<u>M</u> Se < 0.01992	<u>M</u> W < 0.02490
<u>Q</u> Ca 0.05395	<u>M</u> Ho 0.00052	<u>M</u> Nb < 0.00125	<u>I</u> Si	<u>s</u> U
<u>M</u> Ce 0.00010	<u>M</u> In < 0.02490	<u>n</u> Os	<u>M</u> Ag < 0.00498	<u>M</u> V < 0.00498
<u>M</u> Cs < 0.00075	<u>M</u> Ir < 0.01245	<u>M</u> Pd < 0.01245	<u>Q</u> Na 0.00664	<u>M</u> Yb < 0.00249
<u>M</u> Cr < 0.01245	<u>M</u> Fe < 0.49798	<u>I</u> P	<u>M</u> Sr < 0.00125	<u>M</u> Y 0.00062
<u>M</u> Co < 0.00747	<u>M</u> La 0.00145	<u>M</u> Pt < 0.00498	<u>I</u> S	<u>M</u> Zn 0.00114
<u>M</u> Cu 0.00072	<u>M</u> Pb 0.00217	<u>I</u> K	<u>M</u> Ta < 0.01743	<u>M</u> 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 $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 238.0289; +6; 8; UO_2^{2+} (uranyl)

Chemical Compatibility - Soluble in HCl and HNO_3 . Avoid H_2PO_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 100ppb)
ICP-OES 365.958 nm	0.3 / 0.01 $\mu\text{g/mL}$	1	ion	Th, Fe
ICP-OES 367.007 nm	0.3 / 0.02 $\mu\text{g/mL}$	1	ion	Th, Ce
ICP-OES 263.553 nm	0.3 / 0.01 $\mu\text{g/mL}$	1	ion	Ce, Ir, Th, Rh, W, Zr, Ta, Ti, V, Hf, Fe, Re, Ru
ICP-MS 238 amu	2 ppt	n/a	M	$^{238}\text{Pb}^{16}\text{O}_2$

8.0 **HAZARDOUS INFORMATION** - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditación, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (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 - 1995 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2

DATE RECEIVED: 02/25/04
 DATE EXPIRED: 03/01/2005
 DATE OPENED: 02/25/04
 INORG: 4473 PO: F52323

***NOTICE TO ICP-MS USERS:** The ^{235}U in this standard is depleted. The certified abundances in Atom % are as follows:

	Isotope	Natural Abundance	IV's Certified Abundance
		Atom %	Atom %
Uranium	^{238}U	99.3	99.8 ± 0.1
	^{235}U	0.70	0.204 ± 0.002

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: June 10, 2003

Expiration Date:

EXPIRES
1/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

JoAnn Struthers
Katalin Le
Paul Gaines

010383

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
 phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
 e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02.** The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s)), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Tungsten in 1% (abs) HNO₃/1% (abs) HF

Catalog Number:	CGW1-1 and CGW1-5	INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
Lot Number:	W-W01080	DATE RECEIVED: 07/31/03
Starting Material:	W Powder	DATE EXPIRED: 08/01/2004
Starting Material Purity (%):	99.990703	DATE OPENED: 08/01/03
Starting Material Lot No	21418, C31H46, D02J21, E03K06, D11F29	INORG: 4203 PO: E52383
Matrix:	1% (abs) HNO ₃ /1% (abs) HF	

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1001 ± 2 µg/mL

Certified Density: 1.006 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

$$\text{Uncertainty } (\pm) = \frac{2(s)}{(n)^{1/2}}$$

\bar{x} = 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 1001 ± 2 µg/mL (Avg 2 runs)
 ICP Assay NIST SRM 3163 Lot Number: 990209

Assay Method #2 1000 µg/mL
 Gravimetric NIST SRM Lot Number: See Sec. 4.2

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>Q</u> Al 0.01792	<u>M</u> Dy < 0.00595	<u>Q</u> Li < 0.00008	<u>M</u> Pr < 0.00030	<u>M</u> Te < 0.02974
<u>M</u> Sb < 0.00050	<u>M</u> Er < 0.00496	<u>M</u> Lu < 0.00040	<u>i</u> Re	<u>M</u> Tb < 0.00030
<u>M</u> As < 0.00991	<u>M</u> Eu < 0.00297	<u>Q</u> Mg 0.00120	<u>M</u> Rh < 0.00099	<u>M</u> Tl < 0.00099
<u>M</u> Ba < 0.00991	<u>M</u> Gd < 0.00099	<u>M</u> Mn < 0.00397	<u>M</u> Rb < 0.00099	<u>M</u> Th < 0.00099
<u>M</u> Be < 0.00050	<u>M</u> Ga < 0.00099	<u>Q</u> Hg < 0.04778	<u>M</u> Ru < 0.00198	<u>M</u> Tm < 0.00040
<u>M</u> Bi < 0.00040	<u>M</u> Ge < 0.00595	<u>M</u> Mo 0.00050	<u>M</u> Sm < 0.00099	<u>M</u> Sn < 0.00496
<u>Q</u> B < 1.19460	<u>M</u> Au < 0.00297	<u>M</u> Nd < 0.00198	<u>Q</u> Sc < 0.00036	<u>M</u> Ti 0.00198
<u>M</u> Cd < 0.00297	<u>M</u> Hf < 0.00198	<u>M</u> Ni < 0.00793	<u>M</u> Se < 0.00793	<u>S</u> W
<u>Q</u> Ca 0.00080	<u>M</u> Ho < 0.00050	<u>Q</u> Nb < 0.06371	<u>Q</u> Si < 0.01354	<u>M</u> U < 0.00198
<u>M</u> Ce < 0.00496	<u>M</u> In < 0.00991	<u>n</u> Os	<u>M</u> Ag < 0.00198	<u>M</u> V < 0.00198
<u>M</u> Cs < 0.00030	<u>M</u> Ir < 0.00496	<u>M</u> Pd < 0.00496	<u>Q</u> Na 0.04778	<u>M</u> Yb < 0.00099
<u>M</u> Cr < 0.00496	<u>Q</u> Fe < 0.03982	<u>n</u> P	<u>M</u> Sr < 0.00050	<u>M</u> Y < 0.03965
<u>M</u> Co < 0.00297	<u>M</u> La < 0.00050	<u>M</u> Pt < 0.00198	<u>n</u> S	<u>M</u> Zn < 0.01983
<u>M</u> Cu < 0.00595	<u>M</u> Pb 0.00060	<u>Q</u> K 0.03146	<u>Q</u> Ta < 0.39820	<u>M</u> 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 $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 183.85; +6; 6, 7, 8, 9 WOF₆ (chemical form as received)

Chemical Compatibility - W is very readily hydrolyzed requiring 0.1 to 1% HF solutions for stable acidic solutions. The WOF₆ is soluble in % levels of HCl and HNO₃ provided it is in the WOF₆ 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 WVO, precipitate if mixed with other transition elements at higher levels indicating instability. The yellow WVO 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 WOF₆ for months in 1% HNO₃ / LDPE container. 1-10,000 ppm single element solutions as the WOF₆ chemically stable for years in 1% HF in an LDPE container.

W Containing Samples (Preparation and Solution) - Metal (Soluble in HF / HNO₃); Oxide (Soluble in HF or NH₄OH); Organic Matrices (Dry ash at 450 °C in Pt* and dissolve oxide with HF).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at 100ppb)
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*	¹⁴⁶ Er ¹⁴⁰ O

HF Note: This standard should not be prepared or stored in glass.

8.0 **HAZARDOUS INFORMATION** - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 **ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105**

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 **ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"**

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 **ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"**

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RVA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 **10CFR50 Appendix B - Nuclear Regulatory Commission**

- Domestic Licensing of Production and Utilization Facilities

10.5 **10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance**

10.6 **MIL-STD-45662A (Obsolete/Observed)**

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2

DATE RECEIVED: 07/31/03

DATE EXPIRED: 08/01/2004

DATE OPENED: 08/01/03

INORG: 4203 PD: F52383

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010386



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 10, 2003

Expiration Date: **EXPIRES**
12/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

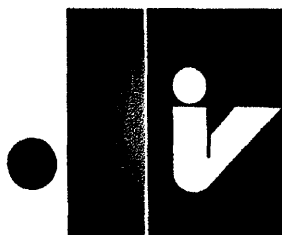
Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

JoAnn Struthers

Katalin Le

Paul Gaines

010387

**inorganic ventures / iv labs**

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
 phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
 e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

- 2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Yttrium in 1.4% (abs) HNO₃

Catalog Number: CGY1-1, CGY1-2, and CGY1-5
 Lot Number: X-QY01101
 Starting Material: Y₂O₃
 Starting Material Purity (%): 99.999727
 Starting Material Lot No 9918901OYL
 Matrix: 1.4% (abs) HNO₃

- 3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1006 ± 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:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2(s)}{(n)^{1/2}}$$

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 1004 ± 4 µg/mL
 ICP Assay NIST SRM 3167a Lot Number: 790412
 Assay Method #2 1006 ± 2 µg/mL
 EDTA NIST SRM 928 Lot Number: 880710

INORGANIC LABS/RADCHEM LABS *PS-46a*

DATE RECEIVED: 03/30/04
 DATE EXPIRED: 04/01/2005 *Y00*
 DATE OPENED: 03/30/04
 INORG: 4513 PO: F53361

- 4.2 BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 4.3 THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.
- 4.4 GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>Q</u> Al 0.00024	<u>M</u> Dy < 0.00595	<u>Q</u> Li < 0.00002	<u>M</u> Pr < 0.00030	<u>M</u> Te < 0.02976
<u>Q</u> Sb < 0.01000	<u>M</u> Er < 0.00496	<u>M</u> Lu < 0.00040	<u>M</u> Re < 0.00099	<u>M</u> Tb < 0.00030
<u>M</u> As < 0.00992	<u>M</u> Eu < 0.00298	<u>Q</u> Mg 0.00015	<u>M</u> Rh < 0.00099	<u>M</u> Tl < 0.00099
<u>M</u> Ba < 0.00992	<u>M</u> Gd < 0.00099	<u>Q</u> Mn < 0.00002	<u>M</u> Rb < 0.00099	<u>M</u> Th < 0.00099
<u>M</u> Be < 0.00050	<u>M</u> Ga < 0.00099	<u>Q</u> Hg < 0.02000	<u>M</u> Ru < 0.00198	<u>M</u> Tm < 0.00040
<u>M</u> Bi < 0.00040	<u>M</u> Ge < 0.00595	<u>M</u> Mo < 0.00198	<u>M</u> Sm < 0.00099	<u>M</u> Sn < 0.00496
<u>Q</u> B 0.00013	<u>M</u> Au < 0.00298	<u>M</u> Nd < 0.00198	<u>Q</u> Sc < 0.00003	<u>M</u> Ti < 0.04959
<u>M</u> Cd < 0.00298	<u>M</u> Hf < 0.00198	<u>M</u> Ni < 0.00794	<u>M</u> Se < 0.00794	<u>M</u> W < 0.00992
<u>Q</u> Ca 0.00100	<u>M</u> Ho < 0.00050	<u>M</u> Nb < 0.00050	<u>Q</u> Si 0.00170	<u>M</u> U < 0.00198
<u>M</u> Ce < 0.00496	<u>M</u> In < 0.00992	<u>n</u> Os	<u>Q</u> Ag < 0.02000	<u>Q</u> V < 0.00080
<u>M</u> Cs < 0.00030	<u>M</u> Ir < 0.00496	<u>Q</u> Pd < 0.10000	<u>Q</u> Na < 0.05000	<u>M</u> Yb < 0.00099
<u>M</u> Cr < 0.00496	<u>Q</u> Fe 0.00070	<u>Q</u> P < 0.07000	<u>Q</u> Sr < 0.00004	<u>s</u> Y
<u>M</u> Co < 0.00298	<u>M</u> La < 0.00050	<u>M</u> Pt < 0.00198	<u>Q</u> S < 0.04300	<u>Q</u> Zn 0.00025
<u>M</u> Cu < 0.00595	<u>M</u> Pb < 0.00298	<u>Q</u> K < 0.10000	<u>M</u> Ta < 0.00694	<u>Q</u> 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 010389

Storage & Handling - Keep tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 88.9059; +3; 6; $\text{Y}(\text{OH})(\text{H}_2\text{O})_2^{3+}$

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.

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 $\text{H}_2\text{O}/\text{HNO}_3$); Ores (Carbonate fusion in Pt followed by HCl dissolution); Organic Matrices (Dry ash and dissolve in 1:1 $\text{H}_2\text{O}/\text{HCl}$ 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 λ concs.)
ICP-OES 360.073 nm	0.005 / 0.000036 $\mu\text{g}/\text{mL}$	1	ion	Ce, Th
ICP-OES 371.030 nm	0.004 / 0.00007 $\mu\text{g}/\text{mL}$	1	ion	Ce
ICP-OES 377.433 nm	0.005 / 0.0009 $\mu\text{g}/\text{mL}$	1	ion	Ta, Th
ICP-MS 89 amu	0.8 ppt	n/a	M'	$^{90}\text{Ge}^{+}\text{O}$, $^{171}\text{Hf}^{+}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (OQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (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. 2 of 2

DATE RECEIVED: 03/30/04
DATE EXPIRED: 04/01/2005
DATE OPENED: 03/30/04
INORG: 4513 PO: F53361

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 24, 2004

Expiration Date:

EXPIRES
1/1/2005

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

JoAnn Struthers

Katalin Le

Paul Gaines

010391

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
 phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
 e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

**certificate of analysis**

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s)), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

- 2.0 **DESCRIPTION OF CRM** Custom-Grade 1000 µg/mL Zirconium in H₂O tr. HNO₃ tr. HF

Catalog Number: CGZR1-1 and CGZR1-5
 Lot Number: **W-ZR01056**
 Starting Material: ZrO₂
 Starting Material Purity (%): 99.994542
 Starting Material Lot No: 22855
 Matrix: H₂O tr. HNO₃ 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 PD: 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:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2(s)}{(n)^{1/2}}$$

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** 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.

<u>Q</u> Al 0.01416	<u>M</u> Dy < 0.01188	<u>Q</u> Li < 0.00012	<u>M</u> Pr < 0.00059	<u>M</u> Te < 0.05942
<u>M</u> Sb < 0.00099	<u>M</u> Er < 0.00990	<u>M</u> Lu < 0.00079	<u>M</u> Re < 0.00198	<u>M</u> Tb < 0.00059
<u>M</u> As < 0.01981	<u>M</u> Eu < 0.00594	<u>Q</u> Mg < 0.00012	<u>M</u> Rh < 0.00198	<u>M</u> Tl < 0.00198
<u>M</u> Ba < 0.01981	<u>M</u> Gd < 0.00198	<u>Q</u> Mn < 0.00401	<u>M</u> Rb < 0.00198	<u>M</u> Th < 0.00198
<u>Q</u> Be < 0.40048	<u>M</u> Ga < 0.00198	<u>Q</u> Hg < 0.04405	<u>M</u> Ru < 0.00396	<u>M</u> Tm < 0.00079
<u>M</u> Bi < 0.00079	<u>M</u> Ge < 0.01188	<u>Q</u> Mo < 0.40048	<u>M</u> Sm < 0.00198	<u>M</u> Sn < 0.00990
<u>M</u> B < 0.13864	<u>M</u> Au < 0.00594	<u>M</u> Nd < 0.00396	<u>Q</u> Sc < 0.00064	<u>Q</u> Ti < 0.16019
<u>Q</u> Cd < 0.02123	<u>M</u> Hf 0.04403	<u>Q</u> Ni 0.01214	<u>M</u> Se < 0.01585	<u>M</u> W < 0.01981
<u>Q</u> Ca 0.00809	<u>M</u> Ho < 0.00099	<u>Q</u> Nb < 0.08010	<u>Q</u> Si < 0.80096	<u>M</u> U < 0.00396
<u>M</u> Ce < 0.00990	<u>M</u> In < 0.01981	<u>n</u> Os	<u>Q</u> Ag < 0.40048	<u>M</u> V < 0.00396
<u>M</u> Cs < 0.00059	<u>M</u> Ir < 0.00990	<u>M</u> Pd < 0.00990	<u>Q</u> Na < 0.02803	<u>M</u> Yb < 0.00198
<u>Q</u> Cr < 0.00881	<u>Q</u> Fe 0.00344	<u>Q</u> P < 0.01922	<u>M</u> Sr < 0.00099	<u>Q</u> Y < 0.00401
<u>M</u> Co < 0.00594	<u>M</u> La < 0.00099	<u>M</u> Pt < 0.00396	<u>Q</u> S < 0.28033	<u>Q</u> Zn < 0.04005
<u>M</u> Cu < 0.01188	<u>M</u> Pb < 0.00594	<u>Q</u> K < 0.00681	<u>M</u> Ta < 0.01386	<u>s</u> Zr

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Kept tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 91.224; +4; 6, 7, 8, $\text{Zr}(\text{F})_6^{4-}$

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 $\text{Zr}(\text{F})_6^{4-}$ + $\text{Zr}(\text{OH})_2\text{F}_2$ for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $\text{Zr}(\text{F})_6^{4-}$ 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 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 4000s.)
ICP-OES 343.823 nm	0.007 / 0.0004 $\mu\text{g/mL}$	1	ion	Hf, Nb
ICP-OES 339.198 nm	0.008 / 0.0007 $\mu\text{g/mL}$	1	ion	Th, Mo
ICP-OES 272.261 nm	0.018 / 0.001 $\mu\text{g/mL}$	1	ion	Cr, V, Th, W
ICP-MS 90 amu	2 ppt	n/a	M'	⁹⁰ Ge ⁺ O, ⁹⁰ Se ⁺ O, [⁹⁰ X ⁺] (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 Safety Data sheet for information regarding this CRM.

9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 **ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105**

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 **ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"**

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 **ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"**

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RVA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 **10CFR50 Appendix B - Nuclear Regulatory Commission**

- Domestic Licensing of Production and Utilization Facilities

10.5 **10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance**

10.6 **MIL-STD-45662A (Obsolete/Observed)**

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2

DATE RECEIVED: 01/23/04
 DATE EXPIRED: 08/01/2005 v05
 DATE OPENED: 01/23/04
 INORG: 4442 PO: F52306

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010394



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

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

JoAnn Struthers
Katalin Le
Paul Gaines

010395

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
 phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
 e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s)), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade 1000 µg/mL Barium in 0.1% (abs) HNO₃

Catalog Number: CGBA1-1, CGBA1-2, and CGBA1-5
 Lot Number: W-BA02023
 Starting Material: Ba(NO₃)₂
 Starting Material Purity (%): 99.999730
 Starting Material Lot No: 21879
 Matrix: 0.1% (abs) HNO₃

INDORGANIC LABS/RADCHEM LABS Pg. 4 of 2
 DATE RECEIVED: 02/25/04
 DATE EXPIRED: 03/31/2005 V03
 DATE OPENED: 02/25/04
 INORG: 4465 PO: F52323

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1001 ± 1 µg/mL

Certified Density: 0.999 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2(\sum s_i)^{1/2}}{(n)^{1/2}}$$

$\sum S$ = The summation of all significant estimated errors.

(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 **TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS**

□ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

□ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 **Assay Method #1** 998 ± 4 µg/mL

ICP Assay NIST SRM 3104a Lot Number: 992907

Assay Method #2 1001 ± 1 µg/mL

Gravimetric NIST SRM Lot Number: See Sec. 4.2

- 4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 4.3 **THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.
- 4.4 **GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

Q Al 0.00011	M Dy < 0.01269	Q 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	Q Tb < 0.00390
M As < 0.02114	Q Eu < 0.00040	Q Mg 0.00009	M Rh < 0.00211	M Tl < 0.00211
s Ba	Q Gd < 0.00052	M Mn < 0.00846	M Rb < 0.00211	M Th < 0.00211
M Be < 0.00106	M Ga < 0.00211	Q Hg < 0.01200	M Ru < 0.00423	M Tm < 0.00085
M Bi < 0.00085	M Ge < 0.01269	M Mo < 0.00423	Q Sm < 0.00071	M Sn < 0.01057
M B < 0.14800	M Au < 0.00634	Q 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
Q Ca 0.00072	M Ho < 0.00106	M Nb < 0.00106	Q 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	Q Fe 0.00062	Q P < 0.00260	Q Sr 0.00379	Q Y 0.00040
M Co < 0.00634	M La < 0.00106	M Pt < 0.00423	Q S < 0.02500	Q Zn < 0.00039
M Cu < 0.01269	M Pb 0.00020	Q K < 0.00180	Q Ta < 0.00690	M Zr < 0.01057

M - Checked by ICP-MS Q - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:

ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 137.33; +2; 6; $\text{Ba}(\text{H}_2\text{O})_6^{2+}$

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^4 followed by HCl dissolution. If sulfate is present dissolve the fused 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 all concs.)
ICP-OES 455.403 nm	0.002 / 0.0001 $\mu\text{g/mL}$	1	ion	Zr, U
ICP-OES 233.527 nm	0.004 / 0.0003 $\mu\text{g/mL}$	1	ion	
ICP-OES 230.424 nm	0.004 / 0.0005 $\mu\text{g/mL}$	1	ion	Mo, Ir, Co
ICP-MS 138 amu	1 ppt	n/a	M'	$^{22}\text{Sn}^{10}\text{O}$, $^{127}\text{Te}^{10}\text{O}$

8.0 **HAZARDOUS INFORMATION** - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (OQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2

DATE RECEIVED: 02/25/04

DATE EXPIRED: 03/01/2005 WSS

DATE OPENED: 02/25/04

INORG: 4465 PO: F52303

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010398



- 11.1 IV Shelf Life** - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.
- 11.2 Expiration Date** - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 28, 2003

Expiration Date:

EXPIRES
12/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

John Struthers
Katalin Le
Paul Gaines

010399

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
 phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
 e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s)), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

- 2.0 **DESCRIPTION OF CRM** Custom-Grade 1000 µg/mL Beryllium in 2% (abs) HNO₃

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) HNO₃

INDORGANIC LABS/RADCHEM LABS 93-1 of 2
 DATE RECEIVED: 06/01/04
 DATE EXPIRED: 06/01/2005 YOS
 DATE OPENED: 06/01/04
 INDORG: 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:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

\bar{x} = mean

x_i = individual results

n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2(s_{\bar{x}})}{(n)^{1/2}}$$

$s_{\bar{x}}$ = 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.

<u>Q</u> Al < 0.00800	<u>M</u> Dy < 0.01305	<u>Q</u> Li < 0.00002	<u>M</u> Pr < 0.00065	<u>M</u> Te < 0.06525
<u>M</u> Sb < 0.00109	<u>M</u> Er < 0.01087	<u>M</u> Lu < 0.00087	<u>M</u> Re < 0.00218	<u>M</u> Tb < 0.00065
<u>M</u> As < 0.02175	<u>M</u> Eu < 0.00652	<u>Q</u> Mg < 0.00003	<u>M</u> Rh < 0.00218	<u>M</u> Tl < 0.00218
<u>M</u> Ba < 0.02175	<u>M</u> Gd < 0.00218	<u>Q</u> Mn < 0.00002	<u>M</u> Rb < 0.00218	<u>M</u> Th < 0.00218
<u>s</u> Be	<u>M</u> Ga < 0.00218	<u>Q</u> Hg < 0.01500	<u>M</u> Ru < 0.00435	<u>M</u> Tm < 0.00087
<u>M</u> Bi < 0.00087	<u>M</u> Ge < 0.01305	<u>M</u> Mo < 0.00435	<u>M</u> Sm < 0.00218	<u>M</u> Sn < 0.01087
<u>Q</u> B < 0.01200	<u>M</u> Au < 0.00652	<u>M</u> Nd < 0.00435	<u>Q</u> Sc < 0.00009	<u>M</u> Ti < 0.10874
<u>M</u> Cd < 0.00652	<u>M</u> Hf < 0.00435	<u>M</u> Ni < 0.65245	<u>M</u> Se < 0.01740	<u>M</u> W < 0.02175
<u>Q</u> Ca 0.00164	<u>M</u> Ho < 0.00109	<u>M</u> Nb < 0.00109	<u>Q</u> Si 0.00649	<u>M</u> U < 0.00435
<u>M</u> Ce < 0.01087	<u>M</u> In < 0.02175	<u>n</u> Os	<u>M</u> Ag < 0.00435	<u>M</u> V < 0.00435
<u>M</u> Cs < 0.00065	<u>M</u> Ir < 0.01087	<u>M</u> Pd < 0.01087	<u>Q</u> Na 0.00368	<u>M</u> Yb < 0.00218
<u>Q</u> Cr < 0.00900	<u>Q</u> Fe 0.00268	<u>n</u> P	<u>M</u> Sr < 0.00109	<u>M</u> Y < 0.08699
<u>M</u> Co < 0.00652	<u>M</u> La < 0.00109	<u>M</u> Pt < 0.00435	<u>i</u> S	<u>M</u> Zn < 0.04350
<u>M</u> Cu < 0.01305	<u>M</u> Pb < 0.00652	<u>Q</u> K < 0.10000	<u>M</u> Ta < 0.01522	<u>M</u> 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(H₂O)₄.^{1,2}

Chemical Compatibility - Soluble in HCl, HNO₃, H₂SO₄, and HF aqueous matrices. Stable with all metals and inorganic anions.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 5-10% HNO₃ / LDPE container.

Be Containing Samples (Preparation and Solution) - Meta (is best dissolved in diluted H₂SO₄). BeO (boiling nitric, hydrochloric, or sulfuric acids or KHSO₄ fusion). Ores (H₂SO₄/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 concs.)
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 Safety Data sheet for information regarding this CRM.
- 9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.
- 10.0 **QUALITY STANDARD DOCUMENTATION**

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)



Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS, Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 **DATE OF CERTIFICATION AND PERIOD OF VALIDITY**



11.1 **IV Shelf Life** - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 **Expiration Date** - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: January 08, 2004

Expiration Date:

INORGANIC LABS/RADCHEM LABS Pg. 3 of 2
DATE RECEIVED: 06/01/04
DATE EXPIRED: 06/01/2005 VOS
DATE OPENED: 06/01/04
INORG: 4592 PO: F53393

EXPIRES
1/1/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: Debbie Newman, Production Manager

Certificate Approved By: Katalin Le, QC Manager

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

010402

Debbie Newman
Katalin Le

Paul Gaines

010403



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 Chromium³⁺ in 1.4% HNO₃ (abs)

Catalog Number: CGCR(3)1-1, CGCR(3)1-2 and CGCR(3)1-5

Lot Number: W-QCR02033

Starting Material:
 Starting Material Purity:
 Starting Material Lot No:

Chromium Metal
 99.995%
 F16122

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 11/5/03
 DATE EXPIRED: 12/1/04
 DATE OPENED: 11/5/03
 INORG: 4318 PO: FS2258

CERTIFIED CONCENTRATION: 995 ± 3 µg/mL

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

$$\text{Uncertainty } (\pm) = \frac{2[(\sum s_i)^2]^{1/2}}{(n)^{1/2}}$$

(x) = mean

x_i = individual results

n = number of measurements

ΣS_i = The summation of all significant estimated errors.

Instrument Analysis: 995 ± 3 µg/mL (Avg of 3 runs)

Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3112a.

Calculated Value: 1002 µg/mL

Method: Calculated, based on starting material.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by ICP-MS were analyzed in an ULPA-Filtered Clean Room.
 An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

Q	Al	0.0028	M	Dy	<0.00060	M	Li	<0.0010	M	Pr	<0.000030	M	Te	<0.0030
M	Sb	<0.000050	M	Er	<0.00050	M	Lu	<0.000040	M	Re	<0.00010	M	Tb	<0.000030
M	As	<0.0010	M	Eu	<0.00030	Q	Mg	<0.010	M	Rh	<0.00010	M	Ti	<0.00010
M	Ba	<0.0010	M	Gd	<0.00010	Q	Mn	<0.050	M	Rb	0.0066	M	Th	<0.00010
M	Be	<0.000050	M	Ga	0.00070	Q	Hg	<0.10	M	Ru	0.017	M	Tm	<0.000040
M	Bi	<0.000040	M	Ge	<0.00080	M	Mo	<0.00020	M	Sm	<0.00010	M	Sn	<0.00050
M	B	<0.0070	M	Au	<0.00030	M	Nd	<0.00020	M	Sc	<0.0010	M	Tl	<0.0050
M	Cd	<0.00030	M	Hf	<0.00020	Q	Ni	<0.10	i	Se		M	W	<0.0010
Q	Ce	0.0011	M	Ho	<0.000050	M	Nb	<0.000050	Q	Si	<0.10	M	U	<0.00020
M	Ce	<0.00050	Q	In	<0.10	n	Os		M	Ag	0.00070	i	V	
M	Cs	<0.000030	M	Ir	<0.00050	M	Pd	<0.00050	Q	Na	0.016	M	Yb	<0.00010
s	Cr		Q	Fe	<0.10	i	P		M	Sr	<0.000050	M	Y	<0.0040
Q	Co	<0.10	M	La	<0.000050	M	Pt	<0.00020	n	S		Q	Zn	<0.10
M	Cu	<0.00060	M	Pb	0.00039	n	K		M	Ta	<0.00070	M	Zr	<0.00050

M - checked by ICP-MS

O - checked by ICP-OES

i - spectral interference

n - not checked for

s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.010 g/mL

(over)

QA:KSL Rev.090402/TS

Quality Assurance Manager

Expires:

EXPIRES
 122004

010404

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 (JOA), 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/IEC 17025-1999 "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 Licensing 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 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 μ m 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



inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s)), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Copper In 2% (abs) HNO₃

Catalog Number: CGCU1-1, CGCU1-2, and CGCU1-5
Lot Number: W-CU02064
Starting Material: Cu shot
Starting Material Purity (%): 99.999437
Starting Material Lot No: K09C13
Matrix: 2% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 V03
DATE OPENED: 02/25/04
INORG: 4469 PO: F52323

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1005 ± 2 µg/mL

Certified Density: 1.014 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2(s_{\bar{x}})}{(n)^{1/2}}$$

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 1005 ± 2 µg/mL

ICP Assay NIST SRM 3114 Lot Number: 891811

Assay Method #2 1005 ± 2 µg/mL

EDTA NIST SRM 928 Lot Number: 880710

- 4.2 BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 4.3 THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.
- 4.4 GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>Q</u> Al < 0.00090	<u>M</u> Dy < 0.03027	<u>Q</u> Li < 0.00002	<u>M</u> Pr < 0.00151	<u>M</u> Te < 0.15134
<u>M</u> Sb < 0.00252	<u>M</u> Er < 0.02522	<u>M</u> Lu < 0.00202	<u>M</u> Re < 0.00504	<u>M</u> Tb < 0.00151
<u>M</u> As < 0.05045	<u>M</u> Eu < 0.01513	<u>Q</u> Mg 0.00001	<u>M</u> Rh < 0.00504	<u>M</u> Tl < 0.00504
<u>M</u> Ba < 0.05045	<u>M</u> Gd < 0.00504	<u>M</u> Mn < 0.02018	<u>M</u> Rb < 0.00504	<u>M</u> Th < 0.00504
<u>M</u> Be < 0.00252	<u>M</u> Ga < 0.00504	<u>Q</u> Hg < 0.01500	<u>M</u> Ru < 0.01009	<u>M</u> Tm < 0.00202
<u>M</u> Bi < 0.00202	<u>M</u> Ge < 0.03027	<u>M</u> Mo < 0.01009	<u>M</u> Sm < 0.00504	<u>Q</u> Sn 0.00439
<u>M</u> B < 0.35312	<u>M</u> Au < 0.01513	<u>M</u> Nd < 0.01009	<u>M</u> Sc < 0.05045	<u>M</u> Ti < 0.25223
<u>M</u> Cd < 0.01513	<u>M</u> Hf < 0.01009	<u>M</u> Ni < 0.04036	<u>M</u> Se < 0.04036	<u>M</u> W < 0.05045
<u>Q</u> Ca 0.00011	<u>M</u> Ho < 0.00252	<u>M</u> Nb < 0.00252	<u>Q</u> Si < 0.00340	<u>M</u> U < 0.01009
<u>M</u> Ce < 0.02522	<u>M</u> In < 0.05045	<u>n</u> Os	<u>M</u> Ag < 0.01009	<u>Q</u> V < 0.00300
<u>M</u> Cs < 0.00151	<u>M</u> Ir < 0.02522	<u>M</u> Pd < 0.02522	<u>Q</u> Na 0.00044	<u>M</u> Yb < 0.00504
<u>M</u> Cr < 0.02522	<u>Q</u> Fe 0.00054	<u>Q</u> P < 0.00260	<u>M</u> Sr < 0.00252	<u>M</u> Y < 0.20178
<u>M</u> Co < 0.01513	<u>M</u> La < 0.00252	<u>M</u> Pt < 0.01009	<u>n</u> S	<u>M</u> Zn < 0.10089
<u>s</u> Cu	<u>M</u> Pb 0.00050	<u>Q</u> K < 0.00180	<u>M</u> Ta < 0.03531	<u>M</u> Zr < 0.02522

M - Checked by ICP-MS

O - Checked by ICP-OES

i - Spectral Interference

n - Not Checked For

s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:

ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

010407

Storage & Handling - Keep tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 63.546; +2; 6; $\text{Cu}(\text{H}_2\text{O})_6^{2+}$

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 $\leq 10\text{ppb}$)
ICP-OES 324.754 nm	0.06/0.001 $\mu\text{g/mL}$	1	atom	Nb, U, Th, Mo, Hf
ICP-OES 224.700 nm	0.01/0.001 $\mu\text{g/mL}$	1	ion	Pb, Ir, Ni, W
ICP-OES 219.958 nm	0.01/0.002 $\mu\text{g/mL}$	1	atom	Th, Ta, Nb, U, Hf
ICP-MS 63 amu	10 ppt	n/a	M'	$^{40}\text{Ar}^{23}\text{Na}$, $^{47}\text{Ti}^{16}\text{O}$, $^{14}\text{N}^{12}\text{C}^{18}\text{Cl}$, $^{18}\text{O}^{12}\text{C}^{18}\text{Cl}$, $^{44}\text{Ca}^{16}\text{O}$, $^{23}\text{Na}^{40}\text{Ca}$

8.0 HAZARDOUS INFORMATION - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 HOMOGENEITY - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditación, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (Bmwa), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS P8-2 of 2

DATE RECEIVED: 03/25/04
 DATE EXPIRED: 03/01/2005 v03
 DATE OPENED: 03/25/04
 INDRG: 4469 PD: F52023

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010408



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: May 02, 2003

Expiration Date:

EXPIRES

11/2/05

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

JoAnn Struthers

Katalin Le

Paul 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 Statistical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Nickel in 1.4% (abs) HNO₃

Catalog Number: CGNI1-1, CGNI1-2, and CGNI1-5
 Lot Number: W-NI02030
 Starting Material: Ni pieces
 Starting Material Purity (%): 99.999371
 Starting Material Lot No: L06L02
 Matrix: 1.4% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS P-1042
 DATE RECEIVED: 02/25/04
 DATE EXPIRED: 03/01/2005 VDS
 DATE OPENED: 02/25/04
 INORG: 4472 PO: F52323

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1002 ± 2 µg/mL
 Certified Density: 1.011 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

$$\text{Uncertainty } (\pm) = \frac{2(\sum s_i^2)^{1/2}}{(n)^{1/2}}$$

(\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 #1 999 ± 5 µg/mL
 ICP Assay NIST SRM 3136 Lot Number: 000612
 Assay Method #2 1002 ± 2 µg/mL
 EDTA NIST SRM 928 Lot Number: 880710

- 4.2 **BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 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.

Q Al < 0.00938	M Dy < 0.06577	Q 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
Q As < 0.01689	M Eu < 0.03289	Q 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
Q Be < 0.00626	M Ga < 0.01096	Q 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
Q 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	Q Se < 0.01877	M W < 0.10962
Q Ca < 0.01157	M Ho < 0.00548	M Nb < 0.00548	Q Si 0.00188	M U < 0.02192
M Ce < 0.05481	M In < 0.10962	Q Os	M Ag < 0.02192	M V < 0.02192
M Cs < 0.00329	M Ir < 0.05481	M Pd < 0.05481	Q Na 0.00102	M Yb < 0.01096
M Cr < 0.05481	Q Fe 0.00156	Q P < 0.31280	M Sr < 0.00548	M Y < 0.43849
Q Co 0.00182	M La < 0.00548	M Pt < 0.02192	Q S < 0.07820	M Zn 0.00189
M Cu < 0.06577	M Pb < 0.03289	Q 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(H₂O)₆²⁺

Chemical Compatibility - Stable in HCl, HNO₃, H₂SO₄, HF, H₃PO₄. Avoid basic media. Stable with most metals and inorganic anions in acidic media.

Stability - 2-100 ppb levels stable for months in 1% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1-5% HNO₃ / LDPE container.

Ni Containing Samples (Preparation and Solution) - Metal (Soluble in HNO₃), Oxides (Soluble in HCl), Ores (Dissolve in HCl / HNO₃).

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 all 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'	⁴⁴ Ca ⁴⁰ H, ⁴⁴ Ca ⁴⁰ O, ²³ Na ²³ Cl

- 8.0 **HAZARDOUS INFORMATION** - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.
- 9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.
- 10.0 **QUALITY STANDARD DOCUMENTATION**

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)
Standards Council of Canada (SCC)
Dutch Council for Accreditation (RVA)
Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of **IQ Net International Certification Network**:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01

10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

11.0 **DATE OF CERTIFICATION AND PERIOD OF VALIDITY**



11.1 **IV Shelf Life** - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 **Expiration Date** - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 23, 2003

Expiration Date:

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 V02
DATE OPENED: 02/25/04
INORG: 4472 PU: F52323

EXPIRES
12/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

010412

JoAnn Struthers

Katalin Le

Paul Gaines



inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010413

certificate of analysis

1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s)), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Boron in H₂O

Catalog Number: CGB1-1, CGB1-2, and CGB1-5
Lot Number: W-B02042
Starting Material: H₃BO₃
Starting Material Purity (%): 99.999998
Starting Material Lot No: OV0133
Matrix: H₂O

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 07/31/03
DATE EXPIRED: 08/01/2004
DATE OPENED: 08/01/03
INORG: 4201 PD: F52383

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 999 ± 2 µg/mL

Certified Density: 1.001 g/mL (measured at 22° C)

The Certified Value is the instrument analysis value. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

$$\text{Uncertainty } (\pm) = \frac{2(\sum s_i^2)^{1/2}}{(n)^{1/2}}$$

\bar{x} = mean

x_i = individual results

n = number of measurements

$\sum s_i^2$ = The summation of all significant estimated errors

(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

□ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

□ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 Assay Method #1 999 ± 2 µg/mL (Avg 2 runs)

ICP Assay NIST SRM 3107 Lot Number: 991907

- 4.2 BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 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 $\mu\text{g/mL}$

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm .

<u>Q</u> Al < 0.00090	<u>M</u> Dy < 0.00600	<u>Q</u> Li < 0.00002	<u>M</u> Pr < 0.00030	<u>M</u> Te < 0.03000
<u>M</u> Sb < 0.00050	<u>M</u> Er < 0.00500	<u>M</u> Lu < 0.00040	<u>M</u> Re < 0.00100	<u>M</u> Tb < 0.00030
<u>M</u> As < 0.01000	<u>M</u> Eu < 0.00300	<u>Q</u> Mg < 0.00006	<u>M</u> Rh < 0.00100	<u>M</u> Tl < 0.00100
<u>Q</u> Ba < 0.00010	<u>M</u> Gd < 0.00100	<u>Q</u> Mn < 0.00002	<u>M</u> Rb < 0.00100	<u>M</u> Th < 0.00100
<u>Q</u> Be < 0.00017	<u>Q</u> Ga < 0.00160	<u>Q</u> Hg < 0.01500	<u>M</u> Ru < 0.00200	<u>M</u> Tm < 0.00040
<u>M</u> Bi < 0.00040	<u>M</u> Ge < 0.00600	<u>M</u> Mo < 0.00200	<u>M</u> Sm < 0.00100	<u>M</u> Sn < 0.00500
<u>s</u> B	<u>M</u> Au < 0.00300	<u>M</u> Nd < 0.00200	<u>Q</u> Sc < 0.00002	<u>M</u> Ti < 0.05000
<u>M</u> Cd < 0.00300	<u>M</u> Hf < 0.00200	<u>Q</u> Ni < 0.00230	<u>Q</u> Se < 0.00620	<u>M</u> W < 0.01000
<u>Q</u> Ca < 0.00007	<u>M</u> Ho < 0.00050	<u>M</u> Nb < 0.00050	<u>Q</u> Si < 0.00067	<u>M</u> U < 0.00200
<u>Q</u> Ce < 0.00300	<u>M</u> In < 0.01000	<u>n</u> Os	<u>M</u> Ag < 0.00200	<u>Q</u> V < 0.00083
<u>M</u> Cs < 0.00030	<u>M</u> Ir < 0.00500	<u>M</u> Pd < 0.00500	<u>Q</u> Na < 0.00010	<u>M</u> Yb < 0.00100
<u>M</u> Cr < 0.00500	<u>Q</u> Fe < 0.00110	<u>Q</u> P < 0.00250	<u>M</u> Sr < 0.00050	<u>M</u> Y < 0.04000
<u>Q</u> Co < 0.00110	<u>M</u> La < 0.00050	<u>M</u> Pt < 0.00200	<u>Q</u> S < 0.10000	<u>Q</u> Zn < 0.00019
<u>M</u> Cu < 0.00600	<u>M</u> Pb < 0.00300	<u>Q</u> K < 0.00300	<u>M</u> Ta < 0.00700	<u>M</u> Zr < 0.00500

M - Checked by ICP-MS Q - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 10.811; +3; 4; $\text{B}(\text{OH})_3$ and $\text{B}(\text{OH})_4^-$

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); $\text{B}(\text{OH})_3$ (water soluble). Ores (avoid acid digestions and use caustic fusions in Pt). Organic Matrices (dry ash mixed with Na_2CO_3 in Pt at 450°C then increase heat to 1000°C to fuse; or perform a Na_2O_2 fusion in a Ni -crucible / Parr bomb).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at $\mu\text{g/L}$ concs.)
ICP-OES 249.773 nm	0.003 / 0.001 $\mu\text{g/mL}$	1	atom	W, Ce, Co, Th, Ta, Mn, Mo, Fe
ICP-OES 249.678 nm	0.004 / 0.003 $\mu\text{g/mL}$	1	atom	Os, W, Co, Cr, Hf
ICP-OES 208.959 nm	0.007 / 0.0005 $\mu\text{g/mL}$	1	atom	Mo
ICP-MS 11amu	700 ppt	n/a	M*	

8.0 **HAZARDOUS INFORMATION** - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditación, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (OQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2

DATE RECEIVED: 07/31/03

DATE EXPIRED: 08/01/2004 VOS

DATE OPENED: 08/01/03

INORG: 4201 PO: F52383

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 21, 2003

Expiration Date: **EXPIRES**
12/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

JoAnn Struthers
Katalin Le
Paul Gaines



inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

010417

certificate of analysis

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

- 2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Molybdenum in H₂O tr. NH₄OH

Catalog Number: CGMO1-1, CGMO1-2, and CGMO1-5
Lot Number: W-MO01132
Starting Material: (NH₄)₆Mo₇O₂₄·xH₂O
Starting Material Purity (%): 99.995947
Starting Material Lot No: 21410
Matrix: H₂O tr. NH₄OH

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
DATE RECEIVED: 02/25/04
DATE EXPIRED: 03/01/2005 v03
DATE OPENED: 02/25/04
INORG: 4471 PO: F52323

- 3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1004 ± 2 µg/mL

Certified Density: 0.998 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2(\sum s_i^2)^{1/2}}{(n)^{1/2}}$$

$\sum S$ = The summation of all significant estimated errors.

(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

- 4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

□ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

□ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

- 4.1 Assay Method #1 1004 ± 2 µg/mL (Avg 2 runs)
ICP Assay NIST SRM 3134 Lot Number: 891307
Assay Method #2 1008 µg/mL
Gravimetric NIST SRM Lot Number: See Sec. 4.2

- 4.2 BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 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 $\mu\text{g/mL}$

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 μm .

<u>Q</u> Al < 0.05000	<u>M</u> Dy < 0.01198	<u>Q</u> Li < 0.01000	<u>Q</u> Pr < 0.10000	<u>i</u> Te
<u>M</u> Sb 0.00939	<u>M</u> Er < 0.00998	<u>M</u> Lu < 0.00080	<u>M</u> Re < 0.00200	<u>M</u> Tb < 0.00060
<u>M</u> As < 0.01997	<u>M</u> Eu < 0.00599	<u>Q</u> Mg < 0.05000	<u>M</u> Rh < 0.00200	<u>M</u> Tl < 0.00200
<u>M</u> Ba < 0.01997	<u>M</u> Gd < 0.00200	<u>M</u> Mn < 0.00799	<u>M</u> Rb 0.02445	<u>M</u> Th < 0.00200
<u>M</u> Be < 0.00100	<u>M</u> Ga < 0.00200	<u>i</u> Hg	<u>M</u> Ru < 0.00399	<u>M</u> Tm < 0.00080
<u>M</u> Bi < 0.00080	<u>M</u> Ge < 0.01198	<u>s</u> Mo	<u>M</u> Sm < 0.00200	<u>M</u> Sn < 0.00998
<u>Q</u> B < 0.50000	<u>M</u> Au < 0.00599	<u>Q</u> Nd < 0.05000	<u>Q</u> Sc < 0.05000	<u>Q</u> Ti < 0.00500
<u>Q</u> Cd < 0.50000	<u>M</u> Hf < 0.00399	<u>M</u> Ni < 0.01597	<u>M</u> Se < 0.01597	<u>M</u> W 0.05576
<u>Q</u> Ca 0.00026	<u>M</u> Ho < 0.00100	<u>Q</u> Nb < 0.10000	<u>Q</u> Si < 0.10000	<u>M</u> U < 0.00399
<u>Q</u> Ce < 0.05000	<u>M</u> In 0.00235	<u>n</u> Os	<u>M</u> Ag < 0.00399	<u>M</u> V < 0.00399
<u>M</u> Cs < 0.00060	<u>M</u> Ir < 0.00998	<u>M</u> Pd < 0.00998	<u>Q</u> Na < 0.10000	<u>M</u> Yb < 0.00200
<u>M</u> Cr < 0.00998	<u>Q</u> Fe < 0.50000	<u>i</u> P	<u>M</u> Sr < 0.00100	<u>M</u> Y < 0.07987
<u>M</u> Co < 0.00599	<u>M</u> La < 0.00100	<u>M</u> Pt < 0.00399	<u>i</u> S	<u>M</u> Zn < 0.03993
<u>M</u> Cu < 0.01198	<u>M</u> Pb < 0.00599	<u>Q</u> K 0.00980	<u>M</u> Ta < 0.01398	<u>M</u> Zr < 0.00998

M - Checked by ICP-MS O - Checked by ICP-OES i - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:
ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

010419

Storage & Handling - Keep tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 95.94; +6; 6, 7, 8, 9; $[\text{MoO}_4]^{2-}$ (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 $[\text{MoO}_4]^{2-}$ is soluble in concentrated HCl $[\text{MoOCl}_4]^{2-}$, dilute HF / HNO_3 $[\text{MoOF}_4]^{2-}$ and basic media $[\text{MoO}_4]^{2-}$. 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 $[\text{MoO}_4]^{2-}$ chemical form.

Stability - 2-100 ppb levels stable (alone or mixed with all other metals that are at comparable levels) as the $[\text{MoOF}_4]^{2-}$ for months in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $[\text{MoO}_4]^{2-}$ 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 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 $\mu\text{g/L}$)
ICP-OES 202.030 nm	0.008 / 0.0002 $\mu\text{g/mL}$	1	ion	Os, Hf
ICP-OES 203.844 nm	0.012 / 0.002 $\mu\text{g/mL}$	1	ion	
ICP-OES 204.598 nm	0.012 / 0.001 $\mu\text{g/mL}$	1	ion	Ir, Ta
ICP-MS 95 amu	3 ppt	n/a	M+	$^{40}\text{Ar}^{54}\text{K}^{10}\text{O}$, $^{79}\text{Br}^{16}\text{O}$, $^{96}\text{Os}^{16}\text{O}$, $^{101}\text{Ru}^{16}\text{O}$

8.0 **HAZARDOUS INFORMATION** - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2

DATE RECEIVED: 02/25/04

DATE EXPIRED: 03/01/2005

DATE OPENED: 02/25/04

INORG: 4471 PO: F52323

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: July 23, 2003

Expiration Date:

EXPIRES
1/1/2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

JoAnn Struthers
Katalin Le
Paul Gaines

010421

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 H₂O

Catalog Number: CGP1-1, CGP1-2 and CGP1-5

Lot Number: W-P01123

Starting Material:
 Starting Material Purity:
 Starting Material Lot No:

Phosphoric Acid
 99.999%
 J18804

INORGANIC LABS/RADCHEM LABS
 DATE RECEIVED: 06/01/04
 DATE EXPIRED: 06/01/2005 V03
 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:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

$$\text{Uncertainty } (\pm) = \frac{2[(\sum s_i^2)^{1/2}]}{(n)^{1/2}}$$

(\bar{x}) = mean

x_i = individual results

n = number of measurements

∑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.

<u>Q</u> Al <0.040	<u>M</u> Dy <0.00060	<u>M</u> Li <0.0010	<u>M</u> Pr <0.000030	<u>M</u> Te <0.0030
<u>M</u> Sb 0.012	<u>M</u> Er <0.00050	<u>M</u> Lu <0.000040	<u>M</u> Re <0.00010	<u>M</u> Tb <0.000030
<u>M</u> As <0.0010	<u>M</u> Eu <0.00030	<u>M</u> Mg <0.0030	<u>M</u> Rh <0.00010	<u>M</u> Tl <0.00010
<u>M</u> Ba <0.0010	<u>M</u> Gd <0.00010	<u>M</u> Mn <0.00040	<u>M</u> Rb <0.00010	<u>M</u> Th <0.00010
<u>M</u> Be <0.000050	<u>M</u> Ga 0.00070	<u>Q</u> Hg <0.020	<u>M</u> Ru <0.00020	<u>M</u> Tm <0.000040
<u>M</u> Bi <0.000040	<u>M</u> Ge <0.00060	<u>M</u> Mo <0.00020	<u>M</u> Sm <0.00010	<u>M</u> Sn <0.00050
<u>M</u> B <0.0070	<u>M</u> Au <0.00030	<u>M</u> Nd <0.00020	<u>n</u> Sc	<u>n</u> Ti
<u>M</u> Cd <0.00030	<u>M</u> Hf <0.00020	<u>Q</u> Ni <0.050	<u>Q</u> Se <0.40	<u>M</u> W <0.0010
<u>Q</u> Ca <0.010	<u>M</u> Ho <0.000050	<u>M</u> Nb <0.000050	<u>Q</u> Si <0.020	<u>M</u> U <0.00020
<u>M</u> Ce <0.00050	<u>M</u> In <0.030	<u>n</u> Os	<u>M</u> Ag <0.00020	<u>M</u> V <0.00020
<u>M</u> Cs <0.000030	<u>M</u> Ir <0.00050	<u>M</u> Pd <0.00050	<u>Q</u> Na <0.090	<u>M</u> Yb <0.00010
<u>M</u> Cr <0.00050	<u>Q</u> Fe <0.050	<u>s</u> P	<u>M</u> Sr <0.000050	<u>M</u> Y <0.0040
<u>M</u> Co <0.00030	<u>M</u> La <0.000050	<u>M</u> Pt <0.00020	<u>n</u> S	<u>M</u> Zn 0.0035
<u>M</u> Cu 0.080	<u>M</u> Pb <0.00030	<u>n</u> K	<u>M</u> Ta <0.00070	<u>M</u> 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. Gaines
 Quality Assurance Manager

Expires:

EXPIRES
 12/2005

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/IEC 17025-1999 "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 Licensing 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 μ m 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

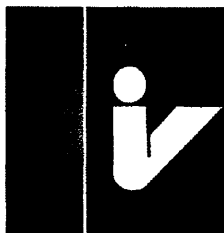
All customers are encouraged to contact us for technical support for the proper use of our products.

TEL 1-800-569-6799

INT'L 1-732-901-1900

FAX 1-732-901-1903

E-MAIL IVtech@ivstandards.com



inorganic ventures / **010423** iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Silicon in H₂O tr. HNO₃ tr. HF

Catalog Number: CGSI1-1, CGSI1-2, and CGSI1-5
Lot Number: W-SI02082
Starting Material: SiO₂
Starting Material Purity (%): 99.996367
Starting Material Lot No: C05310C
Matrix: H₂O tr. HNO₃ tr. HF

INORGANIC LABS/RADCHEM LABS 106
DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005
DATE OPENED: 01/20/04
INORG: 4437 PO: F52303

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 1000 ± 5 µg/mL

Certified Density: 1.002 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

$$\text{Uncertainty } (\pm) = \frac{2(\sum s_i^2)^{1/2}}{(n)^{1/2}}$$

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$\sum s_i^2$ = The summation of all significant estimated errors.

(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

□ "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

□ This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 Assay Method #1 1000 ± 5 µg/mL (Avg 2 runs)

ICP Assay NIST SRM 3150 Lot Number: 991108

Assay Method #2 1001 µg/mL

Gravimetric NIST SRM Lot Number: See Sec. 4.2

- 4.2 BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 4.3 THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.
- 4.4 GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>Q</u> Al 0.02730	<u>M</u> Dy < 0.01358	<u>Q</u> Li < 0.00009	<u>M</u> Pr < 0.00068	<u>M</u> Te < 0.06791
<u>M</u> Sb < 0.00113	<u>M</u> Er < 0.01132	<u>M</u> Lu < 0.00091	<u>M</u> Re < 0.00226	<u>M</u> Tb < 0.00068
<u>M</u> As < 0.02264	<u>M</u> Eu < 0.00679	<u>Q</u> Mg < 0.04991	<u>M</u> Rh < 0.00226	<u>M</u> Tl < 0.00226
<u>M</u> Ba < 0.02264	<u>M</u> Gd < 0.00226	<u>M</u> Mn < 0.00906	<u>M</u> Rb < 0.00226	<u>M</u> Th < 0.00226
<u>Q</u> Be < 0.00091	<u>M</u> Ga < 0.00226	<u>Q</u> Hg < 0.04991	<u>M</u> Ru < 0.00453	<u>M</u> Tm < 0.00091
<u>M</u> Bi < 0.00091	<u>M</u> Ge < 0.01358	<u>M</u> Mo < 0.00453	<u>M</u> Sm < 0.00226	<u>M</u> Sn < 0.01132
<u>Q</u> B 0.02409	<u>M</u> Au < 0.00679	<u>M</u> Nd < 0.00453	<u>Q</u> Sc < 0.00091	<u>Q</u> Ti 0.01325
<u>M</u> Cd < 0.00679	<u>M</u> Hf < 0.00453	<u>Q</u> Ni < 0.01044	<u>M</u> Se < 0.01811	<u>M</u> W < 0.02264
<u>Q</u> Ca 0.00135	<u>M</u> Ho < 0.00113	<u>M</u> Nb < 0.00113	<u>s</u> Si	<u>M</u> U < 0.00453
<u>M</u> Ce < 0.01132	<u>M</u> In < 0.02264	<u>n</u> Os	<u>M</u> Ag < 0.00453	<u>Q</u> V < 0.00408
<u>M</u> Cs < 0.00068	<u>M</u> Ir < 0.01132	<u>M</u> Pd < 0.01132	<u>Q</u> Na 0.02008	<u>M</u> Yb < 0.00226
<u>Q</u> Cr < 0.00681	<u>Q</u> Fe < 0.00499	<u>Q</u> P < 0.02269	<u>Q</u> Sr < 0.00032	<u>M</u> Y < 0.09055
<u>M</u> Co < 0.00679	<u>M</u> La < 0.00113	<u>M</u> Pt < 0.00453	<u>Q</u> S < 0.11342	<u>M</u> Zn < 0.04528
<u>Q</u> Cu < 0.00454	<u>M</u> Pb < 0.00679	<u>Q</u> K < 0.00771	<u>M</u> Ta 0.00200	<u>M</u> Zr < 0.01132

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:

ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 28.0855; +4; 6; $\text{Si}(\text{OH})_4(\text{F})_2^2$

Chemical Compatibility - Soluble in HCl , HF , H_3PO_4 , H_2SO_4 , and HNO_3 as the $\text{Si}(\text{OH})_4(\text{F})_2^2$. 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 $\text{Si}(\text{OH})_4(\text{F})_2^2$. 1-10,000 ppm single element solutions as the $\text{Si}(\text{OH})_4(\text{F})_2^2$ 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 , amorphous (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 $60-100^\circ\text{C}$ to "unzip" the Si-O-Si polymeric structure or digest with concentrated $\text{H}_2\text{SO}_4/\text{H}_2\text{O}_2$ 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 hexamethyldisiloxane. The KOH forms the $\text{K}_2\text{Si}(\text{CH}_3)_2\text{O}^+$ 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 10ppb)
ICP-OES 251.611 nm	0.012 / 0.003 $\mu\text{g/mL}$	1	Ion	Ta, U, Zn, Th
ICP-OES 212.412 nm	0.02 / 0.01 $\mu\text{g/mL}$	1	Ion	Hf, Os, <u>Mo</u> , Ta
ICP-OES 288.158 nm	0.03 / 0.004 $\mu\text{g/mL}$	1	Ion	<u>Ta</u> , Ce, Cr, Cd, Th
ICP-MS 28 amu	4000 - 8000 ppt	n/a	M ⁺	¹⁸ 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 Safety Data sheet for information regarding this CRM.

9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditación, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg 2 of 2

DATE RECEIVED: 01/20/04
DATE EXPIRED: 02/01/2005
DATE OPENED: 01/20/04
INORG: 4437 PO: F52303

010426

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: February 24, 2003

Expiration Date: **EXPIRES**
1 FEB 2005

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

JoAnn Struthers
Katalin Le
Paul Gaines

010427

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**

Catalog Number: CGT11-1, CGT11-2 and CGT11-5

1000 µg/mL Titanium in 1.4% HNO₃ (abs) tr. HFThis standard should not be prepared or stored in glass.Lot Number: **T-TI02039**

Starting Material:
 Starting Material Purity:
 Starting Material Lot No:

Titanium Metal
 99.999%
 F29114

INORGANIC LABS/RADCHEM LABS

DATE RECEIVED: 11/24/03DATE EXPIRED: 12/01/2004 vdDATE OPENED: 11/25/03INORG: 4330 PO: F50279**CERTIFIED CONCENTRATION: 1010 ± 3 µg/mL**

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

$$\text{Uncertainty } (\pm) = \frac{2[(\sum s_i^2)^{1/2}]}{(n)^{1/2}}$$

 (\bar{x}) = mean x_i = individual results

n = number of measurements

 $\sum S_i$ = The summation of all significant estimated errors.

Calculated Value: 1002 µg/mL

Method: Calculated, based on starting material.

Instrument Analysis: 1010 ± 3 µg/mL (Average of 3 runs)

Method: Inductively Coupled Plasma Spectroscopy (ICP) vs NIST SRM 3162a.

TRACE METALLIC IMPURITIES DETERMINED BY ICP-MS AND ICP-OES IN µg/mL:

Custom-Grade solutions tested for trace metallic impurities by ICP-MS were analyzed in an ULPA-Filtered Clean Room.
 An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>Q</u> Al <0.010	<u>M</u> Dy <0.00060	<u>M</u> Li <0.0010	<u>M</u> Pr <0.000030	<u>M</u> Te <0.0030
<u>M</u> Sb <0.000050	<u>M</u> Er <0.00050	<u>M</u> Lu <0.000040	<u>M</u> Re <0.00010	<u>M</u> Tb <0.000030
<u>M</u> As <0.0010	<u>M</u> Eu <0.00030	<u>Q</u> Mg <0.020	<u>M</u> Rh <0.00010	<u>M</u> Tl <0.00010
<u>M</u> Ba <0.0010	<u>M</u> Gd <0.00010	<u>M</u> Mn 0.0020	<u>M</u> Rb <0.00010	<u>M</u> Th <0.00010
<u>M</u> Be <0.000050	<u>M</u> Ga <0.00010	<u>Q</u> Hg <0.050	<u>M</u> Ru <0.00020	<u>M</u> Tm <0.000040
<u>M</u> Bi <0.000040	<u>M</u> Ge <0.00060	<u>M</u> Mo <0.00020	<u>M</u> Sm <0.00010	<u>M</u> Sn <0.00050
<u>Q</u> B <0.050	<u>M</u> Au <0.00030	<u>M</u> Nd <0.00020	<u>Q</u> Sc <0.0020	<u>S</u> Ti
<u>M</u> Cd <0.00030	<u>M</u> Hf <0.00020	<u>Q</u> Ni <0.050	<u>Q</u> Se <0.40	<u>M</u> W <0.0010
<u>Q</u> Ca <0.010	<u>M</u> Ho <0.000050	<u>M</u> Nb <0.000050	<u>Q</u> Si <0.010	<u>M</u> U <0.00020
<u>M</u> Ce <0.00050	<u>Q</u> In <0.020	<u>n</u> Os	<u>M</u> Ag <0.00020	<u>M</u> V <0.00020
<u>M</u> Cs <0.000030	<u>M</u> Ir <0.00050	<u>M</u> Pd <0.00050	<u>Q</u> Na 0.12	<u>M</u> Yb <0.00010
<u>M</u> Cr <0.00050	<u>Q</u> Fe <0.010	<u>i</u> P	<u>M</u> Sr <0.000050	<u>M</u> Y <0.0040
<u>M</u> Co <0.00030	<u>M</u> La <0.000050	<u>M</u> Pt <0.00020	<u>L</u> S	<u>M</u> Zn 0.19
<u>Q</u> Cu <0.040	<u>M</u> Pb <0.00030	<u>n</u> K 0.23	<u>M</u> Ta <0.00070	<u>M</u> Zr <0.00050

M - checked by ICP-MS

O - checked by ICP-OES

i - spectral interference

n - not checked for

s - solution standard element

ANALYZED DENSITY OF SOLUTION (measured at 22°C): 1.011 g/mL

QA:KL Rev.06060201

(over)

Paul R. Gaines
 Quality Assurance Manager

Expires:

EXPIRES
 122004

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/IEC 17025-1999 "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 Licensing 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 μ m 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

010429

inorganic ventures / iv labs

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
 phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
 e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s)), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Strontium in 0.1% (abs) HNO₃

Catalog Number: CGSR1-1, CGSR1-2, and CGSR1-5

Lot Number: T-SR01123

Starting Material: SrCO₃

Starting Material Purity (%): 99.9951

Starting Material Lot No 22593

Matrix: 0.1% (abs) HNO₃

INDORGANIC LABS/RADCHEM LABS Pg. 1 of 3
 DATE RECEIVED: 06/20/03
 DATE EXPIRED: 07/01/2004 V05
 DATE OPENED: 06/23/03
 INDORG: 4154 PD: F52370

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 998 ± 2 µg/mL

Certified Density: 1.000 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2[(\sum s_i^2)^{1/2}]}{(n)^{1/2}}$$

$\sum S$ = The summation of all significant estimated errors.

(Most common are the errors from instrumental measurement, weighing, dilution to volume, and the fixed error reported on the NIST SRM certificate of analysis.)

The Independent samples t-test was used to determine if there is agreement between the above assay methods at the 95% confidence interval. Both methods were compared and showed agreement within the stated uncertainties. This agreement is a confirmation of the accuracy of this CRM.

4.0 TRACEABILITY TO NIST AND VALUES OBTAINED BY INDEPENDENT METHODS

• "Property of the result of a measurement or the value of a standard whereby it can be related to stated references, usually national or international standards, through an unbroken chain of comparisons all having stated uncertainties." (ISO VIM, 2nd ed., 1993, definition 6.10)

• This IV product is Traceable to NIST via direct comparison to NIST SRMs. The uncertainties for each certified value are reported, taking into account the SRM uncertainty error and the measurement, weighing and volume dilution errors.

4.1 Assay Method #1 998 ± 2 µg/mL

EDTA NIST SRM 928 Lot Number: 880710

Assay Method #2 1002 ± 8 µg/mL

ICP Assay NIST SRM 3153a Lot Number: 990906

4.2 BALANCE CALIBRATION - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.

4.3 THERMOMETER CALIBRATION - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.

4.4 GLASSWARE CALIBRATION - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

Q Al < 0.00090	M Dy < 0.00600	Q Li < 0.00003	M Pr < 0.00030	Q Te < 0.10000
M Sb < 0.00050	M Er < 0.00500	M Lu < 0.00040	M Re < 0.00100	M Tb < 0.00030
Q As < 0.00500	M Eu < 0.00300	Q Mg 0.00037	Q Rh < 0.00600	M Ti < 0.00100
M Ba 0.04001	M Gd < 0.00100	Q Mn 0.00018	I Rb	M Th < 0.00100
Q Be < 0.00009	M Ga < 0.00100	Q Hg < 0.01500	Q Ru < 0.00300	M Tm < 0.00040
M Bi < 0.00040	M Ge < 0.00600	M Mo < 0.00200	M Sm < 0.00100	M Sn < 0.00500
Q B < 0.00060	M Au < 0.00300	M Nd < 0.00200	M Sc < 0.01000	M Ti < 0.05001
M Cd < 0.00300	M Hf < 0.00200	Q Ni < 0.00300	Q Se < 0.05000	M W < 0.01000
Q Ca 0.03600	M Ho < 0.00050	M Nb < 0.00050	Q Si 0.00056	M U < 0.00200
M Ce < 0.00500	Q In < 0.00200	n Os	M Ag < 0.00200	M V < 0.00200
M Cs < 0.00030	M Ir < 0.00500	Q Pd < 0.00400	Q Na 0.00520	M Yb < 0.00100
Q Cr < 0.00080	Q Fe 0.00080	Q P < 0.00480	s Sr	Q Y < 0.00004
M Co < 0.00300	M La < 0.00050	M Pt < 0.00200	n S	M Zn < 0.02000
Q Cu < 0.00140	M Pb < 0.00300	Q K < 0.00170	M Ta < 0.00700	M Zr < 0.00500

M - Checked by ICP-MS O - Checked by ICP-OES I - Spectral Interference n - Not Checked For s - Solution Standard Element

6.0 INTENDED USE

For the calibration of analytical instruments including but not limited to the following:

ICP-MS, ICP-OES, FAAS, GFAA, XRF, and DCP

For the validation of analytical methods

For the preparation of "working reference samples"

For interference studies and the determination of correction coefficients

For detection limit and linearity studies

For additional intended uses, contact IV Technical Staff

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

Storage & Handling - Keep tightly sealed when not in use. Store and use at 20 ± 4° C. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 87.62; +2; 6; Sr(H₂O)₈²⁺

Chemical Compatibility - Soluble in HCl, and HNO₃. Avoid H₂SO₄, 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% HNO₃ / LDPE container. 1-10,000 ppm solutions chemically stable for years in 1 - 3.5% HNO₃ / LDPE container.

Sr Containing Samples (Preparation and Solution) - Metal (Best dissolved in diluted HNO₃); Ores (Carbonate fusion in Pt⁰ followed by HCl dissolution); Organic Matrices (Dry ash and dissolution in dilute HCl).

Atomic Spectroscopic Information (ICP-OES D.L.s are given as radial/axial view):

Technique/Line	Estimated D.L.	Order	Type	Interferences (underlined indicates severe at = concs.)
ICP-OES 407.771 nm	0.0004 / 0.00006 µg/mL	1	Ion	U, Ce
ICP-OES 421.552 nm	0.0008 / 0.00004 µg/mL	1	Ion	Rb
ICP-OES 460.733 nm	0.07 / 0.003 µg/mL	1	atom	Ce
ICP-MS 88 amu	1200 ppt	n/a	M ⁺	¹⁷⁴ Ge ¹⁶ O, ¹⁷⁶ Yb ²⁺ , ¹⁷⁶ Lu ²⁺ , ¹⁷⁶ Hf ²⁺

- 8.0 **HAZARDOUS INFORMATION** - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.
- 9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.
- 10.0 **QUALITY STANDARD DOCUMENTATION**

10.1 **ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105**

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (OGS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)



10.2 **ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"**

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 **ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"**

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

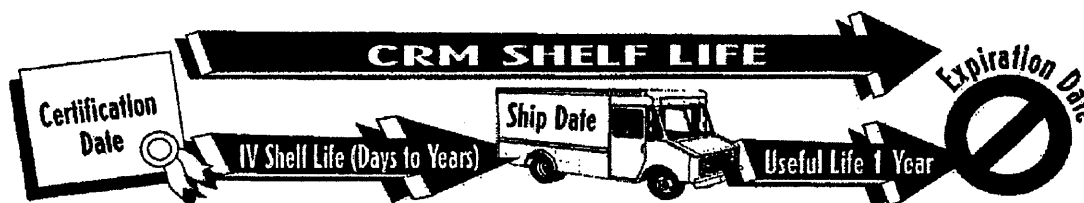
10.4 **10CFR50 Appendix B - Nuclear Regulatory Commission**

- Domestic Licensing of Production and Utilization Facilities

10.5 **10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance**

10.6 **MIL-STD-45662A (Obsolete/Observed)**

11.0 **DATE OF CERTIFICATION AND PERIOD OF VALIDITY**



11.1 **IV Shelf Life** - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 **Expiration Date** - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: October 31, 2002

Expiration Date: **EXPIRES**

01 12 004

INORGANIC LABS/RADCHEM LABS 79.2 of 2

DATE RECEIVED: 06/20/03

DATE EXPIRED: 07/01/2004 YES

DATE OPENED: 06/23/03

INORG: 4154 PO: F52370

010432

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

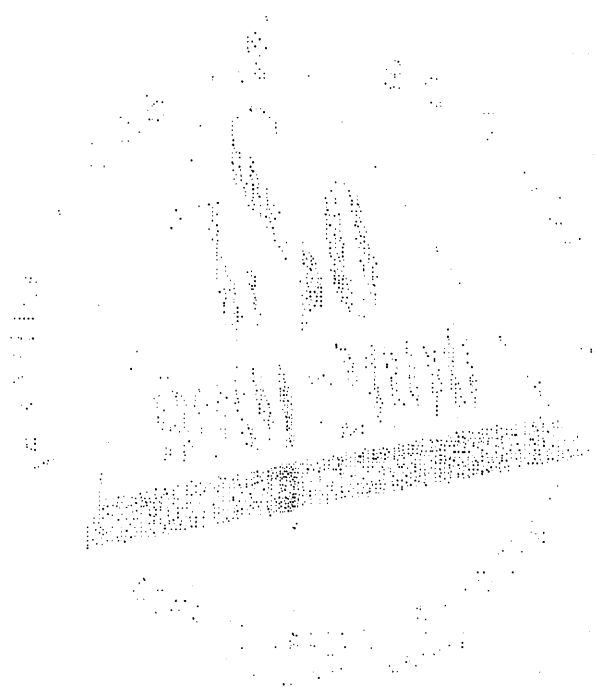
Certificate Prepared By: Debbie Newman, QA Administrator

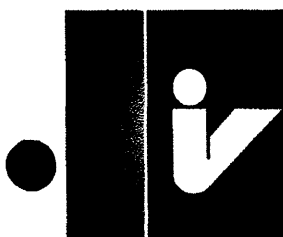
Debbie Newman
Katalin Le

Certificate Approved By: Katalin Le, QC Supervisor

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Paul Gaines





inorganic ventures / iv labs

010433

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: Certificate #883-02. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

2.0 DESCRIPTION OF CRM Custom-Grade 1000 µg/mL Tin in H₂O tr. HNO₃ tr. HF

Catalog Number: CGSN1-1, CGSN1-2, and CGSN1-5
Lot Number: X-SN01115
Starting Material: Sn Shot
Starting Material Purity (%): 99.999438
Starting Material Lot No G12M23
Matrix: H₂O tr. HNO₃ tr. HF

3.0 CERTIFIED VALUES AND UNCERTAINTIES

Certified Concentration: 995 ± 2 µg/mL

Certified Density: 0.998 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

(\bar{x}) = mean

x_i = individual results

n = number of measurements

$$\text{Uncertainty } (\pm) = \frac{2(s)}{(n)^{1/2}}$$

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 #1 995 ± 2 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 Pg. 1 of 2

DATE RECEIVED: 03/30/04
DATE EXPIRED: 04/01/2005 VOS
DATE OPENED: 03/30/04
INORG: 4512 PO: F53361

- 4.2 BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 4.3 THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.
- 4.4 GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>Q</u> Al 0.00050	<u>M</u> Dy < 0.01205	<u>Q</u> Li < 0.00002	<u>M</u> Pr < 0.00060	<u>M</u> Te < 0.06026
<u>Q</u> Sb < 0.01000	<u>M</u> Er < 0.01004	<u>M</u> Lu < 0.00080	<u>M</u> Re < 0.00201	<u>M</u> Tb < 0.00060
<u>M</u> As < 0.02009	<u>M</u> Eu < 0.00603	<u>Q</u> Mg < 0.00003	<u>M</u> Rh < 0.00201	<u>M</u> Tl < 0.00201
<u>Q</u> Ba < 0.00070	<u>M</u> Gd < 0.00201	<u>M</u> Mn < 0.00804	<u>M</u> Rb < 0.00201	<u>M</u> Th < 0.00201
<u>M</u> Be < 0.00100	<u>M</u> Ga < 0.00201	<u>Q</u> Hg < 0.01500	<u>M</u> Ru < 0.00402	<u>M</u> Tm < 0.00080
<u>M</u> Bi < 0.00080	<u>M</u> Ge < 0.01205	<u>M</u> Mo < 0.00402	<u>M</u> Sm < 0.00201	<u>s</u> Sn
<u>Q</u> B < 0.01200	<u>M</u> Au < 0.00603	<u>M</u> Nd < 0.00402	<u>M</u> Sc < 0.02009	<u>M</u> Ti < 0.10043
<u>Q</u> Cd 0.00009	<u>M</u> Hf < 0.00402	<u>Q</u> Ni < 0.01000	<u>M</u> Se < 0.01607	<u>M</u> W < 0.02009
<u>Q</u> Ca < 0.00150	<u>M</u> Ho < 0.00100	<u>M</u> Nb < 0.00100	<u>Q</u> Si < 0.00340	<u>M</u> U < 0.00402
<u>M</u> Ce < 0.01004	<u>M</u> In < 0.02009	<u>n</u> Os	<u>M</u> Ag < 0.00402	<u>M</u> V < 0.00402
<u>M</u> Cs < 0.00060	<u>M</u> Ir < 0.01004	<u>M</u> Pd < 0.01004	<u>Q</u> Na < 0.00010	<u>M</u> Yb < 0.00201
<u>M</u> Cr < 0.01004	<u>Q</u> Fe < 0.00110	<u>Q</u> P < 0.00500	<u>M</u> Sr < 0.00100	<u>M</u> Y < 0.08035
<u>Q</u> Co < 0.00200	<u>M</u> La < 0.00100	<u>M</u> Pt < 0.00402	<u>n</u> S	<u>M</u> Zn < 0.04017
<u>M</u> Cu < 0.01205	<u>M</u> Pb 0.00593	<u>Q</u> K < 0.00200	<u>M</u> Ta < 0.01406	<u>M</u> 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

7.0 INSTRUCTIONS FOR THE CORRECT USE OF THIS REFERENCE MATERIAL

010435

Storage & Handling - Keep tightly sealed when not in use. Store and use at $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 118.710; +4; 4,5,6,7,8 $\text{Sn}(\text{OH})_4\text{F}_2$

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 $\text{Sn}(\text{OH})_4\text{F}_2$ for 1 year in 1% HNO_3 / LDPE container. 1-10,000 ppm single element solutions as the $\text{Sn}(\text{OH})_4\text{F}_2$ 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 stannate.); 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
ICP-OES 189.989 nm	0.03 / 0.003 $\mu\text{g/mL}$	1	ion	
ICP-OES 242.949 nm	0.1 / 0.01 $\mu\text{g/mL}$	1	atom	W, Mo, Rh, Ta, Co
ICP-MS 120 amu	5 ppt	n/a	M	¹²⁷ Te, ¹³⁶ Ru ¹⁶ O, ¹⁰⁶ 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 Safety Data sheet for information regarding this CRM.

9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2

DATE RECEIVED: 03/30/04
 DATE EXPIRED: 04/01/2005 VOS
 DATE OPENED: 03/30/04
 INORG: 4512 PO: F53361

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010436



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 11, 2004

Expiration Date:

EXPIRES
1/12/2005

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

JoAnn Struthers
Katalin Le
Paul Gaines

010437

**inorganic ventures / iv labs**

195 lehigh avenue, suite 4, lakewood, nj 08701 usa
 phone: 800-669-6799 • 732-901-1900 • fax: 732-901-1903
 e-mail: ivsales@ivstandards.com • website: www.ivstandards.com

certificate of analysis

- 1.0 Inorganic Ventures / IV Labs is an ISO Guide 34-2000 Certified Reference Material (CRM) Manufacturer: **Certificate #883-02**. The certificate is designed and the certified value(s) and uncertainty(ies) are determined in accordance with ISO Guide 31-2000 (Reference Materials - Contents of certificates and label(s)), ISO Guide 34-2000 "Quality System Guidelines for the Production of Reference Materials," and ISO Guide 35-1989 "Certification of Reference Materials - General and Statistical Principles."

2.0 **DESCRIPTION OF CRM** Custom-Grade 1000 µg/mL Bismuth in 3.5% (abs) HNO₃

Catalog Number: CGBI1-1 and CGBI1-5
 Lot Number: **W-BI01089**
 Starting Material: Bi needles
 Starting Material Purity (%): 99.999090
 Starting Material Lot No: G25L16
 Matrix: 3.5% (abs) HNO₃

INORGANIC LABS/RADCHEM LABS Pg. 1 of 2
 DATE RECEIVED: 07/31/03
 DATE EXPIRED: 08/01/2004 VOS
 DATE OPENED: 08/01/03
 INORG: 4200 PO: F52383

3.0 **CERTIFIED VALUES AND UNCERTAINTIES**

Certified Concentration: 1002 ± 4 µg/mL

Certified Density: 1.026 g/mL (measured at 22° C)

The Certified Value is based upon the most precise method used to analyze this CRM. The following equations are used in the calculation of the certified value and the uncertainty:

$$\text{Certified Value } (\bar{x}) = \frac{\sum x_i}{n}$$

$$\text{Uncertainty } (\pm) = \frac{2(\sum s_i^2)^{1/2}}{(n)^{1/2}}$$

(\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 ± 4 µg/mL (Avg 2 runs)

ICP Assay NIST SRM 3106 Lot Number: 991212

Assay Method #2 1002 µg/mL

Gravimetric NIST SRM Lot Number: See Sec. 4.2

- 4.2 BALANCE CALIBRATION** - All balances are checked daily using in-house procedure number 6-IMM-001. The weights used for testing are annually compared to Gerhart Scale Corporation's master weights and are traceable to the National Institute of Standards and Technology (NIST). The NIST Traceability numbers are 692476 - Class 1 and 692476A - Class 2. The NIST test number is 822/260017-98. All analytical balances are calibrated every 4 months by Gerhart Scale Corp. of South Amboy. The balances are calibrated with a class 1 and/or class 2 analytical weight set. These weights are tested annually by a NIST / NVLAP accredited calibration lab. The NIST test number is 822/260017-98.
- 4.3 THERMOMETER CALIBRATION** - The thermometers used in the determination of the final densities are calibrated vs standard thermometer No. 903-2680 which was certified in accordance with the procedures outlined by ASTM E77-87 and NIST Monograph 150 using NIST Test Nos. and Std Nos.: 769543, 217368/769543, 217368/P14452, 176240/P14452, 176240. The in-house procedure No. is 2-QC-001. Thermometers which are not calibrated vs standard thermometer No. 903-2680 are traceable to NIST Identification Nos. 92564, 119016, 471047 and NIST test report Nos. 811/258522, 811/2557078, and 236090.
- 4.4 GLASSWARE CALIBRATION** - In-house procedure 3-QC-002 is used to calibrate all Class A Glassware used in the manufacture and quality control of Custom Grade Standards.

5.0 TRACE METALLIC IMPURITIES (TMI) DETERMINED BY ICP/MS AND ICP-OES IN µg/mL

Custom-Grade solutions are tested for trace metallic impurities by Axial ICP-OES and ICP-MS. The result from the most sensitive method for each element, is reported below. Solutions tested by ICP-MS were analyzed in an ULPA-Filtered Clean Room. An ULPA-Filter is 99.9985% efficient for the removal of particles down to 0.3 µm.

<u>Q</u> Al 0.00012	<u>M</u> Dy < 0.01202	<u>Q</u> Li < 0.00002	<u>M</u> Pr < 0.00060	<u>M</u> Te < 0.06008
<u>M</u> Sb < 0.00100	<u>M</u> Er < 0.01001	<u>M</u> Lu < 0.00080	<u>M</u> Re < 0.00200	<u>M</u> Tb < 0.00060
<u>M</u> As < 0.02003	<u>M</u> Eu < 0.00601	<u>Q</u> Mg 0.00070	<u>M</u> Rh < 0.00200	<u>M</u> Tl < 0.00200
<u>M</u> Ba < 0.02003	<u>M</u> Gd < 0.00200	<u>Q</u> Mn < 0.00020	<u>M</u> Rb < 0.00200	<u>M</u> Th < 0.00200
<u>M</u> Be < 0.00100	<u>M</u> Ga < 0.00200	<u>Q</u> Hg < 0.01500	<u>M</u> Ru < 0.00401	<u>M</u> Tm < 0.00080
<u>s</u> Bi	<u>M</u> Ge < 0.01202	<u>M</u> Mo < 0.00401	<u>M</u> Sm < 0.00200	<u>M</u> Sn < 0.01001
<u>M</u> B < 0.14018	<u>M</u> Au < 0.00601	<u>M</u> Nd < 0.00401	<u>M</u> Sc < 0.02003	<u>M</u> Ti < 0.10013
<u>Q</u> Cd 0.00017	<u>M</u> Hf < 0.00401	<u>M</u> Ni < 0.01602	<u>M</u> Se < 0.01602	<u>M</u> W < 0.02003
<u>Q</u> Ca 0.00245	<u>M</u> Ho < 0.00100	<u>M</u> Nb < 0.00100	<u>Q</u> Si 0.00105	<u>M</u> U < 0.00401
<u>M</u> Ce < 0.01001	<u>Q</u> In 0.00105	<u>n</u> Os	<u>M</u> Ag < 0.00401	<u>M</u> V < 0.00401
<u>M</u> Cs < 0.00060	<u>M</u> Ir < 0.01001	<u>Q</u> Pd < 0.00400	<u>Q</u> Na 0.00240	<u>M</u> Yb < 0.00200
<u>Q</u> Cr 0.00020	<u>Q</u> Fe 0.00014	<u>Q</u> P < 0.01000	<u>M</u> Sr < 0.00100	<u>M</u> Y < 0.08011
<u>M</u> Co < 0.00601	<u>M</u> La < 0.00100	<u>M</u> Pt < 0.00401	<u>Q</u> S < 0.03000	<u>Q</u> Zn 0.00008
<u>Q</u> Cu 0.00014	<u>Q</u> Pb 0.00135	<u>Q</u> K 0.00039	<u>M</u> Ta < 0.01402	<u>M</u> 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 $20 \pm 4^\circ\text{C}$. Do not pipet from container. Do not return portions removed for pipetting to container.

Atomic Weight; Valence; Coordination Number; Chemical Form in Solution - 208.9804; +3, 6; $\text{Bi}(\text{O})(\text{H}_2\text{O})_5^{3+}$

Chemical Compatibility - Stable in HCl , HNO_3 , H_2SO_4 , and HF . Avoid basic media forming insoluble hydroxide. Stable with most metals and inorganic anions in acidic media. Many salts that are insoluble in water are soluble in HCl , HNO_3 , and HF . The major problem with Bi^{3+} is its tendency to hydrolyze at higher concentrations or in dilute acid. Nitric acid solutions should be 5% to hold the Bi in solution in the 100 to 10000 $\mu\text{g/mL}$ 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 0.05%)
ICP-OES 223.061 nm	0.04 / 0.005 $\mu\text{g/mL}$	1	atom	Th, Ir, Tl Cu
ICP-OES 308.772 nm	0.08 / 0.01 $\mu\text{g/mL}$	1	atom	Th, U, Zr, Hf, Fe
ICP-OES 222.825 nm	0.1 / 0.02 $\mu\text{g/mL}$	1	atom	Cr, Hf, Ce, Os
ICP-MS 209 amu	2 ppt	n/a	M	^{209}Bi

8.0 **HAZARDOUS INFORMATION** - Please refer to the enclosed Material Safety Data sheet for information regarding this CRM.

9.0 **HOMOGENEITY** - This solution was mixed according to procedure IV-MPM-004 and is guaranteed to be homogeneous.

10.0 QUALITY STANDARD DOCUMENTATION

10.1 ISO 9001:2000 Quality Management System Registration - QMI Certificate Number 010105

Recognized by:

Registrar Accreditation Board (ANSI-RAB)

Standards Council of Canada (SCC)

Dutch Council for Accreditation (RVA)

Entidad Mexicana de Acreditacion, a.c.(EMA)

Members of IQ Net International Certification Network:

Argentina (IRAM), Australia (QAS), Austria (ÖQS), Belgium (Avinter), Brazil (FCAV), Canada (QMI), Hong Kong (HKQAA), Columbia (ICONTEC), Czech Republic (CQS), Denmark (DS), Finland (SFS), France (AFAQ), Germany (DQS), Greece (ELOT), Hungary (MSZT), Ireland (NSAI), Israel (SII), Italy (CISQ), Japan (JQA), Korea (KSA-QA), Netherlands (KEMA), Norway (NCS), Poland (PCBC), Portugal (APCER), Singapore (PSB), Slovenia (SIQ), Spain (AENOR), Switzerland (SQS)

10.2 ISO/IEC 17025 - 1999 "General Requirements for the Competence of Testing and Calibration"

- Chemical Testing - Accredited A2LA Certificate Number 883.01



10.3 ISO/IEC Guide 34 - 2000 "General Requirements for the Competence of Reference Material Producers"

- Reference Materials Production - Accredited A2LA Certificate Number 883.02

A2LA Mutual Recognition Agreement Partners:

Australia (NATA), Austria (BmWA), Belgium (BELTEST) (BKO-OBE), Canada (SCC), Chinese Taipei (CNLA), Czech Republic (NAO), Denmark (DANAK), Finland (FINAS), France (COFRAC), Germany (DAR), Hong Kong (HKAS), Ireland (NAB), Italy (SIT) (SINAL), Japan (JAB) (JNLA), Republic of Korea (KOLAS), The Netherlands (RvA), New Zealand (IANZ), Norway (NA), Portugal (IPQ), Singapore (SAC-SINGLAS), Spain (ENAC), Sweden (SWEDAC), Switzerland (SAS), United Kingdom (UKAS) and United States (NVLAP) (ICBO ES)

10.4 10CFR50 Appendix B - Nuclear Regulatory Commission

- Domestic Licensing of Production and Utilization Facilities

10.5 10CFR21 - Nuclear Regulatory Commission - Reporting Defects and Non-Compliance

10.6 MIL-STD-45662A (Obsolete/Observed)

INORGANIC LABS/RADCHEM LABS Pg. 2 of 2
 DATE RECEIVED: 07/21/03
 DATE EXPIRED: 08/01/2004 VOS
 DATE OPENED: 08/01/03
 INDRG: 4200 PO: F52383

11.0 DATE OF CERTIFICATION AND PERIOD OF VALIDITY

010440



11.1 IV Shelf Life - The period of time during which the concentration of the analyte(s) in a properly packaged, unopened, and unused standard stored under environmentally controlled and monitored conditions will remain within the specified uncertainty range. Shelf life is limited primarily by transpiration (loss of water from the solution) and infrequently, by chemical instability. Transpiration studies (P-SP01020) of chemically-stable solutions performed at Inorganic Ventures / IV Labs indicate a CRM shelf-life of four years for solutions packaged in 500-mL low density polyethylene bottles. When stored under special conditions that minimize transpiration and instability, the shelf life can be extended past this limit.

11.2 Expiration Date - The date after which a CRM should not be used. Routine laboratory use of a CRM increases transpiration losses and the chance of contamination which affect the integrity of the CRM and limit its useful life. Inorganic Ventures / IV Labs concurs with state and federal regulatory agencies' recommendations that solution standards be assigned a one-year expiration date.

Certification Date: March 28, 2003

Expiration Date:

EXPIRES
1/2004

12.0 NAMES AND SIGNATURES OF CERTIFYING OFFICERS

Certificate Prepared By: JoAnn Struthers, QA Administrative Assistant

JoAnn Struthers

Certificate Approved By: Katalin Le, QC Supervisor

Katalin Le

Certifying Officer: Paul Gaines, Chemist, Senior Technical Director

Paul Gaines

SPEXertificate™

Certificate of Reference Material

010441

Catalog Number: AS-F9-2X/2Y

Lot No. 25-5AS

Description: 1000 mg/L Fluoride

Matrix: H2O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 998 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/

Certified Value is Traceable to: NIST SRM 3183

The CRM is prepared gravimetrically using high purity Sodium Fluoride Lot# M44142. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

Method: Potentiometric using Fluoride combination electrode

Instrumentation Analysis By Ion Chromatography: 999 mg/L

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Ion	mg/L	Ion	mg/L
Br	<0.2	NO3	<0.2
Cl	<10	PO4	<1
NO2	<0.2	SO4	<0.5

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification:

JAN -- 2004

Certifying Officer:

N. Kocherakota

INORGANIC LABS/FACDCHEN LABS
DATE RECEIVED: 01/06/04
DATE EXPIRED: 01/15/2005 YD3
DATE OPENED: 01/06/04
INORG: 4388
PO: F52292

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

010442

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 $k_p = s^2 m$ 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_p = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001
CERTIFIED

SPEXTM
Certificate of Reference Material

010443

Catalog Number: AS-CL9-2X/2Y

Lot No. 7-147VY

Description: 1000 mg/L Chloride

Matrix: H2O

This ASSURANCE[®] certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 997 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM 3182

The CRM is prepared gravimetrically using high purity Sodium Chloride Lot# 004723. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 997 mg/L

Method: Gravimetry: Precipitation using AgNO₃, filtering, drying and weighing as AgCl.

Instrumentation Analysis By Ion Chromatography: 997 mg/L

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Element	mg/L	Element	mg/L
F	<0.05	Br	<0.1
PO ₄	<0.05	NO ₃	<0.1
SO ₄	<0.05	NO ₂	<0.2

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN -- 2004 Certifying Officer: N. Kocherakota

LABS/RADCHEM LABS
DATE RECEIVED: 01/06/04
DATE EXPIRED: 01/15/2005
DATE OPENED: 01/06/04
INFO: 4387
PO: F50292

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

010444



SPEXertificateTM
Certificate of Reference Material

010445

Catalog Number: AS-NO2N9-2X/2Y

Lot No. 7-158VY

Description: 1000 mg/L Nitrite-N

Matrix: H2O

This ASSURANCE[®]certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1001.5 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: SPEX CRM 0902

The CRM is prepared gravimetrically using high purity Sodium Nitrite Lot# 0791R. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000mg/L

Method: Titration with KMNO4 that was standardized against Sodium Oxalate NIST SRM 40h.

Instrumentation Analysis By Ion Chromatography: 1003 mg/L

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Ion	mg/L	Ion	mg/L
Br	<20	NO3	<40
Cl	<20	PO4	<0.8
F	<0.4	SO4	<0.4

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: MAR -- 2004 **Certifying Officer:** N. Kocherakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 03/05/04
DATE EXPIRED: 03/15/2005
DATE OPENED: 03/05/04
INDRG: 4480 PU: F50337

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

010446

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



SPEXcertificate™

010447

Certificate of Reference Material

Catalog Number: AS-BR9-2X/2Y **Lot No.:** 23-52AS
Description: 1000 mg/L of Bromide
Matrix: H₂O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: Bromide (Br⁻): 999 mg/L ± 3 mg/L
Traceable to: SPEX CRM 19-45AS

The CRM is prepared gravimetrically using high purity Sodium Bromide (NaBr) Lot#017400
The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1,002 mg/L

Method: Gravimetric analysis by precipitation using Silver Nitrate, filtering, drying and weighing as AgBr.

Instrumental Analysis by Ion Chromatography: 996 mg/L

Trace Anion Impurities in the Actual Solution via IC Analysis:

Element	mg/L
F ⁻	<0.02
BrO ₃ ⁻	<0.02
NO ₂ ⁻	<0.05
NO ₃ ⁻	<0.05
PO ₄ ⁻³	<0.20
Cl ⁻	<1.50
SO ₄ ⁻²	<0.05

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others.
This CRM is guaranteed stable and accurate to +/- 0.5% of the certified concentration value for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: MAY - - '03 **Certifying Officer:** N. Kocherakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 05/28/03
DATE EXPIRED: 05/30/2004
DATE OPENED: 05/28/03
INORG: 4106 PO: F50354

Report of Certification

This Certified Reference Material has been prepared and certified under an ISO 9001 system consistent with the following guides:

Guide To The Expression Of Uncertainty In Measurement 1995

EURACHEM/CITAC Guide: Quantifying Uncertainty in Analytical Measurement – Second Edition

ASTM Guide D6362-98

ISO Guide 34: Quality system guidelines for the production of reference materials.

ISO Guide 17025: Certification of reference materials, general and statistical principles

ISO Guide 31: Contents of certificates of reference materials

NIST Technical Note 1297

ILAC-G12-2000: Guidelines for the requirements for the competence of reference materials producers

ISO/REMCO N280

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

ISO 9001

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010448

SPEXertificate™
Certificate of Reference Material

010449

Catalog Number: AS-NO3N9-2X/2Y **Lot No.** 25-65AS
Description: 1000 mg/L Nitrate Nitrogen
Matrix: H2O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 1003.5 mg/L

Uncertainty Associated with Measurement: +/- 3.0 mg/L

Certified Value is Traceable to: NIST SRM 3185

The CRM is prepared gravimetrically using high purity Sodium Nitrate Lot# M14156. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1004 mg/L

Method: Precipitate using Nitron Acetate, filter, dry and weigh as C20H16N4HNO3

Instrumentation Analysis By Ion Chromatography: 1003 mg/L

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Ion	mg/L	Ion	mg/L
Br	<0.5	NO2	<0.2
Cl	<0.2	PO4	<2.0
F	<0.05	SO4	<0.5

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN -- 2004 **Certifying Officer:** N. Kocherakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/06/04
DATE EXPIRED: 01/05/2005
DATE OPENED: 01/06/04
INFORM: 4389
FO: F52292

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

010450

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



SPEX CertificateTM
Certificate of Reference Material

010451

Catalog Number: AS-PO4P9-2X/2Y

Lot No. 7-145VY

Description: 1000 mg/L Phosphate-P

Matrix: H2O

This ASSURANCE[®] certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 998 mg/L

Uncertainty Associated with Measurement: +/- 3 mg/L

Certified Value is Traceable to: NIST SRM #318b

The CRM is prepared gravimetrically using high purity KH₂PO₄ Lot# V35142. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 998 mg/L

Method: Precipitation using Magnesia Mixture. Filter, ignite, and weigh as Mg₂P₂O₇

Instrumentation Analysis By Ion Chromatography: 998 mg/L

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Element	mg/L	Element	mg/L
Cl	<3.0	Br	<0.3
F	<0.2	NO ₃	<0.5
NO ₂	<0.3	SO ₄	<0.5

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to +/-0.5% of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: JAN -- 2004

Certifying Officer: N. Kochenakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 01/06/04
DATE EXPIRED: 01/05/2005
DATE OPENED: 01/06/04
INFO: 9390
PO: F522972

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

010452

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

S = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.



SPEXertificateTM
Certificate of Reference Material

010453

Catalog Number: AS-SO49-2X/2Y

Lot No. 7-149VY

Description: 1000 mg/L Sulfate

Matrix: H₂O

This ASSURANCE[®] certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: 997 mg/L

Uncertainty Associated with Measurement: ± 3.0 mg/

Certified Value is Traceable to: NIST SRM 3181

The CRM is prepared gravimetrically using high purity Potassium Sulfate Lot# X34146. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 998 mg/L

Method: Precipitated using Barium Chloride, filtered, ignited and weighed as BaSO₄

Instrumentation Analysis By Ion Chromatography: 996 mg/L

Uncertified Properties:

Trace Ionic Impurities in the Actual Solution via IC Analysis:

Element	mg/L	Element	mg/L
Br	<0.01	NO ₃	<0.01
Cl	<0.01	PO ₄	<0.10
F	<0.005		
NO ₂	<0.01		

Balances are calibrated regularly with weight sets traceable to NIST #32856, #32857 and others. This CRM is guaranteed stable to $\pm 0.5\%$ of the certified concentration inclusive of uncertainty of measurements and other effects, such as transpiration losses, for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: MAY -- '03 Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 05/28/03
DATE EXPIRED: 05/28/2004 VOS
DATE OPENED: 05/28/03
INDRG: 4108 PO: F52054

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

010454

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

$U = k u_k$ where $k=2$ is the coverage factor at the 95% confidence level

u_k is obtained by combining the individual element standard uncertainty components u_i and $u_{\text{rel}} = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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010455

SPEXertificate™

Certificate of Reference Material

Catalog Number: ICMIX2-100 Lot No.: 25-145AS
 Description: IC Instrument Check Standard 2
 Matrix: H₂O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

The CRM is prepared from high purity single ion concentrates of individual elements using Class A laboratory ware to give precise concentration.
 Refer to side 2 for details of measurement uncertainties.

Instrumental Analysis by ION Chromatography:

Analyte	Labeled (mg/L)	Measured (mg/L)	NIST SRM
F ⁻	100	100	3183
Cl ⁻	200	200	3182
Br ⁻	400	399	3184
NO ₃ ⁻	400	402	3185
HPO ₄ ⁻²	600	600	3186
SO ₄ ⁻²	400	399	3181

Spex Reference Multi: Lot #IC6-77VY

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable and accurate to +/- 0.5% on the average of all the certified concentrations with no single component exceeding +/- 2%. This guarantee is valid for a period of one year from the date of certification only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: APR - - 2004 Certifying Officer: N. Kocherlakota

INORGANIC LABS/EA/DOHEM LABS
 DATE RECEIVED: 04/06/04
 DATE EXPIRED: 04/15/2005 V03
 DATE OPENED: 04/06/04
 INORG: 4518 PO: F53362

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

010456

Material Source:

All analytes and matrix materials are obtained and verified by SPEX CertiPrep from pre-qualified vendors as per ISO 9000 guidelines. Vendor identifications are proprietary, however sources of all materials used in the preparation and testing of SPEX CertiPrep CRMs are tracked and documented. For further information contact CRM Sales.

Instructions for Use:

Primary usage of this CRM is in neat form or diluted serially with matrix of a purity at or greater than the purity of the original matrix solution. If dilution is required the diluent must be compatible with all certified analytes and contain stabilizers appropriate for the period of intended use. The CRM can also be used as a spike or with a spike, again with appropriate compatibility considerations. All solutions should be thoroughly mixed, by shaking, prior to use and never pipetted directly from the bottle. All surfaces that come in contact with the solution must be thoroughly cleaned and leached prior to use. Dilutions should be performed only with Class A volumetric glassware.

Method of Preparation:

Clean laboratory procedures and techniques have been used throughout the preparation. All materials, equipment, analytical instrumentation and personnel have been qualified prior to use. The highest purity acids applicable, 18 megohm, double deionized water, acid-leached triple-rinsed bottles, and Class A glassware have been used in all preparations.

Homogeneity:

The Homogeneity of the CRM has been confirmed by procedures consistent with ISO guide 17025, ISO/REMCO N280 and ASTM D6362-98 Appendix X2. Random, replicate samples of the final, packaged material have been analyzed for the certified values by procedures consistent with the intended use of the CRM.

The mathematical expression $k_s = s^2 m$ is employed to determine the sampling size

s = relative standard deviation in % for one component of the sample. (ie. The sub-sampling uncertainty)

m = the sub-sampling mass

k_s = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

SPEX CertiPrep reference materials are not for any cosmetic, drug or household application and are to be used only by qualified individuals who are trained in appropriate procedures. No claims against SPEX CertiPrep, Inc. of any kind whatsoever, whether based on breach of warranty, alleged negligence, or otherwise, with respect to this RM shall be greater than the purchase price. In no event shall SPEX CertiPrep, Inc. be liable for any loss of profits or any incidental, special, or consequential damages.

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146

PROJECT NO.

BOOK NO.

1CH

TITLE

NO₂N

QC

Work continued from Page

SwRI®

010457

5 146-01-1CH Nitrite-N, 101 mg/L (Inorg# 4107)
5 ml of Nitrite- (Spex 23-23AS, 1000 mg/L NO₂)
+ 10 ml DI H₂O.

10

15

20

25

30

35

4/8/04

R. Spores

www.scientificbindery.com

Work continued to Page

SIGNATURE

R. Spores

DATE

4/8/04

DISCLOSED TO AND UNDERSTOOD BY

Linda Spores

DATE

4/12/04

WITNESS

DATE

SPEXcertificate™

Certificate of Reference Material

010458

Catalog Number: AS-NO₂-9-2X/2Y Lot No.: 23-23AS
Description: 1000 mg/L of Nitrite
Matrix: H₂O

This ASSURANCE® certified reference material, CRM, is intended primarily for use as a calibration standard or quality control standard for Ion Chromatography instrumentation. It can be employed in USEPA, ASTM and other methods relevant to the certified properties listed below.

Certified Value: Nitrite (NO₂⁻): 1000.5 mg/L ± 3 mg/L
Traceable to: SPEX CRM 0601NO₂

The CRM is prepared gravimetrically using high purity Sodium Nitrite (NaNO₂) Lot#0791R. The certified value listed is the average of values obtained by classical wet assay and Ion Chromatography analysis.

Refer to side 2 for details of measurement uncertainties.

Classical Wet Assay: 1000 mg/L

Method: Titrimetric analysis using KMnO₄. KMnO₄ standardized with As₂O₃ NIST SRM #83d.

Instrumental Analysis by Ion Chromatography: 1001 mg/L

Trace Anion Impurities in the Actual Solution via IC Analysis:

Element	mg/L
F ⁻	<0.2
SO ₄ ⁻²	<0.2
Cl ⁻	<0.5
PO ₄ ⁻³	<0.5
Br ⁻	<10.0
NO ₃ ⁻	<10.0

Balances are calibrated regularly with weight sets traceable to NIST#s 32856, 32867 and others. This CRM is guaranteed stable and accurate to +/- 0.5% of the certified concentration value for a period of one year from the date of certification. This guarantee is valid only when the material is kept tightly capped and transported and stored under laboratory conditions.

Date of Certification: MAY - - '03 Certifying Officer: N. Kocherakota

INORGANIC LABS/RADCHEM LABS
DATE RECEIVED: 05/28/03
DATE EXPIRED: 05/29/04
DATE OPENED: 05/28/03
INORG: 4107 PO: FS2354

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 $k_r = s^2 m$ 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_r = mass of sub-sample necessary to ensure a relative sub-sampling error of 1% (68% confidence level) in a single determination

Statistical estimator and Confidence limits:

The certified value 'x' listed on the reverse of this document is at the 95% level of confidence and can be expressed as

$X = x \pm U$ where X = True value (Labeled Value), U = Expanded uncertainty

$U = k u_c$ where $k=2$ is the coverage factor at the 95% confidence level

u_c is obtained by combining the individual element standard uncertainty components u_i and $u_c = \sqrt{\sum u_i^2}$

Certification Traveler Report:

All certified values reported were derived from Traveler Report (Spex CertiPrep's traceability documentation) identified by the lot number of this CRM. For further information contact CRM Sales.

Legal Notice:

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010460

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Certificate of Analysis

SOUTHWEST RESEARCH INST
DANNY RAMIREZ
6220 CULEBRA RD
SAN ANTONIO TX 78238

PO NBR: 130686E

INORGANICS LAB 27/28/29/30/34
DATE RECEIVED: 1/9/2001
DATE EXPIRED: 1/9/2002 DR
DATE OPENED: 1/9/2001
INORG: 2626 PO: 130686E

PRODUCT NUMBER: 236527-500G

LOT NUMBER: 15308EI

PRODUCT NAME: SODIUM HYDROGENCARBONATE, 99.7+%,
A.C.S. REAGENT

FORMULA: NaHCO_3

FORMULA WEIGHT: 84.01

APPEARANCE	WHITE POWDER
TITRATION	100.3 % (WITH HCL)
ICP ASSAY	CONFIRMS SODIUM COMPONENT
INSOLUBLE MATTER	0.001% *
CALCIUM	0.0050%
CHLORIDE	0.0014% *
IRON	< 0.0001% *
HEAVY METALS	<5PPM (AS PB) *
POTASSIUM	<0.0020 % *
MAGNESIUM	0.00025%
AMMONIUM	<5PPM *
PHOSPHATE	<0.001% *
CALCIUM, MAGNESIUM & R2O3 PRECIPITATE	0.016% *

CONTINUED ON NEXT PAGE

ALDRICH CHEMICAL COMPANY
DAVID SWESSEL
JANUARY 5, 2001

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INORGANIC LABS/RADCHEM LABS **010461**
DATE RECEIVED: 02/27/03
DATE EXPIRED: 02/27/2013 VES
DATE OPENED: 04/10/03
INORG: 4033 PO: 330176E

Sodium carbonate, ACS primary standard, 99.95-100.05% (dried basis)

Stock Number: 33377

Lot Number: L06M34

Analysis

Test	Limits	Results
Assay (dried basis)	99.95 – 100.05 %	100.0 %
Insoluble	0.01 % max	< 0.01 %
Loss on heating (285°C)	1.0 % max	< 0.05 %
Chloride	0.001 % max	< 0.001 %
Nitrogen compounds	0.001 % max	< 0.001 %
Phosphate	0.001 % max	< 0.001 %
Silica	0.005 % max	< 0.005 %
Sulfur compounds	0.003 % max	< 0.003 %
NH ₄ OH precipitate	0.01 % max	< 0.01 %
Potassium	0.005 % max	< 0.001 %
Calcium	0.02 % max	< 0.01 %
Magnesium	0.004 % max	< 0.004 %
Heavy metals (as Pb)	0.0005 % max	< 0.0005 %
Iron	0.0005 % max	< 0.0005 %

Traceable to NIST? Yes

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INORGANIC LABS/RADCHEM LABS **010462**
DATE RECEIVED: 02/27/03
DATE EXPIRED: 02/27/2013 VOS
DATE OPENED: 04/10/03
INORG: 4033 PO: 330176E

Sodium carbonate, ACS primary standard, 99.95-100.05% (dried basis)

Stock Number: 33377

Lot Number: L06M34

Analysis

Test	Limits	Results
Assay (dried basis)	99.95 – 100.05 %	100.0 %
Insoluble	0.01 % max	< 0.01 %
Loss on heating (285°C)	1.0 % max	< 0.05 %
Chloride	0.001 % max	< 0.001 %
Nitrogen compounds	0.001 % max	< 0.001 %
Phosphate	0.001 % max	< 0.001 %
Silica	0.005 % max	< 0.005 %
Sulfur compounds	0.003 % max	< 0.003 %
NH ₄ OH precipitate	0.01 % max	< 0.01 %
Potassium	0.005 % max	< 0.001 %
Calcium	0.02 % max	< 0.01 %
Magnesium	0.004 % max	< 0.004 %
Heavy metals (as Pb)	0.0005 % max	< 0.0005 %
Iron	0.0005 % max	< 0.0005 %

Traceable to NIST? Yes

Certified by:

Quality Control:

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**SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT**

010463

CLIENT: Division 20

TASK ORDER: 040415-2

SRR: 25770

SDG: 243222

CASE: CNWRA

VTSR: April 14, 2004

PROJECT#: 06002.01.141

Pipette Calibrations

SwRI - Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

(Space provide for Inorganic Laboratories' Fixed Volume Pipette Verification Spreadsheet)

010464

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	1.0088	1.0069	1.0055	1.01	100.71
TMA1	1000	1.0043	1.0018	1.0023	1.00	100.28
TMA2	1000	1.0064	1.005	1.0048	1.01	100.54
TMA3	1000	OUT	OF	SERVICE		
TMA6	1000	NOT	FOUND			
TMB1	900	0.9014	0.9018	0.9005	0.90	100.14
TMC1	800	0.7999	0.8004	0.8014	0.80	100.07
TMDD1	750	0.7543	0.7532	0.7538	0.75	100.50
TMD1	700	0.6974	0.6946	0.6936	0.70	99.31
TMD2	700	0.7059	0.7054	0.7058	0.71	100.81
TME1	600	0.5979	0.5961	0.5948	0.60	99.38
TMF2	500	0.5	0.4965	0.4969	0.50	99.50 99.56 99.57 01/01/04
TMF5	500	0.5039	0.5035	0.5022	0.50	100.64
ICF1	500	0.4974	0.4971	0.4954	0.50	99.33
L30-500	500	0.5038	0.5015	0.501	0.50	100.42
TMG3	400	0.3941	0.3949	0.3953	0.39	98.69
TMH1	300	OUT	OF	SERVICE		
TMH2	300	0.2974	0.2971	0.2959	0.30	98.93
TMJ1	250	0.2484	0.248	0.2481	0.25	99.27
TMJ2	250	0.2487	0.2484	0.2485	0.25	99.41
TMJ3	250	0.2501	0.2495	0.2491	0.25	99.83
TMK2	200	0.2007	0.2007	0.2006	0.20	100.33
TML1	150	0.1487	0.1488	0.1486	0.15	99.13
TMM1	120	0.1206	0.1206	0.1202	0.12	100.39
TMN3	100	0.1001	0.1	0.1	0.10	100.03
ICN1	100	0.1005	0.1005	0.1009	0.10	100.63
TMQ1	80	0.08	0.0797	0.0799	0.08	99.83
TMR1	70	OUT	OF	SERVICE		
TMS1	60	OUT	OF	SERVICE		
LAB-30A	50	NOT	FOUND			
TMU1	40	0.0398	0.0398	0.0403	0.04	99.92
TMU2	40	0.0397	0.0396	0.0395	0.04	99.00
TMV1	30	0.0297	0.0296	0.0297	0.03	98.89
L30-20	20	0.0203	0.0203	0.0202	0.02	101.33
TMW1	25	0.0253	0.0249	0.025	0.03	100.27
TMY1	15	OUT	OF	SERVICE		

SwRI - Div. 01, Inorganic Labs' Fixed Volume Pipette Verification Log

Balance #: 34Thermometer #: G011diH2O Temperature (°C): 21

Eppendorf #	True Value (μL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)
Lab30	1000	1.0088	1.0069	1.0055
TMA1	1000	1.0043	1.0018	1.0023
TMA2	1000	1.0064	1.005	1.0048
TMA3	1000	Out	OF	Service
TMA6	1000	NOT	FOUND	
TMB1	900	.9014	.9018	.9005
TMC1	800	.7999	.8004	.8014
TMDD1	750	.7543	.7532	.7538
TMD1	700	.6974	.6946	.6936
TMD2	700	.7059	.7054	.7058
TME1	600	.5979	.5961	.5948
TMF2	500	.5000	.4956	.4969
TMF5	500	.5039	.5035	.5022
ICF1	500	.4974	.4971	.4954
L30-500	500	.5038	.5015	.5010
TMG3	400	.3941	.3949	.3953
TMH1	300	Out	OF	Service
TMH2	300	.2974	.2971	.2959
TMJ1	250	.2484	.2480	.2481
TMJ2	250	.2487	.2484	.2485
TMJ3	250	.2501	.2495	.2491
TMK2	200	.2007	.2007	.2006
TML1	150	.1487	.1488	.1486
TMM1	120	.1206	.1206	.1202
TMN3	100	.1001	.1000	.1000
ICN1	100	.1005	.1005	.1009
TMQ1	80	.0800	.0797	.0799
TMR1	70	Out	OF	Service
TMS1	60	Out	OF	Service
LAB-30A	50	NOT	FOUND	
TMU1	40	.0398	.0398	.0403
TMU2	40	.0397	.0394	.0395
TMV1	30	.0297	.0296	.0297
L30-20	20	.0203	.0203	.0202
TMW1	25	.0253	.0249	.0250
TMY1	15	Out	OF	Service

Analyst: John WellsDate: 5-28-04Reviewed by: Valle DejeDate: 07/01/04

Book/page: _____

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010466

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
ADJ200-A	20	0.0203	0.0204	0.0201	0.020	101.33
	100	0.0990	0.0997	0.1001	0.100	99.60
	200	0.1993	0.1991	0.1990	0.199	99.57
ADJ200-C	20	0.0202	0.0202	0.0201	0.020	100.83
	100	0.0991	0.0985	0.0980	0.099	98.53
	200	0.1987	0.1991	0.1991	0.199	99.48
ADJ200-D	20	0.0203	0.0202	0.0202	0.020	101.17
	100	0.0989	0.0996	0.0993	0.099	99.27
	200	0.1989	0.1998	0.1999	0.200	99.77
ADJ200-G	20					
	100					
	200					
ADJ200-H	20					
	100					
	200					
ADJ200-J	20					
	100					
	200					
ADJ200-K	20	0.0204	0.0203	0.0200	0.020	101.17
	100	0.0999	0.0993	0.0998	0.100	99.67
	200	0.2021	0.2001	0.2000	0.201	100.37
ADJ200	20					
	100					
	200					
ADJ200	20					
	100					
	200					

FRM-247a (Rev 4/Apr 04)

Book/page: _____

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log **010467**Balance #: 34Thermometer #: 6011diH2O Temperature (°C) 21

Eppendorf #	True Value (μL)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
20 μL – 200 μL	20	.0203	.0204	.0201
	ADJ200-A	100	.0990	.0997
		200	.1993	.1991
ADJ200-C	20	.0202	.0202	.0201
	ADJ200-C	100	.0991	.0985
		200	.1987	.1991
ADJ200-D	20	.0203	.0202	.0202
	ADJ200-D	100	.0989	.0996
		200	.1989	.1998
ADJ200-G	20			
	ADJ200-G	100		
		200		
ADJ200-H	20			
	ADJ200-H	100		
		200		
ADJ200-J	20			
	ADJ200-J	100		
		200		
ADJ200-K	20	.0204	.0203	.0200
	ADJ200-K	100	.0999	.0993
		200	.2021	.2001
ADJ200	20			
	ADJ200	100		
		200		

Analyst: John WillhReviewed by: ValwagerDate: 6-11-04Date: 06/30/04

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010468*Walter A. Naegeli 06/11/04***SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet**

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
ADJ200-A	20					
	100					
	200					
ADJ200-C	20					
	100					
	200					
ADJ200-D	20					
	100					
	200					
ADJ200-G	20	0.0201	0.0200	0.0198	0.020	99.83
	100	0.0985	0.0982	0.0988	0.099	98.50
	200	0.1973	0.1975	0.1996	0.198	99.07
ADJ200-H	20	0.0203	0.0204	0.0204	0.020	101.83
	100	0.0996	0.0989	0.0994	0.099	99.30
	200	0.1992	0.2006	0.1999	0.200	99.95
ADJ200-J	20	0.0204	0.0203	0.0203	0.020	101.67
	100	0.0991	0.0991	0.0985	0.099	98.90
	200	0.1984	0.1985	0.1982	0.198	99.18
ADJ200	20					
	100					
	200					
ADJ200	20					
	100					
	200					
ADJ200-K	20					
	100					
	200					

FRM-247a (Rev 3/Oct 03)

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log **010469**

Balance #: _____

Thermometer #: _____

diH₂O Temperature (° C) _____

Eppendorf #	True Value (μL)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
20 μL – 200 μL	20			
	ADJ200-A	100		
		200		
		20		
	ADJ200-C	100		
		200		
		20		
	ADJ200-D	100		
		200		
		20		
	ADJ200-G	100		
		200		
	20	0.0201	0.0200	0.0198
	ADJ200-G	0.0985	0.0982	0.0988
		0.1973	0.1975	0.1996
	20	0.0203	0.0204	0.0204
	ADJ200-H	0.0996	0.0989	0.0994
		0.1992	0.2006	0.1999
	20	0.0204	0.0203	0.0203
	ADJ200-J	0.0991	0.0991	0.0985
		0.1984	0.1985	0.1982
	20			
	ADJ200-K	100		
		200		
	20			
	ADJ200	100		
		200		

Analyst: William A. NagelReviewed by: William A. NagelDate: 06/11/04Date: 6/21/04

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010470**SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet**

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100	0.1019	0.1020	0.1018	0.102	101.90
ADJ1000-C	500	0.4963	0.4968	0.4985	0.497	99.44
	1000	0.9940	0.9957	0.9951	0.995	99.49
	100	0.1006	0.1004	0.0994	0.100	100.13
ADJ1000-D	500	0.4959	0.4991	0.4962	0.497	99.41
	1000	0.9956	1.0002	0.9989	0.998	99.82
	100	0.0998	0.0999	0.0999	0.100	99.87
ADJ1000-E	500	0.4965	0.4994	0.4956	0.497	99.43
	1000	0.9968	0.9942	0.9949	0.995	99.53
	100	0.1008	0.1009	0.1013	0.101	101.00
ADJ1000-F	500	0.4958	0.4962	0.4973	0.496	99.29
	1000	0.9947	0.9952	0.9958	0.995	99.52
	100					
ADJ1000-G	500					
	1000					
	100					
ADJ1000-H	500					
	1000					
	100					
ADJ1000-J	500					
	1000					
	100	0.1011	0.1012	0.1015	0.101	101.27
ADJ1000-K	500	0.4977	0.4974	0.4960	0.497	99.41
	1000	1.0009	1.0002	0.9993	1.000	100.01
	100					
ADJ1000	500					
	1000					

FRM-247b (Rev 3/Apr 04)

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

010471

Balance #: 34Thermometer #: G-011diH2O Temperature (°C) 21

Eppendorf #	True Value (μL)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
100 μL – 1000 μL	100	.1019	.1020	.1018
	ADJ1000-C	500	.4963	.4968
		1000	.9940	.9957
ADJ1000-D	100	.1006	.1004	.0994
	500	.4959	.4991	.4962
	1000	.9956	1.0002	.9989
ADJ1000-E	100	.0998	.0999	.0999
	500	.4965	.4994	.4956
	1000	.9968	.9942	.9949
ADJ1000-F	100	.1008	.1009	.1013
	500	.4958	.4962	.4973
	1000	.9947	.9952	.9958
ADJ1000-G	100			
	500			
	1000			
ADJ1000-H	100			
	500			
	1000			
ADJ1000-J	100			
	500			
	1000			
ADJ1000-K	100	.1011	.1012	.1015
	500	.4977	.4974	.4960
	1000	1.0009	1.0002	.9993
ADJ1000	100			
	500			
	1000			

Analyst: John WillsDate: 6-11-04Reviewed by: Valer OjaDate: 06/30/04

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010472*Warden A. Naegeli 06/11/04***SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet**

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100					
ADJ1000-C	500					
	1000					
	100					
ADJ1000-D	500					
	1000					
	100					
ADJ1000-E	500					
	1000					
	100					
ADJ1000-F	500					
	1000					
	100	0.1019	0.1011	0.1020	0.102	101.67
ADJ1000-G	500	0.4943	0.4978	0.5000	0.497	99.47
	1000	1.0098	1.0072	1.0066	1.008	100.79
	100	0.0998	0.1000	0.0992	0.100	99.67
ADJ1000-H	500	0.4918	0.4936	0.4959	0.494	98.75
	1000	0.9820	0.9863	0.9876	0.985	98.53
	100	0.0991	0.1001	0.1003	0.100	99.83
ADJ1000-J	500	0.4967	0.4955	0.4965	0.496	99.25
	1000	0.9927	0.9936	0.9923	0.993	99.29
	100					
ADJ1000	500					
	1000					
	100					
ADJ1000-K	500					
	1000					

FRM-247b (Rev 2/Oct 03)

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log 010473

Balance #: _____

Thermometer #: _____

diH2O Temperature (° C) _____

Eppendorf #	True Value (μL)	1 st Reading (g)	2 nd Reading (g)	3 rd 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	0.1019	0.1011	0.1020
ADJ1000-G	500	0.4943	0.4978	0.5000
	1000	1.0098	1.0072	1.0066
	100	0.0998	0.1000	0.0992
ADJ1000-H	500	0.4918	0.4936	0.4959
	1000	0.9820	0.9863	0.9876
	100	0.0991	0.1001	0.1003
ADJ1000-J	500	0.4967	0.4955	0.4965
	1000	0.9927	0.9936	0.9923
	100			
ADJ1000-K	500			
	1000			
	100			
ADJ1000	500			
	1000			

Analyst: W. Brown A. NagelsDate: 06/11/04Reviewed by: W. Brown A. NagelsDate: 6/21/04

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010474**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	0.4941	0.4940	0.4928	0.494	98.73
ADJ5000-C	2500	2.5032	2.5028	2.5024	2.503	100.11
	5000	5.0334	5.0356	5.0234	5.031	100.62
	500					
ADJ5000-G	2500	OUT	OF	SERVICE		
	5000					
	500					
ADJ5000-H	2500	OUT	OF	SERVICE		
	5000					
	500	0.5089	0.5091	0.5088	0.509	101.79
ADJ5000-I	2500	2.5011	2.5089	2.5092	2.506	100.26
	5000	5.0180	5.0258	5.0274	5.024	100.47
	500					
ADJ5000-J	2500					
	5000					
	500					
ADJ5000-K	2500					
	5000					
	500					
ADJ5000-L	2500					
	5000					
	500	0.5022	0.4980	0.5022	0.501	100.16
ADJ5000-M	2500	2.4911	2.4930	2.4936	2.493	99.70
	5000	5.0187	5.0189	4.9959	5.011	100.22
	500	0.5050	0.5037	0.5028	0.504	100.77
ADJ5000-N	2500	2.5066	2.5033	2.5089	2.506	100.25
	5000	5.0232	5.0266	5.0249	5.025	100.50
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					

FRM-247c (Rev 3/Apr 04)

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34Thermometer #: G011diH2O Temperature (° C) 21 **010475**

Eppendorf #	True Value (μL)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
500 μL – 5000 μL	500	.4941	.4940	.4928
	ADJ5000-C	2500	2.5032	2.5028
		5000	5.0334	5.0356
	500			
	ADJ5000-G	2500	OUT	OF
		5000		SERVICE
	500			
	ADJ5000-H	2500	OUT	OF
		5000		SERVICE
	500			
	ADJ5000-I	2500	.5089	.5091
		5000	2.5011	2.5089
	500			
	ADJ5000-J	2500	5.0180	5.0258
		5000		5.0274
	500			
	ADJ5000-K	2500		
		5000		
	500			
	ADJ5000-L	2500		
		5000		
	500			
	ADJ5000-M	2500	.5022	.4980
		5000	2.4911	2.4930
	500			
	ADJ5000-N	2500	5.0187	5.0189
		5000	.5050	.5037
	500			
	ADJ5000	2500	2.5066	2.5033
		5000	5.0232	5.0266
	500			
	ADJ5000	2500		
		5000		
	500			
	ADJ5000	2500		
		5000		

Analyst: John WellsDate: 6-11-04Reviewed by: Nabe AghaDate: 06/30/04

SwRI - Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010476

Warran A. Naegeli Dec 11/04

SwRI - Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (μL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	500					
ADJ5000-C	2500					
	5000					
	500					
ADJ5000-G	2500					
	5000					
	500					
ADJ5000-H	2500					
	5000					
	500					
ADJ5000-I	2500					
	5000					
	500	0.5006	0.5040	0.5058	0.503	100.69
ADJ5000-J	2500	2.4968	2.4974	2.4999	2.498	99.92
	5000	4.9870	4.9977	4.9976	4.994	99.88
	500	0.4948	0.4954	0.4962	0.495	99.09
ADJ5000-K	2500	2.4969	2.4949	2.4960	2.496	99.84
	5000	5.0356	5.0067	5.0094	5.017	100.34
	500	0.5017	0.5005	0.5019	0.501	100.27
ADJ5000-L	2500	2.4897	2.4897	2.4894	2.490	99.58
	5000	4.9800	4.9833	4.9877	4.984	99.67
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000-M	2500					
	5000					

FRM-247c (Rev 2/Mar 03)

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: _____

Thermometer #: _____

diH2O Temperature (°C) 010477

Eppendorf #	True Value (µL)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
500 µL – 5000 µL	500			
	ADJ5000-C	2500		
		5000		
		500		
	ADJ5000-G	2500		
		5000		
		500		
	ADJ5000-H	2500		
		5000		
		500		
	ADJ5000-I	2500		
		5000		
		500	0.5006	0.5040
	ADJ5000-J	2500	2.4968	2.4974
		5000	4.9870	4.9977
		500	0.4948	0.4954
	ADJ5000-K	2500	2.4969	2.4949
		5000	5.0356	5.0067
		500	0.5017	0.5005
	ADJ5000-L	2500	2.4897	2.4897
		5000	4.9800	4.9833
		500		
	ADJ5000-M	2500		
		5000		
		500		
	ADJ5000-N	2500		
		5000		
		500		
	ADJ5000	2500		
		5000		
		500		
	ADJ5000	2500		
		5000		

Analyst: W. D. NagelDate: 06/11/04Reviewed by: KimberlyDate: 6/21/04

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34Thermometer #: 6011diH2O Temperature (° C) 22.010478

Eppendorf #	True Value (μL)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
	500			
	ADJ5000-C	2500		
		5000		
	500			
	ADJ5000-G	2500		
		5000		
	500			
	ADJ5000-H	2500		
		5000		
	500			
	ADJ5000-I	2500		
		5000		
	500	0.5040	0.5017	0.4999
	ADJ5000-J	2500	2.5059	2.5053
		5000	5.0069	4.9985
	500	0.4990	0.4999	0.5011
	ADJ5000-K	2500	2.4981	2.4901
		5000	5.0065	4.9916
	500	0.4998	0.5036	0.5041
	ADJ5000-L	2500	2.4959	2.4927
		5000	5.0257	4.9999
	500			
	ADJ5000-M	2500		
		5000		
	500			
	ADJ5000-N	2500		
		5000		
	500			
	ADJ5000	2500		
		5000		
	500			
	ADJ5000	2500		
		5000		

Analyst: Walter G. NaegeliDate: 04/24/04Reviewed by: Walter G. NaegeliDate: 06/30/04

010478-A

Book/page: 06 128

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34

Thermometer #: 6011

diH2O Temperature (° C) 22.0

Eppendorf #	True Value (μL)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
500 μL – 5000 μL	500			
	ADJ5000-C	2500		
		5000		
	500			
	ADJ5000-G	2500		
		5000		
	500			
	ADJ5000-H	2500		
		5000		
	500			
	ADJ5000-I	2500		
		5000		
	500	0.5040	0.5017	0.4999
	ADJ5000-J	2500	2.5059	2.5013
		5000	5.0069	5.0031
	500	0.4990	0.4999	0.5011
	ADJ5000-K	2500	2.4981	2.4955
		5000	5.0065	5.0041
	500	0.4998	0.5036	0.5041
	ADJ5000-L	2500	2.4959	2.4929
		5000	5.0257	4.9930
	500			
	ADJ5000-M	2500		
		5000		
	500			
	ADJ5000-N	2500		
		5000		
	500			
	ADJ5000	2500		
		5000		
	500			
	ADJ5000	2500		
		5000		

Analyst: Wagner G. NaegeliDate: 04/24/04Reviewed by: Wagner G. NaegeliDate: 06/30/04

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010479*Wooden A. Nagel 04/30/04*

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	500					
ADJ5000-C	2500					
	5000					
	500					
ADJ5000-G	2500					
	5000					
	500					
ADJ5000-H	2500					
	5000					
	500					
ADJ5000-I	2500					
	5000					
	500	0.5040	0.5017	0.4999	0.502	100.37
ADJ5000-J	2500	2.5059	2.5013	2.5053	2.504	100.17
	5000	5.0069	5.0031	4.9985	5.003	100.06
	500	0.4990	0.4999	0.5011	0.500	100.00
ADJ5000-K	2500	2.4981	2.4955	2.4901	2.495	99.78
	5000	5.0065	5.0041	4.9916	5.001	100.01
	500	0.4998	0.5036	0.5041	0.503	100.50
ADJ5000-L	2500	2.4959	2.4929	2.4927	2.494	99.75
	5000	5.0257	4.9930	4.9999	5.006	100.12
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000-M	2500					
	5000					

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SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010480

Wanda A. Nagel: 04/30/04

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
ADJ5000-C	500					
	2500					
	5000					
ADJ5000-G	500					
	2500					
	5000					
ADJ5000-H	500					
	2500					
	5000					
ADJ5000-I	500					
	2500					
	5000					
ADJ5000-J	500	0.5040	0.5017	0.4999	0.502	100.37
	2500	2.5059	2.5013	2.5053	2.504	100.17
	5000	5.0069	5.0031	4.9985	5.003	100.06
ADJ5000-K	500	0.4990	0.4999	0.5011	0.500	100.00
	2500	2.4981	2.4955	2.4901	2.495	99.78
	5000	5.0065	5.0041	4.9916	5.001	100.01
ADJ5000-L	500	0.4998	0.5036	0.5041	0.503	100.50
	2500	2.4959	2.4929	2.4927	2.494	99.75
	5000	5.0257	4.9930	4.9999	5.006	100.12
ADJ5000	500					
	2500					
	5000					
ADJ5000	500					
	2500					
	5000					
ADJ5000	500					
	2500					
	5000					
ADJ5000-M	500					
	2500					
	5000					

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010481

Book/page: 06 068

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34

Thermometer #: 6011

diH2O Temperature (°C) 22.0

Eppendorf #	True Value (μL)	1 st Reading (g)	2 nd Reading (g)	3 rd 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	0.0998	0.1012	0.1011
	ADJ1000-G	500	0.4924	0.4954
		1000	0.9869	0.9902
	100	0.0999	0.1009	0.1005
	ADJ1000-H	500	0.4921	0.4921
		1000	0.9870	0.9924
	100	0.0981	0.0982	0.0983
	ADJ1000-J	500	0.4945	0.4942
		1000	0.9881	0.9925
	100			
	ADJ1000-K	500		
		1000		
	100			
	ADJ1000	500		
		1000		

Analyst: Warren G. Naegeli

Date: 04/24/04

Reviewed by: [Signature]

Date: 06/30/04

Book/page: 06 067

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010482

Warren A. Naegeli 04/30/04

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	100					
ADJ1000-C	500					
	1000					
	100					
ADJ1000-D	500					
	1000					
	100					
ADJ1000-E	500					
	1000					
	100					
ADJ1000-F	500					
	1000					
	100	0.0998	0.1012	0.1011	0.101	100.70
ADJ1000-G	500	0.4924	0.4954	0.4954	0.494	98.88
	1000	0.9869	0.9902	0.9936	0.990	99.02
	100	0.0999	0.1009	0.1005	0.100	100.43
ADJ1000-H	500	0.4921	0.4921	0.4937	0.493	98.53
	1000	0.9870	0.9924	0.9937	0.991	99.10
	100	0.0981	0.0982	0.0983	0.098	98.20
ADJ1000-J	500	0.4945	0.4942	0.4943	0.494	98.87
	1000	0.9881	0.9925	0.9932	0.991	99.13
	100					
ADJ1000	500					
	1000					
	100					
ADJ1000-K	500					
	1000					

FRM-247b (Rev 2/Oct 03)

010483

Book/page: 06 010

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34

Thermometer #: 3011

diH2O Temperature (° C) 22.0

Eppendorf #		True Value (μL)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
20 μL – 200 μL		20			
	ADJ200-A	100			
		200			
		20			
	ADJ200-C	100			
		200			
		20			
	ADJ200-D	100			
		200			
		20	0.0198	0.0204	0.0202
	ADJ200-G	100	0.0996	0.0998	0.0996
		200	0.1984	0.1993	0.1990
		20	0.0202	0.0202	0.0202
	ADJ200-H	100	0.0994	0.1001	0.0997
		200	0.1990	0.1990	0.1999
		20	0.0202	0.0204	0.0200
	ADJ200-J	100	0.1002	0.1003	0.1002
		200	0.2008	0.2005	0.2006
		20			
	ADJ200-K	100			
		200			
		20			
	ADJ200	100			
		200			

Analyst: Wanda A. NaegelReviewed by: [Signature]Date: 04/24/04Date: 4/29/04

Book/page: 06 009

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

Wasoran A. Nagelli 04/30/04

010484

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	0.0198	0.0204	0.0202	0.020	100.67
ADJ200-G	100	0.0996	0.0998	0.0996	0.100	99.67
	200	0.1984	0.1993	0.1990	0.199	99.45
	20	0.0202	0.0202	0.0202	0.020	101.00
ADJ200-H	100	0.0994	0.1001	0.0997	0.100	99.73
	200	0.1990	0.1990	0.1999	0.199	99.65
	20	0.0202	0.0204	0.0200	0.020	101.00
ADJ200-J	100	0.1002	0.1003	0.1002	0.100	100.23
	200	0.2008	0.2005	0.2006	0.201	100.32
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					
	20					
ADJ200-K	100					
	200					

FRM-247a (Rev 3/Oct 03)

✓ R. Spier
4/29/04

FRM-244 (Rev 2/Sept 02)

010485

Book/page: 06 0066

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34Thermometer #: 6011diH2O Temperature (°C) 22

20 μ L – 200 μ L	Eppendorf #	True Value (μ L)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
		20			
	ADJ200-A	100			
		200			
		20			
	ADJ200-C	100			
		200			
		20			
	ADJ200-D	100			
		200			
		20	0.0201	0.0203	0.0200
	ADJ200-G	100	0.0983	0.0985	0.0985
		200	0.1965	0.1983	0.1972
		20	0.0203	0.0201	0.0199
	ADJ200-H	100	0.0998	0.0985	0.0991
		200	0.2003	0.1998	0.1990
		20	0.0197	0.0199	0.0197
	ADJ200-J	100	0.0987	0.0988	0.0993
		200	0.1998	0.1995	0.1986
		20			
	ADJ200-K	100			
		200			
		20			
	ADJ200	100			
		200			

Analyst: Wanda A. NaegeleDate: 04/19/04Reviewed by: Wanda A. NaegeleDate: 06/30/04

Book/page: 06 006 a

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

010486

Warren A. Naegeli 04/30/04

SwRI – Div. 01, Inorganic Laboratory Adjustable Pipette Verification Spreadsheet

Eppendorf #	True Value (µL)	1st Reading (g)	2nd Reading (g)	3rd Reading (g)	Avg Wt (g)	% of True Value
	20					
ADJ200-A	100					
	200					
	20					
ADJ200-C	100					
	200					
	20					
ADJ200-D	100					
	200					
	20	0.0201	0.0203	0.0200	0.020	100.67
ADJ200-G	100	0.0983	0.0985	0.0985	0.098	98.43
	200	0.1965	0.1983	0.1972	0.197	98.67
	20	0.0203	0.0201	0.0199	0.020	100.50
ADJ200-H	100	0.0998	0.0985	0.0991	0.099	99.13
	200	0.2003	0.1998	0.1990	0.200	99.85
	20	0.0197	0.0199	0.0197	0.020	98.83
ADJ200-J	100	0.0987	0.0988	0.0993	0.099	98.93
	200	0.1998	0.1995	0.1986	0.199	99.65
	20					
ADJ200	100					
	200					
	20					
ADJ200	100					
	200					
	20					
ADJ200-K	100					
	200					

FRM-247a (Rev 3/Oct 03)

010487

Book/page: 06 124

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34

Thermometer #: 6011

diH2O Temperature (° C) 22

Eppendorf #	True Value (μL)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
500 μL – 5000 μL	500			
	ADJ5000-C	2500		
		5000		
	500			
	ADJ5000-G	2500		
		5000		
	500			
	ADJ5000-H	2500		
		5000		
	500			
	ADJ5000-I	2500		
		5000		
	500	0.5053	0.5072	0.5012
	ADJ5000-J	2500	2.4954	2.4898
		5000	4.9987	5.0102
	500	0.4962	0.4987	0.4979
	ADJ5000-K	2500	2.5003	2.5018
		5000	4.9878	4.9927
	500	0.5011	0.5028	0.5002
	ADJ5000-L	2500	2.4983	2.4998
		5000	5.0234	5.0217
	500			
	ADJ5000-M	2500		
		5000		
	500			
	ADJ5000-N	2500		
		5000		
	500			
	ADJ5000	2500		
		5000		
	500			
	ADJ5000	2500		
		5000		

Analyst: Warren A. Naegel

Date: 04/19/04

Reviewed by: [Signature]

Date: 06/30/04

010488

Book/page: 06 124

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34

Thermometer #: 6011

diH2O Temperature (°C) 22

Eppendorf #	True Value (µL)	1 st Reading (g)	2 nd Reading (g)	3 rd Reading (g)
	500			
	2500			
	5000			
ADJ5000-C	500			
	2500			
	5000			
ADJ5000-G	500			
	2500			
	5000			
ADJ5000-H	500			
	2500			
	5000			
ADJ5000-I	500			
	2500			
	5000			
ADJ5000-J	500	0.5053	0.5072	0.5012
	2500	2.4954	2.4898	2.4913
	5000	4.9987	5.0102	5.0035
ADJ5000-K	500	0.4962	0.4987	0.4979
	2500	2.5003	2.5018	2.4978
	5000	4.9878	4.9927	4.9951
ADJ5000-L	500	0.5011	0.5028	0.5002
	2500	2.4983	2.4998	2.5017
	5000	5.0234	5.0217	5.0138
ADJ5000-M	500			
	2500			
	5000			
ADJ5000-N	500			
	2500			
	5000			
ADJ5000	500			
	2500			
	5000			
ADJ5000	500			
	2500			
	5000			

Analyst: Warren A. Naegeli

Date: 04/19/04

Reviewed by: [Signature]

Date: 06/30/04

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

Warren A. Naegeli 04/30/04

010489

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
ADJ5000-C	500					
	2500					
	5000					
ADJ5000-G	500					
	2500					
	5000					
ADJ5000-H	500					
	2500					
	5000					
ADJ5000-I	500					
	2500					
	5000					
ADJ5000-J	500	0.5053	0.5072	0.5012	0.505	100.91
	2500	2.4954	2.4898	2.4913	2.492	99.69
	5000	4.9987	5.0102	5.0035	5.004	100.08
ADJ5000-K	500	0.4962	0.4987	0.4979	0.498	99.52
	2500	2.5003	2.5018	2.4978	2.500	100.00
	5000	4.9878	4.9927	4.9951	4.992	99.84
ADJ5000-L	500	0.5011	0.5028	0.5002	0.501	100.27
	2500	2.4983	2.4998	2.5017	2.500	100.00
	5000	5.0234	5.0217	5.0138	5.020	100.39
ADJ5000	500					
	2500					
	5000					
ADJ5000	500					
	2500					
	5000					
ADJ5000	500					
	2500					
	5000					
ADJ5000-M	500					
	2500					
	5000					

FRM-247c (Rev 2/Mar 03)

FRM-244 (Rev 2/Sept 02)

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

Warren A. Naegeli 04/30/04

010490

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					
ADJ5000-C	2500					
	5000					
	500					
ADJ5000-G	2500					
	5000					
	500					
ADJ5000-H	2500					
	5000					
	500					
ADJ5000-I	2500					
	5000					
	500	0.5053	0.5072	0.5012	0.505	100.91
ADJ5000-J	2500	2.4954	2.4898	2.4913	2.492	99.69
	5000	4.9987	5.0102	5.0035	5.004	100.08
	500	0.4962	0.4987	0.4979	0.498	99.52
ADJ5000-K	2500	2.5003	2.5018	2.4978	2.500	100.00
	5000	4.9878	4.9927	4.9951	4.992	99.84
	500	0.5011	0.5028	0.5002	0.501	100.27
ADJ5000-L	2500	2.4983	2.4998	2.5017	2.500	100.00
	5000	5.0234	5.0217	5.0138	5.020	100.39
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000	2500					
	5000					
	500					
ADJ5000-M	2500					
	5000					

FRM-247c (Rev 2/Mar 03)

010491

Book/page: 06 064

SwRI Div. 01 – Inorganic Laboratory Adjustable Pipette Verification Log

Balance #: 34

Thermometer #: 6011

diH2O Temperature (°C) 22

Eppendorf #	True Value (μL)	1 st Reading (g)	2 nd Reading (g)	3 rd 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	0.1007	0.1003	0.1006
	ADJ1000-G	500	0.4923	0.4967
		1000	0.9998	1.0002
		100	0.0997	0.0992
	ADJ1000-H	500	0.5023	0.5037
		1000	1.0010	0.9982
		100	0.1008	0.0983
	ADJ1000-J	500	0.4953	0.4937
		1000	0.9852	0.9876
		100		
	ADJ1000-K	500		
		1000		
		100		
	ADJ1000	500		
		1000		

Analyst: Warren A. Nageli

Date: 04/19/04

Reviewed by: [Signature]

Date: 06/30/04

SwRI – Div. 01, Inorganic Labs' Adjustable Volume Pipette Verification Log

(Space provided for Inorganic Laboratories' Adjustable Volume Pipette Verification Spreadsheet)

Wade A. Naegeli 04/30/04

010492

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					
ADJ1000-C	500					
	1000					
	100					
ADJ1000-D	500					
	1000					
	100					
ADJ1000-E	500					
	1000					
	100					
ADJ1000-F	500					
	1000					
	100	0.1007	0.1003	0.1006	0.101	100.53
ADJ1000-G	500	0.4923	0.4967	0.4971	0.495	99.07
	1000	0.9998	1.0002	0.9985	1.000	99.95
	100	0.0997	0.0992	0.0987	0.099	99.20
ADJ1000-H	500	0.5023	0.5037	0.5012	0.502	100.48
	1000	1.0010	0.9982	0.9975	0.999	99.89
	100	0.1008	0.0983	0.0995	0.100	99.53
ADJ1000-J	500	0.4953	0.4937	0.4963	0.495	99.02
	1000	0.9852	0.9876	0.9864	0.986	98.64
	100					
ADJ1000	500					
	1000					
	100					
ADJ1000-K	500					
	1000					

FRM-247b (Rev 2/Oct 03)

010493

**SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT**

CLIENT: Division 20

TASK ORDER: 040415-2

SRR: 25770

SDG: 243222

CASE: CNWRA

VTSR: April 14, 2004

PROJECT#: 06002.01.141

Balance Calibrations

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	
6-3-04	2.0000	2.0000	KE	SN: 99-JS0526-15
6-4-04	2.0000	2.0000	KE	"
6-7-04	2.0000	2.0001	KE	"
6-8-04	2.0000	2.0000	KE	"
6-9-04	2.0000	2.0000	KE	"
6-10-04	2.0000	2.0001	KE	"
6-11-04	2.0000	2.0001	KE	"
6-14-04	2.0000	1.9999	KE	"
6-15-04	2.0000	3.0000	KE	"
6-16-04	2.0000	2.0000	KE	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.

If balance is still out of limits, place a "DO NOT USE" sign on it and call (DQA) for service.

Southwest Research Institute
Division 01
BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
19	27	0068597	±0.05	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
6-2-04	10.00	10.00	Jew	SN: 99-J50624-S
6-3-04	10.00	10.00	KE	"
6-4-04	10.00	10.00	KE	"
6-7-04	10.00	10.00	KE	"
6-8-04	10.00	10.00	KE	"
6-9-04	10.00	10.00	KE	"
6-10-04	10.00	10.00	KE	"
6-11-04	10.00	10.01	KE	"
6-14-04	10.00	10.00	Jew	"
6-15-04	10.00	10.01	Jew	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.
If balance is still out of limits, place a "DO NOT USE" sign on it and call (x5896) for service.

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010495

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	SN: 99-J50526-15
6-10-04	2.0000	2.0000	KE	N
6-11-04	2.0000	2.0000	KE	N
6-14-04	2.0000	1.9999	Jew	- "
6-15-04	2.0000	2.0001	Jew	"
6-16-04	2.0000	2.0000	KE	N
6-17-04	2.0000	2.0000	KE	N
6-18-04	2.0000	2.0000	KE	N
6-21-04	2.0000	2.0000	KE	N
6-22-04	2.0000	2.0000	KE	N
6-23-04	2.0000	2.0000	KE	N

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.

010497

Southwest Research Institute
Division 01
BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
34	28	1116031935	± 0.0005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
4-9-04	2.0000	2.0000	JW	SW: JS0526-15
4-12-04	2.0000	2.0000	KE	"
4-13-04	2.0000	2.0000	KE	"
4-14-04	2.0000	2.0000	KE	"
4-15-04	2.0000	2.0000	KE	"
4-16-04	2.0000	1.9999	KE	"
4-19-04	2.0000	2.0000	KE	"
4-20-04	2.0000	2.0000	KE	"
4-21-04	2.0000	2.0000	KE	"
4-22-04	2.0000	2.0000	KE	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.

If balance is still out of limits, place a "DO NOT USE" sign on it and call (x5896) for service.

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FRM-112 (Rev 1/Dec 99)

Southwest Research Institute
Division 01
BALANCE VERIFICATION LOG

BALANCE #	LAB #:	SERIAL #:	TOLERANCE:	COMMENTS:
34	28	1116031935	± 0.0005	
Date	Std Wt (g)	Recorded Wt (g)	Operator	
4-9-04	2.0000	2.0000	KE	SV: J50526-15
4-12-04	2.0000	2.0000	KE	"
4-13-04	2.0000	2.0000	KE	"
4-14-04	2.0000	2.0000	KE	"
4-15-04	2.0000	2.0000	KE	"
4-16-04	2.0000	1.9999	KE	"
4-19-04	2.0000	2.0000	KE	"
4-20-04	2.0000	2.0000	KE	"
4-21-04	2.0000	2.0000	KE	"
4-22-04	2.0000	2.0000	KE	"

If balance is out of limits, clean the balance and re-calibrate using Class "S" weights.

If balance is still out of limits, place a "DO NOT USE" sign on it and call (x5896) for service.

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010498

**SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT**

CLIENT: Division 20

TASK ORDER: 040415-2

010499

SRR: 25770

SDG: 243222

CASE: CNWRA

VTSR: April 14, 2004

PROJECT#: 06002.01.141

DI Water Verification

D.I. WATER SYSTEM NOTEBOOK

SOUTHWEST RESEARCH INSTITUTE

BUILDING 70

Contact U.S. Filter (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

040006

HIGH PURITY SYSTEM (HP)

010500

DATE / TIME	INITIALS	RESISTIVITY MONITOR		QC LIGHTS		USAGE (GALS)	COMMENTS
		(M OHMS)	QC LT.	QC 1	QC 2		
5/24/04 6:00pm	DR	18.04	✓	✓	✓	1903.8	ALL OK ✓
5/25/04 6:49pm	DR	18.04	✓	✓	✓	1946.3	✓
5/26/04 6:41pm	DR	18.04	✓	✓	✓	1974.6	✓
5/27/04 8:56pm	DR	18.04	✓	✓	✓	1992.2	✓
6/1/04 6:49pm	DR	18.04	✓	✓	✓	2012.0	✓
6/2/04 6:16pm	DR	18.04	✓	✓	✓	2029.5	✓
6/3/04 6:20pm	DR	18.04	✓	✓	✓	2044.4	✓
6/4/04 5:43pm	DR	18.04	✓	✓	✓	2054.7	✓
6/7/04 5:53pm	DR	18.05	✓	✓	✓	2072.0	✓
6/8/04 7:34pm	DR	18.05	✓	✓	✓	2086.5	✓
6/9/04 7:10pm	DR	18.04	✓	✓	✓	2123.7	✓
6/10/04 7:30pm	DR	18.05	✓	✓	✓	2136.8	✓
6/10/04 6:16pm	DR	18.04	✓	✓	✓	2145.4	✓
6/14/04 6:20pm	DR	18.05	✓	✓	✓	2156.2	✓
6/15/04 5:18pm	DR	18.04	✓	✓	✓	2170.2	✓
6/16/04 7pm	DR	18.05	✓	✓	✓	2187.0	✓

Legend: Check = Green (OK); X = Red (call for service)

LOW PURITY SYSTEM (LP)

DATE / TIME	INITIALS	QC LIGHTS		USAGE (GALS)	COMMENTS
		QC 1	QC 2		
5/24/04 6:00pm	DR	✓ (14.5)	✓	910.2	ALL OK ✓
5/25/04 6:49pm	DR	✓ (15.0)	✓	911.6	✓
5/26/04 6:41pm	DR	✓ (15.0)	✓	912.1	✓
5/27/04 8:56pm	DR	✓ (15.0)	✓	912.3	✓
6/1/04 6:49pm	DR	✓ (15.0)	✓	912.9	✓
6/2/04 6:16pm	DR	✓ (16.0)	✓	913.7	✓
6/3/04 6:20pm	DR	✓ (16.5)	✓	913.9	✓
6/4/04 5:43pm	DR	✓ (16.5)	✓	914.0	✓
6/7/04 5:53pm	DR	✓ (18.0)	✓	914.0	✓
6/8/04 7:34pm	DR	X (18.0)	✓	914.5	need to call USE Filter / P.O.
6/9/04 7:10pm	DR	X	(17.5) ✓	915.0	need P.O.
6/10/04 7:30pm	DR	X	(17.5) ✓	915.1	P.O. Requested. US Filter called
6/10/04 6:16pm	DR	X	(17.5) ✓	917.3	need P.O.
6/14/04 6:20pm	DR	✓	(14.0) ✓	920.5	thank Filter exchange. ALL OK.
6/15/04 5:18pm	DR	✓	(15.0) ✓	921.7	✓
6/16/04 7pm	DR	✓	(15.5) ✓	923.2	✓

Legend: Check = Green (OK); X = Red (call for service)

D.I. WATER SYSTEM NOTEBOOK

SOUTHWEST RESEARCH INSTITUTE

BUILDING 70

040004

Contact U.S. Filter (1-800-466-7873) for repairs/exchanges. (Make sure to have a P.O.)

HIGH PURITY SYSTEM (HP)

010501

DATE / TIME	INITIALS	RESISTIVITY MONITOR		QC LIGHTS		USAGE (GALS)	COMMENTS
		(M OHMS)	QC LT.	QC 1	QC 2		
4/9/04 1:44pm	DR	18.08	✓	✓	✓	1248.2	—
4/12/04 6:33pm	DR	18.04	✓	✓	—	1258.9	—
4/13/04 10:02am	DR	18.03	✓	✓	✓	1262.7	—
4/14/04 4:50pm	DR	18.04	✓	✓	✓	1279.9	—
4/15/04 12:52pm	DR	18.03	✓	✓	✓	1289.7	—
4/16/04 9:22pm	DR	18.05	✓	✓	✓	1335.1	—
4/19/04 4:20pm	DR	18.04	✓	✓	✓	1361.5	—
4/20/04 4:43pm	DR	18.06	✓	✓	✓	1381.8	—
4/21/04 5:45pm	DR	18.04	✓	✓	✓	1406.2	—
4/22/04 6:15pm	DR	18.03	✓	✓	✓	1435.6	—
4/23/04 5:25pm	DR	18.03	✓	✓	✓	1460.7	—
4/25/04 5:25pm	RSS	18.04	✓	✓	✓	1461.6	—
4/26/04 6:03pm	DR	18.04	✓	✓	✓	1482.8	—
4/27/04 6:24pm	DR	18.04	✓	✓	✓	1490.9	—
4/28/04 4:06pm	DR	18.04	✓	✓	✓	1495.7	—
4/29/04 5:41pm	DR	18.04	✓	✓	✓	1519.4	—

Legend: Check = Green (OK); X = Red (call for service)

LOW PURITY SYSTEM (LP)

DATE / TIME	INITIALS	QC LIGHTS		USAGE (GALS)	COMMENTS
		QC 1	QC 2		
4/9/04 1:45pm	DR	✓	✓	851.6	—
4/12/04 6:34pm	DR	X	✓	853.1	check in am still red, call service
4/13/04 10:04am	DR	X	✓	857.2	need PO for service call
4/14/04 4:51pm	DR	X	✓	871.4	US Filter called (received PO)
4/15/04 12:50pm	DR	✓	✓	875.5	TANK, Carbon Filter exchanged. REC OK.
4/16/04 9:26pm	DR	✓	✓	877.6	—
4/19/04 4:01pm	DR	✓	✓	879.5	—
4/20/04 4:44pm	DR	✓	✓	883.0	—
4/21/04 9:46pm	DR	✓	✓	885.1	—
4/22/04 8:16pm	DR	✓	✓	888.0	—
4/23/04 5:26pm	DR	✓	✓	888.4	—
4/23/04 5:23pm	RSS	✓	✓	886.9	—
4/26/04 6:24pm	DR	✓	✓	887.4	—
4/27/04 6:24pm	DR	✓	✓	888.5	—
4/28/04 4:00pm	DR	✓	✓	887.0	891.5
4/29/04 5:41pm	DR	✓	✓	893.7	—

Legend: Check = Green (OK); X = Red (call for service)

12 Amis
4/16/04

010502

**SOUTHWEST RESEARCH INSTITUTE
NUCLEAR PROJECT**

CLIENT: Division 20

TASK ORDER: 040415-2

SRR: 25770

SDG: 243222

CASE: CNWRA

VTSR: April 14, 2004

PROJECT#: 06002.01.141

**SURVEILLANCE REPORTS
From Division 30**



Institute Quality Assurance Surveillance Report

Project Number: 20-06002

Report Number: 2004-SR-0238

Page 1 of 1

Surveillance Scope: Monitor the tests for Trace Metal Analysis by ICP and IC in Division 01. The client is NRC High Level Waste Program. This is a QA Nuclear surveillance.

Reference Documents: Task Order 040415-2, TAP 01-0406-038 Inductively Coupled Plasma/Atomic Emission Spectrometric Method for Trace Elemental Analysis, TAP 01-0406-042, IC for the Measurement of Inorganic Ions, and QPP Rev. 4.

Starting Date: 2004-04-14

Ending Date: 2004-09-10

Institute QA Representative: Charles S. Butcher

Person(s) Conducting Test/Exam/Procedure: K. Edrisi, R. Spies, D. Harris

Satisfactory Findings: Division 20 provided a work request to Division 01 for work performed. The work order was logged in by Receiving and labeled with PO number, QA Nuclear requirements, project number, tests required, and test revisions. Samples were labeled with PO number, QA label, ID number, and work order number. Analyst's training records were on file as required. Work orders, methods, and PQP were available and latest revisions were used. The instruments were calibrated with NIST traceable standards and the samples run. Data run was recorded, signed and reviewed by project personnel prior to transmittal to the client.

Unsatisfactory Findings: N/A

Nonconformance Report Number: N/A

CAR/SCAR Number: N/A

Attachments: None

Recommendations/Actions: N/A

Equipment Calibration: Equipment was calibrated before running samples. All standards were NIST traceable.

Approved: "/s/ R. Weber"
Institute Quality Assurance

Date: 9/14/04

Distribution: Original – IQS Records
c: C. S. Butcher (30)
PM – B. Werling (20)
J. Boyd (01)