PARAGON ANALYTICS
225 Commerce Drive ◆ Fort Collins, CO 80524 ◆ (800) 443-1511 ◆ (970) 490-1511 ◆ FAX (970) 490-1522

June 30, 2006

Mr. James Hix
Cordilleran Compliance Services, Inc.
5550 Marshall Street
Arvada CO 80002

Re: Paragon Workorder: 06-05-177
Client Project Name: Battlement Mesa
Client Project Number: E04243

Dear Mr. Hix:

Two water samples were received from Cordilleran Compliance Services, Inc. on May 24, 2006. The samples were scheduled for Tritium (pages 1-78) and Gamma Spectroscopy (pages 1-183) analysis.

The results for this analysis are contained in the enclosed reports.

Thank you for your confidence in Paragon Analytics. Should you have any questions, please call.

Sincerely,

Paragon Analytics
Lance Steere
Project Manager

LRS/mh
Enclosure: Report

Paragon Analytics

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 0605177
Client Name: Cordilleran Compliance Services, Inc.
Client Project Name: Battlement Mesa
Client Project Number: E04243
Client PO Number:

Client Sample	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
BM3613 PW	0605177-1		WATER	17-May-06	8:58
BM2642	0605177-2		WATER	20-May-06	12:15

Paragon Analytics
A Division of DataChem Laboratories, Inc.

225 Commerce Drive Fort Collins, CO 80524
800-443-1511 or (970) 490-1511 (970) 490-1522 Fax

Accession Number (LAB ID) 0605177 ~~0506177~~ per 5/24/06

Chain-of-Custody Date _____ Page ___ of ___ **Originator:** Retain pink copy

Project Name / No.: PRESCO/E04243 Sampler(s): _____ Turnaround (circle one): Standard or Rush (Due _____) Dispose: Date _____ or Return to Client

Report To: James Hix
Phone: 303.237.2072
Fax: 303.237.2659
E-mail: jameshix@cordcomp.com
Company: Cordilleran Compliance Services
Address: 5550 Marshall street
Arvada, CO 80002

Circle method (right); provide additional information as needed (comments).

Sample ID	Date	Time *	Lab ID	Matrix	Preservative (indicate type)	No. of Containers	VOCs SW8260B E624 E524.2	BTEX (only) SW8021B	SVOCs SW8270C E625	OC Pesticides SW8081A E608	PCBs SW8082 E608	Herbicides SW8151A	Explosives SW8330	TCLP Organics SW1311 SW8260B 8270C 8081A 8151A	TCLP Metals SW1311 SW6010B SW7471	Total Metals by ICP SW6010B 7470 7471 E200 ILMO	Dissolved Metals by ICP SW6010B 7470 E200 ILMO	Total Metals by ICP/MS SW6020 E200.8 ILMO	Dissolved Metals by ICP/MS SW6020 E200.8 ILMO	Hexavalent Chromium SW7196A Alkaline Digest? Y / N	Inorganic Anions SW9056 E300.0 (specify in comments)	Solids: Total E160.3 TDS E160.1 TSS E160.2	pH SW9040B SW9045C	TPH GRO DRO SW8015B (both)	Gross Alpha / Beta SW9310 E900.0	Actinides by Paragon SOP Pu / U / Am / Th / Cm / ___	Tritium E906.0	Total Alpha-Emitting Radium SW9315 E903.0	Radium 226 E903.1 SW9320 E904.0	Radium 228 SW9320 E904.0	Strontium 89 D5811-00 Strontium 90 D5811-00	Gamma Isotopes E901.1
BM2642	5/20/06	1215	(2)			2																				✓				✓

5/23/06

* Time Zone: EST CST MST PST Matrix Key: O = oil, S = soil, NS = non-soil solid, W = water, L = liquid, E = extract, F = filter

Comments:

Form 202r5.xls (4/6/04)

Relinquished By: (1)	Relinquished By: (2)
Signature _____	Signature _____
Printed Name Travis Marshall	Printed Name _____
Date 5/23/06 Time 1650	Date _____ Time _____
Company Cordilleran	Company _____

Received By: (1)	Received By: (2)
Signature _____	Signature _____
Printed Name J. Kornoski	Printed Name _____
Date 5/24/06 Time 0925	Date _____ Time _____
Company Paragon	Company _____

Paragon Analytics
A Division of DataChem Laboratories, Inc.

225 Commerce Drive Fort Collins, CO 80524
800-443-1511 or (970) 490-1511 (970) 490-1522 Fax

Accession Number (LAB ID) 0605177

Chain-of-Custody

Date _____ Page ___ of ___

Originator: Retain pink copy

Project Name / No.: _____ Sampler(s): _____ Turnaround (circle one): **Standard** or **Rush** (Due _____) Dispose: **Date** _____ or **Return** to Client

Report To: James Hix
Phone: 303.237.2072
Fax: 303.237.2659
E-mail: jameshix@cordcomp.com
Company: Cordilleran Compliance Services
Address: 5550 Marshall Street
Arvada, CO 80002

Circle method (right); provide additional information as needed (comments).

Sample ID	Date	Time *	Lab ID	Matrix	Preservative (indicate type)	No. of Containers	VOCs SW8260B E624 E524.2	BTEX (only) SW8021B	SVOCs SW8270C E625	OC Pesticides SW8081A E608	PCBs SW8082 E608	Herbicides SW8151A	Explosives SW8330	TCLP Organics SW1311 SW8260B 8270C 8081A 8151A	TCLP Metals SW1311 SW6010B SW7471	Total Metals by ICP SW6010B 7470 7471 E200 ILMO__	Dissolved Metals by ICP SW6010B 7470 E200 ILMO__	Total Metals by ICP/MS SW6020 E200.8 ILMO__	Dissolved Metals by ICP/MS SW6020 E200.8 ILMO__	Hexavalent Chromium SW7196A Alkaline Digest? Y / N	Inorganic Anions SW9056 E300.0 (specify in comments)	Solids: Total E160.3 TDS E160.1 TSS E160.2	pH SW9040B SW9045C	TPH GRO DRO SW8015B (both)	Gross Alpha / Beta SW9310 E900.0	Actinides by Paragon SOP Pu / U / Am / Th / Cm / ___	Tritium E906.0	Total Alpha-Emitting Radium SW9315 E903.0	Radium 226 E903.1 SW9320 E904.0	Strontium 89 D5811-00	Gamma Isotopes E901.1
BM3613 PW	5/17/06	858	(1)	W	HNO_3 Ice	2																					✓				✓

* Time Zone: EST CST MST PST **Matrix Key:** O = oil, S = soil, NS = non-soil solid, W = water, L = liquid, E = extract, F = filter

Comments:

Form 202r5.xls (4/6/04)

Relinquished By: (1)	Relinquished By: (2)
Signature James Hix	Signature
Printed Name James Hix	Printed Name
Date 05/12/06 Time	Date Time
Company Cordilleran Compliance	Company
Received By: (1)	**Received By:** (2)
Signature Sheri Lafferty	Signature
Printed Name Sheri Lafferty	Printed Name
Date 5.18.06 Time 0925	Date Time
Company paragon	Company

CONDITION OF SAMPLE UPON RECEIPT FORM **Paragon Analytics**

Client: Cardi Heran Workorder No: 0605177

Project Manager: _____ Initials: _____ Date: _____

1.	Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2.	Are custody **seals** on **shipping containers** intact?	NONE	(YES)	NO
3.	Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4.	Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5.	Are the **COC and bottle labels complete and legible**?		(YES)	NO
6.	Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		(YES)	NO
7.	Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8.	Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	N/A	YES	(NO) Δ
9.	Are all aqueous **non-preserved samples pH 4-9**?	N/A	(YES)	NO
10.	Is there **sufficient sample** for the requested analyses?		YES	(NO) ★
11.	Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12.	Are all samples within **holding times** for the requested analyses?		(YES)	NO
13.	Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14.	Are all samples requiring no headspace (VOC, GRO, Rx CN/S, radon), headspace free? **Size of bubble:** ____ < green pea ____ > green pea	(N/A)	YES	NO
15.	Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
16.	Were the samples **shipped on ice**?		(YES)	NO
17.	Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: (#2) #4	RAD ONLY	(YES)	NO

Cooler #:	1							
Temperature (°C):	4.4							
No. of custody seals on cooler:	2							
DOT Survey/ Acceptance Information — External µR/hr reading:	14							
Background µR/hr reading:	12							

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

★ possible limited volume for tritium only 125ml received Volume OK/h

Δ 1 liter Poly for RAD ANALYSIS recieved at PH 7 added 4ml HNO3 lot #B19075 @ 1000 5.18.06 final ph 1.6 SL

v. Sl. Sed in ♂ ...include?

If applicable, was the client contacted? YES / (NO) / NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: 5/18/06

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

CONDITION OF SAMPLE UPON RECEIPT FORM **Paragon Analytics**

Client: Cordilleran Workorder No: ~~0605477~~ 0605177

Project Manager: LS Initials: JM Date: 5/24/06

1.	Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2.	Are custody **seals** on **shipping containers** intact?	(NONE)	YES	NO
3.	Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4.	Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5.	Are the **COC and bottle labels complete and legible**?		(YES)	NO
6.	Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	(NO) 2.
7.	Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8.	Are all aqueous **samples requiring preservation preserved correctly?** (excluding volatiles)	N/A	YES	(NO) 1.
9.	Are all aqueous **non-preserved samples pH 4-9**?	N/A	(YES)	NO
10.	Is there **sufficient sample** for the requested analyses?		(YES)	NO
11.	Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12.	Are all samples within **holding times** for the requested analyses?		(YES)	NO
13.	Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14.	Are all samples requiring no headspace (VOC, GRO, Rx CN/S, radon), headspace free? **Size of bubble**: ____ < green pea ____ > green pea	(N/A)	YES	NO
15.	Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
16.	Were the samples **shipped on ice**?		(YES)	NO
17.	Were cooler temperatures measured at 0.1-6.0°C? **IR gun used*:** #2 (#4)	RAD ONLY	(YES)	NO

Cooler #:	1
Temperature (°C):	1.8
No. of custody seals on cooler:	0
DOT Survey/ Acceptance Information — External µR/hr reading:	12
DOT Survey/ Acceptance Information — Background µR/hr reading:	12

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

add on - sample # 2

1. See page 2
2. Bottle sent for tritium labelled as Gamma
Preserved bottle sent for Gamma labelled as tritium.

If applicable, was the client contacted? YES / (NO) / NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: 5/25/06

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

CONDITION OF SAMPLE UPON RECEIPT FORM **Paragon Analytics**

Client: Cardiller an Workorder No: 0605177 ~~0505177~~ JM 5/24/05

Project Manager: LS Initials: JM Date: 5/24/05

Additional Information:

N/A

Was the laboratory directed to proceed with the analysis of any samples yielding the presence of residual chlorine? YES / NO / NA

NOTE:

No pH adjustments shall be made without prior consent of Project Manager. After pH adjustments, hold metals and radchem samples ≥ 16 hrs. before analysis.

Was the pH of any sample adjusted by the laboratory? **YES** (See Table below) / **NO**

pH Excursion:

Paragon Sample ID	Client Sample ID	Initial pH	Final pH	Reagent Used	Volume Added (mL)	Lot No. of Reagent	Requested Analysis	Initials / Date / Time
0605177-2-2	BM2642	7	1.6	HNO_3	3.0	B19075	Gamma	JM 5/24/05 1050

If applicable, was the client contacted? YES / NO / NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: 5/25

FedEx Express US Airbill — FedEx Tracking Number 8573 0923 5636

0200 — 060527 — **Recipient's Copy**

1 From [redacted]

Date 02/17/06

Sender's Name James Hix — Phone 303 237-2072

Company [illegible] Compliance Services

Address 6309 Marshall Street — Dept/Floor/Suite/Room

City Arvada — State CO — ZIP 80002

2 Your Internal Billing Reference E04293

3 To

Recipient's Name [illegible] — Phone 800 443-1511 / 770 490-1511

Company [illegible] Analytics

Recipient's Address 225 [illegible] Drive — Dept/Floor/Suite/Room

We cannot deliver to P.O. boxes or P.O. ZIP codes.

Address

To request a package be held at a specific FedEx location, print FedEx address here.

City Fort Collins — State CO — ZIP [illegible]

4a Express Package Service — *Packages up to 150 lbs.*

- [x] FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx Standard Overnight — Next business afternoon.* Saturday Delivery NOT available.
- [ ] FedEx First Overnight — Earliest next business morning delivery to select locations.* Saturday Delivery available.
- [ ] FedEx 2Day — Second business day.* Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx Express Saver — Third business day.* Saturday Delivery NOT available.

FedEx Envelope rate not available. Minimum charge: One-pound rate. *To most locations.

4.4

4b Express Freight Service — *Packages over 150 lbs.*

- [ ] FedEx 1Day Freight* — Next business day.** Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx 2Day Freight — Second business day.** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx 3Day Freight — Third business day.** Saturday Delivery NOT available.

* Call for Confirmation. ** To most locations.

5 Packaging

- [ ] FedEx Envelope*
- [ ] FedEx Pak* — Includes FedEx Small Pak, FedEx Large Pak, and FedEx Sturdy Pak.
- [ ] FedEx Box
- [ ] FedEx Tube
- [x] Other

* Declared value limit $500.

6 Special Handling — Include FedEx address in Section 3.

- [ ] SATURDAY Delivery — Not available for FedEx Standard Overnight, FedEx First Overnight, FedEx Express Saver, or FedEx 3Day Freight.
- [ ] HOLD Weekday at FedEx Location — Not available for FedEx First Overnight.
- [ ] HOLD Saturday at FedEx Location — Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

Does this shipment contain dangerous goods? One box must be checked.

- [x] No
- [ ] Yes — As per attached Shipper's Declaration.
- [ ] Yes — Shipper's Declaration not required.
- [ ] Dry Ice — Dry Ice, 9, UN 1845 ___ x ___ kg

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging.

- [ ] Cargo Aircraft Only

7 Payment *Bill to:* Enter FedEx Acct. No. or Credit Card No. below.

- [x] Sender — Acct. No. in Section 1 will be billed.
- [ ] Recipient
- [ ] Third Party
- [ ] Credit Card
- [ ] Cash/Check

Obtain Recip. Acct. No.

[redacted]

Total Packages	Total Weight	Total Declared Value†	Total Charges
1	1/2	$ .00	

†Our liability is limited to $100 unless you declare a higher value. See back for details.

Credit Card Auth.

8 NEW Residential Delivery Signature Options — If you require a signature, check Direct or Indirect.

- [ ] No Signature Required — Package may be left without obtaining a signature for delivery.
- [ ] Direct Signature — Anyone at recipient's address may sign for delivery. *Fee applies.*
- [ ] Indirect Signature — If no one is available at recipient's address, anyone at a neighboring address may sign for delivery. *Fee applies.*

520

8573 0923 5636

0605177

~~0506177~~

5/24/06

ORIGIN ID: GJTA (970) 263-7800
CANDY SMITH
CORDILLERAN COMPLIANCE SVCS, INC.
826 21 ROAD

GRAND JUNCTION, CO 81505
UNITED STATES US

Ship Date: 23MAY06
Actual Wgt: 25.0 LB MAN
System#: 144334/CAFE2285
Account: S 235727234

TO (800) 443-1511

PARAGON ANALYTICS
225 COMMERCE DRIVE

FORT COLLINS, CO 80524

12.0
1.8

FedEx Express

CLS091905/08/15

REF: E04243

Delivery Address Barcode

BILL SENDER

PRIORITY OVRNIGHT

WED
Deliver By:
24MAY06

TRK# 7290 1771 5077 Form 0201

DEN AA

:80524 -CO-US

72 FTCA

9-05

Part# 156146-434 NAT:

Paragon Analytics
Radiochemistry Case Narrative
Tritium

Cordilleran Compliance Services, Inc.

Battlement Mesa / E04243

Paragon WO 0605177

1. This report consists of the analytical results and supporting documentation for two water samples received by Paragon on 5/24/06.
2. These samples were prepared according to Paragon Analytics procedure SOP700R9.
3. The samples were analyzed for the presence of tritium according to Paragon Analytics procedure SOP704R7. The analyses were completed on 6/21/06
4. The analysis results for these samples are reported in units of pCi/L. The samples were not filtered prior to analysis.
5. The daily check for the ^{14}C window parameter failed low on 6/10/06, 6/11/06, and 6/12/06. The batch Q.C. is in control for this workorder and the data quality is believed to be unaffected. Please refer to QASS 301252 for further information regarding this incident.
6. There are cases where the magnitude of negative activity is greater than the 2σ TPU. Under typical conditions, where background data is normally distributed and analyzed by paired observations, this event is likely to occur at least 2.5% of the time. Review of the data does not indicate a problem with the instrument or reporting systems and results are reported without further qualification.
7. No anomalous situations were encountered during the preparation or analysis of these samples. All quality control criteria were met.

The data contained in the following report have been reviewed and approved by the personnel listed below. In addition, Paragon Analytics certifies that the analyses reported herein are true, complete and correct within the limits of the methods employed.

Mike Clemmer — 6/22/06
Radiochemistry Instrument Technician — Date

Radiochemistry Final Data Review — 6/22/06
Date

1

PARAGON ANALYTICS, INC.
Radiochemistry Data Package

Section 1

SAMPLE RESULTS SUMMARY

Tritium Analysis By Liquid Scintillation Sample Results Summary

Client Name: Cordilleran Compliance Services, Inc.
Client Project Name: Battlement Mesa
Client Project Number: E04243

Laboratory Name: Paragon Analytics
PAI Work Order: 0605177

Reported on: Thursday, June 22, 2006 10:10:34 AM

Lab Sample ID	Client Sample ID	Sample Type	Nuclide	Result +/- 2 s TPU	MDC	Units	Matrix	Prep Batch	Date Analyzed	Flags
0605177-1	BM3613 PW	Sample	H-3	-200 +/- 190	330	pCi/l	WATER	3H060522-1	6/10/2006	U
0605177-2	BM2642	Sample	H-3	-170 +/- 210	350	pCi/l	WATER	3H060606-2	6/21/2006	U

Comments:

Data Package ID: *H30605177-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits

M - The requested MDC was not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

2

PARAGON ANALYTICS, INC.

Radiochemistry Data Package

Section 2

QC RESULTS SUMMARY

Tritium Analysis By Liquid Scintillation

PAI 704 Rev 7

Method Blank Results

Lab Name: Paragon Analytics
Work Order Number: 0605177
Client Name: Cordilleran Compliance Services, Inc.
ClientProject ID: Battlement Mesa E04243

Lab ID: 3H060522-1MB

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 9
Date Collected: 22-May-06
Date Prepared: 22-May-06
Date Analyzed: 10-Jun-06

Prep Batch: 3H060522-1
QCBatchID: 3H060522-1-2
Run ID: 3H060522-1A
Count Time: 100 minutes

Final Aliquot: 10.0 ml
Result Units: pCi/l
File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
10028-17-8	H-3	-90 +/- 190	330	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: *H30605177-1*

Tritium Analysis By Liquid Scintillation

PAI 704 Rev 7

Method Blank Results

Lab Name: Paragon Analytics
Work Order Number: 0605177
Client Name: Cordilleran Compliance Services, Inc.
ClientProject ID: Battlement Mesa E04243

Lab ID: 3H060606-2MB

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 9
Date Collected: 06-Jun-06
Date Prepared: 06-Jun-06
Date Analyzed: 21-Jun-06

Prep Batch: 3H060606-2
QCBatchID: 3H060606-2-1
Run ID: 3H060606-2A
Count Time: 90 minutes

Final Aliquot: 10.0 ml
Result Units: pCi/l
File Name: YU0562001

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
10028-17-8	H-3	-10 +/- 210	350	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110% Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

M - Requested MDC not met.

B - Analyte concentration greater than MDC.

B3 - Analyte concentration greater than MDC but less than Requested MDC.

Data Package ID: *H30605177-1*

Tritium Analysis By Liquid Scintillation

PAI 704 Rev 7

Laboratory Control Sample(s)

Lab Name: Paragon Analytics
Work Order Number: 0605177
Client Name: Cordilleran Compliance Services, Inc.
ClientProject ID: Battlement Mesa E04243

Lab ID: 3H060522-1LCS

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 9
Date Collected: 22-May-06
Date Prepared: 22-May-06
Date Analyzed: 10-Jun-06

Prep Batch: 3H060522-1
QCBatchID: 3H060522-1-2
Run ID: 3H060522-1A
Count Time: 93.35 minutes

Final Aliquot: 9.90 ml
Result Units: pCi/l
File Name: Manual Entry

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10028-17-8	H-3	10600 +/- 1600	300	11000	96.4	85 - 115	P

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *H30605177-1*

Tritium Analysis By Liquid Scintillation

PAI 704 Rev 7

Laboratory Control Sample(s)

Lab Name: Paragon Analytics
Work Order Number: 0605177
Client Name: Cordilleran Compliance Services, Inc.
ClientProject ID: Battlement Mesa E04243

Lab ID: 3H060606-2LCS

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 9
Date Collected: 06-Jun-06
Date Prepared: 06-Jun-06
Date Analyzed: 21-Jun-06

Prep Batch: 3H060606-2
QCBatchID: 3H060606-2-1
Run ID: 3H060606-2A
Count Time: 90 minutes

Final Aliquot: 9.90 ml
Result Units: pCi/l
File Name: YU0562001

CASNO	Target Nuclide	Results +/- 2s TPU	MDC	Spike Added	% Rec	Control Limits	Lab Qualifier
10028-17-8	H-3	10300 +/- 1600	400	11000	94.1	85 - 115	P

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

LT - Result is less than Requested MDC, greater than sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

L - LCS Recovery below lower control limit.

H - LCS Recovery above upper control limit.

P - LCS Recovery within control limits.

M - The requested MDC was not met.

M3 - The requested MDC was not met, but thereported activity is greater than the reported MDC.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

Data Package ID: *H30605177-1*

PARAGON ANALYTICS, INC.
Radiochemistry Data Package

3

Section 3

INDIVIDUAL SAMPLE RESULTS

Tritium Analysis By Liquid Scintillation

PAI 704 Rev 7

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0605177
Client Name: Cordilleran Compliance Services, Inc.
ClientProject ID: Battlement Mesa E04243

Field ID: BM3613 PW
Lab ID: 0605177-1

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 9
Date Collected: 17-May-06
Date Prepared: 22-May-06
Date Analyzed: 10-Jun-06

Prep Batch: 3H060522-1
QCBatchID: 3H060522-1-2
Run ID: 3H060522-1A
Count Time: 100 minutes
Report Basis: Unfiltered

Final Aliquot: 10.0 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: Manual Entry

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
10028-17-8	H-3	-200 +/- 190	330	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *H30605177-1*

Tritium Analysis By Liquid Scintillation

PAI 704 Rev 7

Sample Results

Lab Name: Paragon Analytics
Work Order Number: 0605177
Client Name: Cordilleran Compliance Services, Inc.
ClientProject ID: Battlement Mesa E04243

Field ID: BM2642
Lab ID: 0605177-2

Sample Matrix: WATER
Prep SOP: PAI 700 Rev 9
Date Collected: 20-May-06
Date Prepared: 06-Jun-06
Date Analyzed: 21-Jun-06

Prep Batch: 3H060606-2
QCBatchID: 3H060606-2-1
Run ID: 3H060606-2A
Count Time: 90 minutes
Report Basis: Unfiltered

Final Aliquot: 10.0 ml
Prep Basis: Unfiltered
Moisture(%): 100.000
Result Units: pCi/l
File Name: YU0562001

CASNO	Target Nuclide	Result +/- 2 s TPU	MDC	Lab Qualifier
10028-17-8	H-3	-170 +/- 210	350	U

Comments:

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative Yield is assumed.

Y2 - Chemical Yield outside default limits.

LT - Result is less than Requested MDC, greater than sample specific MDC.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

M - The requested MDC was not met.

Abbreviations:

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

BDL - Below Detection Limit

Data Package ID: *H30605177-1*

PARAGON ANALYTICS, INC.
Radiochemistry Data Package

4

Section 4

RAW DATA

Tritium Analysis By Liquid Scintillation Raw Data Report

Laboratory Name: Paragon Analytics
PAI Work Order: 0605177

Prep SOP: PAI 700
Analytical SOP: PAI 704

Reported on: Wednesday, June 14, 2006 12:55:35 PM

Sample ID / QC Type	Nuclide / Type	Sample Date/Time	Prep Batch / QCBatchID	Ingrowth Date /Time	Quench Factor / %Lum	Matrix / %Moist.	Samp Alq / Analy Alq	Inst ID / Det ID	AnRunID / File Name	Count Date/Time	GrossCPM / BkgCPM	BaseEff / ProgEff	CntDur(min) / Yield	Activity +/- 2 s TPU	MDC / DecLev	ReportUnits / ReportBasis	DER / RPD	%Spk. Recov / Flags
0605177-1	H-3	5/17/2006	3H060522-1	NA	140.3	WATER	50 ml	LS6500	3H060522-1A	6/10/2006	9.850	21.58%	100	-200	330	pCi/l	NA	
SMP	Trg. Analyte	8:58:00 AM	3H060522-1-2	NA	0.1	100	10 ml	44-06	Manual Entry	3:23 AM	10.830	NA	NA	190	NA	Unfiltered	NA	U
0605177-2	H-3	5/20/2006	3H060606-2	NA	143.6	WATER	50 ml	LS6500	3H060606-2A	6/21/2006	10.380	21.58%	90	-170	350	pCi/l	NA	
SMP	Trg. Analyte	12:15:00 PM	3H060606-2-1	NA	0.22	100	10 ml	42-02	YU0562001	12:11 AM	11.200	NA	NA	210	NA	Unfiltered	NA	U
3H060522-1	H-3	5/22/2006	3H060522-1	NA	144.1	WATER	50 ml	LS6500	3H060522-1A	6/10/2006	10.420	21.58%	100	-90	330	pCi/l	NA	
MB	Trg. Analyte	2:30:19 PM	3H060522-1-2	NA	0.06	NA	10 ml	44-12	Manual Entry	1:16 PM	10.830	NA	NA	190	NA	Unfiltered	NA	U
3H060522-1	H-3	5/22/2006	3H060522-1	NA	143.6	WATER	50 ml	LS6500	3H060522-1A	6/10/2006	61.070	21.58%	93.35	10600	300	pCi/l	NA	96.4
LCS	Trg. Analyte	2:30:19 PM	3H060522-1-2	NA	0.04	NA	9.9 ml	45-01	Manual Entry	2:51 PM	10.830	NA	NA	1600	NA	Unfiltered	NA	P
3H060606-2	H-3	6/6/2006	3H060606-2	NA	144.1	WATER	50 ml	LS6500	3H060606-2A	6/21/2006	11.170	21.58%	90	-10	350	pCi/l	NA	
MB	Trg. Analyte	8:33:12 AM	3H060606-2-1	NA	0.23	NA	10 ml	42-08	YU0562001	9:11 AM	11.200	NA	NA	210	NA	Unfiltered	NA	U
3H060606-2	H-3	6/6/2006	3H060606-2	NA	144	WATER	50 ml	LS6500	3H060606-2A	6/21/2006	60.170	21.58%	90	10300	400	pCi/l	NA	94.1
LCS	Trg. Analyte	8:33:12 AM	3H060606-2-1	NA	0.12	NA	9.9 ml	42-09	YU0562001	10:41 AM	11.200	NA	NA	1600	NA	Unfiltered	NA	P

Comments:

Data Package ID: *H30605177-1*

Qualifiers/Flags:

U - Result is less than the sample specific MDC.

Y1 - Chemical Yield is in control at 100-110%. Quantitative yield is assumed.

Y2 - Chemical Yield outside default limits.

W - DER is greater than Warning Limit of 1.42

D - DER is greater than Control Limit of 2.13

+ - Duplicate RPD not within limits.

LT - Result is less than Request MDC, greater than sample specific MDC

* - Aliquot Basis is 'As Received' while the Report Basis is 'Dry Weight'.

- Aliquot Basis is 'Dry Weight' while the Report Basis is 'As Received'.

M - Requested MDC not met.

M3 - The requested MDC was not met, but the reported activity is greater than the reported MDC.

L - LCS Recovery below lower control limit

H - LCS Recovery above upper control limit

P - LCS, Matrix Spike Recovery within control limits.

N - Matrix Spike Recovery outside control limits

NC - Not Calculated for duplicate results less than 5 times MDC

B - Analyte concentration greater than MDC

B3 - Analyte concentration greater than MDC but less than Requested MDC

Notes:

1) The Tracer results are not yield corrected (i.e. activity measured not activity added).

2) Where sample time is not available, 12:00 PM (Mountain) is used for decay correction.

Abbreviations:

TR- Tracer TA - Target Analyte

TPU - Total Propagated Uncertainty (see PAI SOP 743)

MDC - Minimum Detectable Concentration (see PAI SOP 709)

DER - Duplicate Error Ratio

BDL - Below Detection Limit

000013

ID:H3-- 10 ML GEO. 9 JUN 2006 17:23
USER: 8 COMMENT:LS6500

PRESET TIME :	100.00							
DATA CALC :	CPM	H#	:YES	SAMPLE REPEATS:	1	PRINTER	: STD
COUNT BLANK :	NO	IC#	: NO	REPLICATES :	1	RS232	: OFF
TWO PHASE :	NO	AQC	: NO	CYCLE REPEATS :	1	DISK	:EDIT
SCINTILLATOR:	LIQUID	LUMEX:	NO	LOW SAMPLE REJ:	0		
LOW LEVEL :	YES	HALF LIFE CORRECTION DATE:			none		

CHAN: 100.0 - 320.0	%ERROR: 2.65	FACTOR:	1.000000	BKG. SUB:	0
CHAN: 380.0 - 990.0	%ERROR:20.00	FACTOR:	1.000000	BKG. SUB:	0

SAM NO	POS	TIME MIN	H#	WIND1 CPM	WIND1 %ERROR	WIND2 CPM	WIND2 %ERROR	LUMEX %	ELAPSED TIME
1	44-1	100.00	144.0	10.67	6.12	41.07	3.12	0.07	101.37
2	44-2	100.00	144.5	10.45	6.19	40.80	3.13	0.06	202.79
3	44-3	100.00	142.4	10.91	6.06	40.37	3.15	0.09	304.25
4	44-4	100.00	143.8	11.22	5.97	41.47	3.11	0.08	405.69
5	44-5	91.80	143.5	62.05	2.65	40.98	3.26	0.04	498.87
6	44-6	100.00	140.3	9.86	6.37	41.14	3.12	0.10	600.33
7	44-7	100.00	143.8	10.53	6.16	41.23	3.11	0.07	701.77
8	44-8	100.00	142.9	10.83	6.08	40.16	3.16	0.08	803.20
9	44-9	100.00	144.0	10.39	6.20	41.33	3.11	0.07	904.64
10	44-10	92.65	144.2	61.51	2.65	40.94	3.25	0.03	998.64
11	44-11	92.30	144.0	61.73	2.65	41.34	3.24	0.03	1092.31
12	44-12	100.00	144.1	10.42	6.20	42.70	3.06	0.06	1193.75
13	45-1	93.35	143.6	61.07	2.65	41.97	3.20	0.04	1288.59
14	45-2	100.00	142.8	10.98	6.04	41.17	3.12	0.06	1390.01

ID:H3-- 10 MIL GEO. 20 JUN 2006 22:41
USER: 5 COMMENT:LS6500
PRESET TIME : 90.00

DATA CALC :	CPM	HH :	YES	SAMPLE REPEATS:	1	PRINTER	: STD
COUNT BLANK :	NO	ID# :	NO	REPLICATES :	1	PSZ..	: OFF
TWO PHASE :	NO	AQC :	NO	CYCLE REPEATS :	1	DISK	:EDIT
SCINTILLATOR:	LIQUID	LUMEX:	NO	LOW SAMPLE REJ:	0		
LOW LEVEL :	YES	HALF LIFE		CORRECTION DATE:		none	

CHAN: 100.0 - 520.0	%ERROR: 2.50	FACTOR:	1.000000	BKG. SUB:	\
CHAN: 540.0 - 990.0	%ERROR: 2.00	FACTOR:	1.000000	BKG. SUB:	C

SAM NO	POS	TIME MIN	H#	WIND1 CPM	WIND1 %ERROR	WIND2 CPM	WIND2 %ERROR	LUMEX %	ELAPSED TIME
• 1	42-1	90.00	117.0	11.46	6.23	40.96	3.29	0.24	91.39
0.22	16..81								

INTERRUPTING TO PRINT INTERRUPT DATA 21 JUN 2006 16:2o

FILE = 4U0562001
MC 6/22/06

RESUMING AUTOCOUNT PRINTOUT 21 JUN 2006 16:24

SAM NO	POS	TIME MIN	HH	WIND1 CPM	WIND1 %ERROR	WIND2 CPM	WIND2 %ERROR	LUMEX %	ELAPSED TIME
3	42-3	90.00	144.8	10.61	6.47	39.86	3.34	0.19	1105.33
4	42-4	90.00	145.4	10.96	6.37	41.31	3.28	0.17	1194.74
5	42-5	90.00	144.2	11.02	6.35	41.18	3.37	0.19	1288.17
6	42-6	90.00	145.1	61.10	2.70	41.23	3.28	0.10	1379.40
7	42-7	90.00	144.7	58.90	2.75	40.71	3.30	0.11	1471.02
8	42-8	90.00	144.1	11.17	6.31	41.09	3.29	0.23	1562.45
9	42-9	90.00	144.0	60.17	2.72	41.70	3.26	0.12	1653.89
10	42-10	90.00	144.2	11.12	6.32	41.57	3.27	0.22	1745.35

FILE = YU 0562001

MC
6/22/06

U0562001

BSF Version	: 3
Instrument Type	: LS 6000
Data Capture Date	: 20 Jun 2006 22:41:48
User Filename	: A:\USER05\U0562001.BSF
USER#	: 05
ID	: H3- 10 ML GEO.
Comments	: LS6500
Preset Count Time	: 90.00
Calculation Mode	: CPM
Sample Repeats	: 1
Printer Output Mode	: STD
Blank count	: NO
Replicates	: 1
RS232 Output Mode	: OFF
Two-Phase Selected	: NO
Color Correction	: NO
Cycle Repeats	: 1
Data Buffer Output Mode	: EDIT
Scintillator Choice	: LIQUID
Lum-Ex Selected	: NO
Low Sample Reject Count	: 0
Low Level Option	: YES
Half Life Corr Date	: NONE
Limits Wiindow 1	: 100.00
Preset %Error Iso1	: 2.50
Norm Multiplier Iso1	: 1.00
Background CPM 1	: 0.00
Limits Wiindow 2	: 380.00
Preset %Error Iso2	: 20.00
Norm Mulitplier Iso2	: 1.00
Background CPM 2	: 0.00

1,42-01,90,145,11.46,6.23,40.96,3.29,0.24,91.39
2,42-02,90,143.6,10.38,6.54,42.03,3.25,0.22,182.81
3,42-03,90,144.8,10.61,6.47,39.86,3.34,0.19,1105.3
4,42-04,90,145.4,10.96,6.37,41.31,3.28,0.17,1196.7
5,42-05,90,144.2,11.02,6.35,41.18,3.29,0.19,1288.2
6,42-06,90,145.1,61.1,2.7,41.23,3.28,0.1,1379.6
7,42-07,90,144.7,58.9,2.75,40.71,3.3,0.11,1471
8,42-08,90,144.1,11.17,6.31,41.09,3.29,0.23,1562.4
9,42-09,90,144,60.17,2.72,41.7,3.26,0.12,1653.9
10,42-10,90,144.2,11.12,6.32,41.57,3.27,0.22,1745.3

FILE => U0562001
MC 6/22/06

Paragon Analytics

LSC Run Log

Instrument ID: LS 6500

	Date	Sample ID	CountTime (min.)	Rack & Position	Test	User #	Batch ID	Position Check	Initials	Comments
1	6/9/06	3406052Z-1CB1	100	44 - 1	H3-10mL	6	3406052Z-1	MC	MC	NA
2		0605170-9		- 2						
3		-9D		- 3						
4		-10		- 4						
5		-9MS	91.8	- 5						
6		177-1	100	- 6						
7		196-2		- 7						
8		3406052Z-1CB2		- 8						
9		0605198-2D		- 9						
10		-2MS	92.65	- 10						
11		-2MSD	92.3	- 11						
12		3406052Z-1MB	100	- 12						
13		-1LCS	93.35	45 - 1						
14		3406052Z-1CB3	100	- 2						
15	6/10	DAILY Q.C.	10	1 - 1-4	—	1	—	MC	MC	LCW 14C
16		3406060I-1CB1	10	50 - 1	H3-10mL	5	3406060I-1			NA
17		0604900-1		- 2						
18		2		- 3						
19		3		- 4						
20		4		- 5						
21		5		- 6						
22		6		- 7						
23		7		- 8						
24		7D		- 9						
25		8		- 10						
26		9		- 11						
27		10		- 12						
28		11		51 - 1						
29		3406060I-1CB7		- 2						
30		0604900-12		- 3						

Reviewed by / Date MC 6/22/06

306255

FORM 762r4.XLS (12/24/2002)

000018

Paragon Analytics

LSC Run Log

Instrument ID: LS 6500

	Date	Sample ID	CountTime (min.)	Rack & Position	Test	User #	Batch ID	Position Check	Initials	Comments
1	6/19/06	340606O1-3CB1	230	51 - 1	H3-5ML	3	340606O1-3	MC	MC	NA
2		0605175-1	127.1	- 2						
3		2	8.35	- 3						
4		3	8.1	- 4						
5		176-1	230	- 5						
6		-2		- 6						
7		340606O1-3CB2		- 7						
8		0605176-2D		- 8						
9		0605194-1	190.15	- 9						
10		2	194.85	- 10						
11		3	161.45	- 11						
12		340606O1-3MB	230	- 12						
13	6/20/06	-3LCS	19.05	5763- 1						
14	6/20/06	-3CB3	230	- 2						
15	6/20/06	DAILY Q.C.	10	1 - 1-4	—	1	—	MC	MC	
16	6/21/06	340606O6-2CB1	90	42 - 1	H3-10ML	5	340606O6-2			
17		0605177-2		- 2						
18		0605243-1		- 3						
19		-1D		- 4						
20		340606O6-2CB2		- 5						
21		0605243-1MS		- 6						
22		-1MSD		- 7						
23		340606O6-2MB		- 8						
24		-2LCS		- 9						
25		-2CB3		- 10						
26	6/22/06	DAILY Q.C.	10	1 - 1-4	—	1	—	MC	MC	
27		340606O30-1CB1		56 - 1	H3-5ML	9	340606O30-1			
28		0605209-1	MC 6/22/06	- 2						
29		1D		- 3						
30		2		- 4						

Reviewed by / Date MC 6/22/06

306259

FORM 762r4.XLS (12/24/2002)

000019

PARAGON ANALYTICS, INC.
Radiochemistry Data Package

Section 5

QUALITY ASSURANCE SUMMARY REPORTS

5

Paragon Analytics

QUALITY ASSURANCE SUMMARY SHEET

PAI W.O. # / BATCH —
TEST ALL LS6500 ANALYSES
METHOD LIQ. SCINT.
SOP/REV (PREP) —
SOP/REV (ANAL) 7C4R7

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

BEGINNING ON 6/9/06, THE ^{14}C COUNT RATE FAILED DAILY CHECKS. THIS FAILURE CONTINUED ON 6/10/06, 6/11/06, AND 6/12/06. THE ^{3}H AND BLANK DAILY CHECK PARAMETERS WERE IN CONTROL FOR 6/9/06, 6/10/06, 6/11/06, AND 6/12/06. THE DATA QUALITY FOR ALL ^{3}H DATA ACQUIRED DURING THIS TIME PERIOD IS BELIEVED TO BE UNAFFECTED. THE BECKMAN LS6500 INSTRUMENT WAS GAIN RE-CALIBRATED ON 6/12/06 AND THE SUBSEQUENT DAILY CHECK RUN PASSED FOR ALL PARAMETERS EXCEPT ~~ALL REQUIRED~~ MC 6/13/06 FOR THE ^{14}C COUNT RATE. MC 6/13/06 ~~PARAMETERS.~~ RESULTS ARE SUBMITTED WITHOUT FURTHER QUALIFICATION. MC 6/12/06

TECHNICIAN/ANALYST _____ DATE 6/12/06

DEPARTMENT MANAGER _____ DATE 6/13/06

301252

PARAGON ANALYTICS, INC.
Radiochemistry Data Package

Section 6

LABORATORY BENCH SHEETS

6

Radiochemistry Instrument Worksheet

Paragon Analytics

Prep Batch: 3H060522-1

Prep Procedure: H3 10-mL

Analytical QASS / NCR? Y / (N) RG 6/28/06 NA 301252

Prep Num	LabID	QC Type	Init Alq	Fin Alq	Units	Cnt 1 File/Inst	Cnt 1 Rack-Pos	Cnt 1 Pos Chk By	Cnt 2 File/Inst	Cnt 2 Rack-Pos	Cnt 2 Pos Chk By	Cnt 3 File/Inst	Cnt 3 Rack-Pos	Cnt 3 Pos Chk By	Notes
1	0605170-9	SMP	50	10	ml	LS6500	44-2	MC	LS6500	44-2	MC				[6] RECOUNT [X] RECOUNT
1	0605170-9	DUP	50	10	ml		-3			-3					
1	0605170-19	SMP	50	10	ml		-4			4					
1	0605170-19	MS	50	9.900990	ml		-5			5					
1	0605177-1	SMP	50	10	ml		-6			6					
1	0605198-2	SMP	50	10	ml		-7			7					
1	0605198-2	DUP	50	10	ml		-9			9					
1	0605198-2	MS	50	9.900990	ml		-10			10					
1	0605198-2	MSD	50	9.900990	ml		-11			11					
1	3H060522-1CB1	MB	50	10	ml		44-1			44-1		[X]			[X] RECOUNT
1	3H060522-1CB2	MB	50	10	ml		8			8					
1	3H060522-1CB3	MB	50	10	ml		45-2			45-2					
1	3H060522-1	MB	50	10	ml		44-12			44 12					
1	3H060522-1	LCS	50	9.900990	ml		45-1			45-1					

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	H-3	486.3020.23	2,446.059	DPM/ml	05/22/06	0.5	ml	ST-002

[6] LURONG USER (5-ML 3H) USED. MC 6/14/06

[X] H# OUTSIDE CALIBRATION RANGE FOR SAMPLES. NO SINGLE-POINT CALIBRATION VALID FOR USE. SAMPLES AND Q.C. WILL BE QUENCHED WITH NITROMETHANE AND RE-COUNTED. MC 6/13/06

000023

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: 3H060522-1

Prep Procedure: H3

Reviewed By: KAA KAA Review Date: 5/23/2006

Non-Routine Pre-Treatment? Y / (N) Batch: MA Re-Prep? Y / (N) Batch: MA Prep QASS / NCR? Y / (N) MA

Prep SOP: PAI 700 Rev: 9
Prep SOP: NONE
Matrix Class: liquid

Prep Analyst: Kimberly Arnett KAA
Prep Date: 5/22/2006
Prep Dept: RS

Balance:
Balance:

Cocktail: UG LLT
Cocktail Pipet: T-002
Aliquot Pipet: RS-007

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq ml	Fin Alq ml	Prep Basis	Water Added(ml)	Moisture(%)	Analysis Vol.(ml)	Standards	Prep Notes
1	1	0605170-9	SMP		50	10	Unfiltered	0	100	10		
2	1	0605170-9	DUP		50	10	Unfiltered	0	100	10		
3	1	0605170-19	SMP		50	10	Unfiltered	0	100	10		
4	1	0605170-19	MS		50	9.900990	Unfiltered	0	100	10	S1	
5	1	0605177-1	SMP		50	10	Unfiltered	0	100	10		
6	1	0605198-2	SMP		50	10	Unfiltered	0	100	10		
7	1	0605198-2	DUP		50	10	Unfiltered	0	100	10		
8	1	0605198-2	MS		50	9.900990	Unfiltered	0	100	10	S1	
9	1	0605198-2	MSD		50	9.900990	Unfiltered	0	100	10	S1	
10	1	3H060522-1CB1	MB		50	10	Unfiltered	0	100	10		
11	1	3H060522-1CB2	MB		50	10	Unfiltered	0	100	10		
12	1	3H060522-1CB3	MB		50	10	Unfiltered	0	100	10		
13	1	3H060522-1	MB		50	10	Unfiltered	0	100	10		
14	1	3H060522-1	LCS		50	9.900990	Unfiltered	0	100	10	S1	

KAA 5/23/06

Spiked By: Kimberly Arnett Date: 5/23/2006

Witnessed By: Jeff Kujawa Date: 5/23/2006

Relinquished By: KAA
Date: 5/23/06
Received By: MS
Date: 5/23/06

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	H-3	486.3020.23	2,446.059	DPM/ml	05/22/06	0.5	ml	ST-002

020004

Comments
UG LLT LOT #97-060101

Paragon Analytics
LIMS Version: 5.373A

Supersedes: 5/22/06 14:37

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: 3H060522-1

Prep Procedure: H3

Prep Batch Not Validated!!!

Reviewed By: Review Date:

Non-Routine Pre-Treatment? Y / (N) Batch: MA Re-Prep? Y / (N) Batch: MA Prep QASS / NCR? Y / (N) MA

Prep SOP: PAI 700 Rev: 9
Prep SOP: NONE
Matrix Class: liquid

Prep Analyst: Kimberly Arnett KMA
Prep Date: 5/22/06
Prep Dept: RS

Balance:
Balance:

Cocktail: UG LLT
Cocktail Pipet: T-002
Aliquot Pipet: RS-007

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq ml	Fin Alq ml	Prep Basis	Water Added(ml)	Moisture(%)	Analysis Vol.(ml)	Standards	Prep Notes
1	1	0605170-9	SMP		50	10	Unfiltered	0	100	10		
2	1	0605170-9	DUP		50	10	Unfiltered	0	100	10		
3	1	0605170-19	SMP		50	10	Unfiltered	0	100	10		
4	1	0605170-19	MS		50	9.900990	Unfiltered	0	100	10	S1	
5	1	0605177-1	SMP		50	10	Unfiltered	0	100	10		
6	1	0605198-2	SMP		50	10	Unfiltered	0	100	10		
7	1	0605198-2	DUP		50	10	↓	0	100	10		
8	1	0605198-2	MS		50	9.900990	↓ KMA 5/23/06	0	100	10	S1	
9	1	0605198-2	MSD		50	9.900990	↓	0	100	10	S1	
10	1	3H060522-1CB1	MB		50	10	Unfiltered	0	100	10		
11	1	3H060522-1CB2	MB		50	10	Unfiltered	0	100	10		
12	1	3H060522-1CB3	MB		50	10	Unfiltered	0	100	10		
13	1	3H060522-1	MB		50	10	↓ KMA 5/23/06	0	100	10		
14	1	3H060522-1	MB		50	10	Unfiltered	0	100	10		
15	1	3H060522-1	LCS		50	9.900990	Unfiltered	0	100	10	S1	
16	1	3H060522-1	LCS		50	9.900990	↓ KMA 5/23/06	0	100	10	S1	

Spiked By: Kimberly Arnett KMA Date: 5/23/06

Witnessed By: [signature] Date: 5/23/06

Relinquished By:
Date:
Received By:
Date:

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	H-3	486.3020.23	2,446.059	DPM/ml	05/22/06	0.5	ml	ST-002

Exl. 411507

620000

Comments

UG LLT LOT #97-060101

Paragon Analytics

TRITIUM RUN LOG

297942 Logbook/Page No. SOP 700 Rev 9 Form 1306r1.doc (3/30/2003)

Date	Workorder/ Sample Number	Column ID	Flask ID	Run No.	Comments	Technician's Initials
5/8/06	0604258 -2S	A	T11	3	Batch 3H060505-2	KAA
↓	0605028 -11	B	605	↓		
5/9/06	0604225 - 3mS	A	T9	1		
	↓ -3mSD	B	609			
	0604232 -16mS	C	T2			
	↓ -16mSD	D	602			
	0604256 -8mS	E	103			
↓	↓ -8mSD	F	600	↓		
5/8/06	3H060505-2 -mB	C	T3	3		
5/9/06	↓ -LCS	A	T1	2	↓	↓
5/5/06	0604225 -1	A	603	1	Batch 3H060515-1	KAA
	↓ -1Dup	B	T8			
	0605107 -1	C	102			
	-2	D	T4			
↓	-3	E	604	↓		
5/16/06	-4	A	T7	2		
	-5	B	101			
	-6	C	605			
	↓ -7	D	T3			
	3H060515-1 -mB	E	T11	↓		
	↓ -LCS	A	608	3		
	KAA 5/18/06 0604225 0605107 -1mS	B	T10			
↓	↓ -1mSD	C	606	↓	↓	↓
5/22/06	0605170 -9	A	T7	I	Batch 3H060522-1	KAA

Reviewed by / Date KAA 5/22/06

TRITIUM RUN LOG

297943 Logbook/Page No. SOP 700 Rev 9 Form 1306r1.doc (3/30/2003)

Date	Workorder/ Sample Number	Column ID	Flask ID	Run No.	Comments	Technici Initia
5/22/06	0605170 - 9Dup	B	T4	1	Batch 3H06 0522-1	KAA
↓	↓ -9	C	603	↓	↓	↓
	0605177 -1	D	111			
	0605198 -2	E	TB			
	↓ -2Dup	A	604	2		
↓	3H060522-1-MB	B	102	↓		
5/23/06	0605170 -9MS	A	6666	1		
	0605198 -2MS	B	T11			
	↓ -2MSD	C	T6			
↓	3H060522-1 LCS	D	605	↓	↓	↓

KAA 5/23/06

Reviewed by / Date KAA 5/23/06

SAMPLE CONDITION FORM (LIQUID)

ANALYST: KAA

ANALYSIS DATE: 5/22/06 METHOD: 3H

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		pH	Color	Remarks
0605170	9	7.0	clear	NA
↓	19	↓	↓	↓
0605197	1		yellow	suspended matter
0605198	2	↓	clear	NA

KAA 5/22/06

Radiochemistry Instrument Worksheet

Paragon Analytics

Prep Batch: 3H060606-2

Prep Procedure: H3 10-mL

Analytical QASS / NCR? Y / (N) NA

Prep Num	LabID	QC Type	Init Alq	Fin Alq	Units	Cnt 1 File/Inst	Cnt 1 Rack-Pos	Cnt 1 Pos Chk By	Cnt 2 File/Inst	Cnt 2 Rack-Pos	Cnt 2 Pos Chk By	Cnt 3 File/Inst	Cnt 3 Rack-Pos	Cnt 3 Pos Chk By	Notes
1	0605177-2	SMP	50	10	ml	KJ056200	42-2	MC							
1	0605243-1	SMP	50	10	ml		3								
1	0605243-1	DUP	50	10	ml		4								
1	0605243-1	MS	50	9.900990	ml		6								
1	0605243-1	MSD	50	9.900990	ml		7								
1	3H060606-2CB1	MB	50	10	ml		42-1								
1	3H060606-2CB2	MB	50	10	ml		5								
1	3H060606-2CB3	MB	50	10	ml		10								
1	3H060606-2	MB	50	10	ml		8								
1	3H060606-2	LCS	50	9.900990	ml		9								

BG 6/28/06

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	H-3	486.3020.23	2,440.512	DPM/ml	06/06/06	0.5	ml	ST-002

Fraction Barcodes

0605243-1	*3H060606-2PS2*	0605177-2	*3H060606-2PS1*
0605243-1DUP	*3H060606-2PS3*	3H060606-2LCS	*3H060606-2PS10*
3H060606-2LCS	*3H060606-2PS10*	3H060606-2MB	*3H060606-2PS9*
3H060606-2CB1MB	*3H060606-2PS6*	3H060606-2MB	*3H060606-2PS9*
3H060606-2CB3MB	*3H060606-2PS8*	3H060606-2CB2MB	*3H060606-2PS7*
0605243-1MS	*3H060606-2PS4*	0605243-1MSD	*3H060606-2PS5*

620029

Radiochemistry Prep Worksheet

Paragon Analytics

Prep Batch: 3H060606-2

Prep Procedure: H3

Reviewed By: KAA 6/6/06 **Review Date:** 6/6/06

Non-Routine Pre-Treatment? Y / (N) **Batch:** MA **Re-Prep?** Y / (N) **Batch:** MA **Prep QASS / NCR?** Y / (N) MA

Prep SOP: PAI 700 **Rev:** 9
Prep SOP: NONE
Matrix Class: liquid

Prep Analyst: Kimberly Arnett KAA
Prep Date: 6/6/06
Prep Dept: RS

Balance:
Balance:

Cocktail: UG LLT
Cocktail Pipet: T-002
Aliquot Pipet: RS-007

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq ml	Fin Alq ml	Prep Basis	Water Added(ml)	Moisture(%)	Analysis Vol.(ml)	Standards	Prep Notes
1	1	0605177-2	SMP		50	10	Unfiltered	0	100	10		
2	1	0605243-1	SMP		50	10	Unfiltered	0	100	10		
3	1	0605243-1	DUP		50	10	Unfiltered	0	100	10		
4	1	0605243-1	MS		50	9.900990	Unfiltered	0	100	10	S1	
5	1	0605243-1	MSD		50	9.900990	Unfiltered	0	100	10	S1	
6	1	3H060606-2CB1	MB		50	10	Unfiltered	0	100	10		
7	1	3H060606-2CB2	MB		50	10	Unfiltered	0	100	10		
8	1	3H060606-2CB3	MB		50	10	Unfiltered	0	100	10		
9	1	3H060606-2	MB		50	10	Unfiltered	0	100	10		
10	1	3H060606-2	LCS		50	9.900990	Unfiltered	0	100	10	S1	

KAA 6/6/06 KAA 6/6/06 KAA 6/6/06 KAA 6/6/06

Spiked By: Kimberly Arnett **Date:** 6/6/06

Witnessed By: Jeff Kujawa **Date:** 6/6/06

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	H-3	486.3020.23	2,440.512	DPM/ml	06/06/06	0.5	ml	ST-002

000030

Comments
UG LLT LOT #97-060101

Paragon Analytics

Radiochemistry Prep Worksheet

Prep Batch: 3H060606-2

Prep Procedure: H3

Prep Batch Not Validated!!!

Reviewed By: **Review Date:**

Non-Routine Pre-Treatment? Y / (N) Batch: MA Re-Prep? Y / (N) Batch: MA Prep QASS / NCR? Y / (N) MA

Prep SOP: PAI 700 Rev: 9
Prep SOP: NONE
Matrix Class: liquid

Prep Analyst: Kimberly Arnett KA
Prep Date: 6/6/06
Prep Dept: RS

Balance:
Balance:

Cocktail: UG LLT
Cocktail Pipet: T-002
Aliquot Pipet: RS-007

Samp Num	Prep Num	LabID	QC Type	Dish No.	Init Alq ml	Fin Alq ml	Prep Basis	Water Added(ml)	Moisture(%)	Analysis Vol.(ml)	Standards	Prep Notes
1	1	0605177-2	SMP		50	10	Unfiltered	0	100	10		
2	1	0605243-1	SMP		50	10	Unfiltered	0	100	10		
3	1	0605243-1	DUP		50	10	Unfiltered	0	100	10		
4	1	0605243-1	MS		50	9.900990	Unfiltered	0	100	10	S1	
5	1	0605243-1	MSD		50	9.900990	Unfiltered	0	100	10	S1	
6	1	3H060606-2CB1	MB		50	10	Unfiltered	0	100	10		
7	1	3H060606-2CB2	MB		50	10	Unfiltered	0	100	10		
8	1	3H060606-2CB3	MB		50	10	Unfiltered	0	100	10		
9	1	3H060606-2	MB		50	10	Unfiltered	0	100	10		
10	1	3H060606-2	LCS		50	9.900990	Unfiltered	0	100	10	S1	

Spiked By: Kimberly Arnett KA Date: 6/6/06

Witnessed By: [signature] Date: 6/6/06

Spike Solution Information

Soln #	Nuclide	SolnID	Prep Conc	Units	Prep Date	Aliquot	Units	Pipet ID
S1	H-3	486.3020.23	2,440.512	DPM/ml	06/06/06	0.5	ml	ST-002

Exp. 4/05/07

0000031

Comments
UG LLT LOT #97-060101

TRITIUM RUN LOG

297945 Logbook/Page No. SOP 700 Rev 9 Form 1306r1.doc (3/30/2003)

Date	Workorder/ Sample Number	Column ID	Flask ID	Run No.	Comments	Technician's Initials
6/1/06	0604900 -24	C	101	5	Batch 3H060601-1	KAA
↓	3H060601-1 -MB	D	111	↓	3H060601-1	
↓	3H060601-2 -MB	E	608	↓	3H060601-2	
6/2/06	0604900 -20MS	A	T5	1	3H060601-1	
↓	↓ -24MS	B	T1	↓	3H060601-2	
↓	3H060601-1 -LCS	C	T9	↓	3H060601-1	
↓	3H060601-2 -LCS	D	103	↓	↓ 3H060601-2	↓
6/6/06	0605177 -2	A	605	1	Batch 3H060606-2	KAA
↓	0605243 -1	B	609	↓	↓	↓
↓	↓ -1DUP	C	T6	↓	↓	↓
↓	↓ -1MS	D	666	↓	↓	↓
↓	↓ -1MSD	E	T3	↓	↓	↓
↓	3H060606-2 -MB	F	604	↓	↓	↓
↓	↓ -LCS	A	T4	2	↓	↓

KAA 6/6/06

Reviewed by / Date KAA 6/6/06

SAMPLE CONDITION FORM (LIQUID)

ANALYST: LAA

ANALYSIS DATE: 6/6/06 METHOD: 3A

WORK ORDER	SAMPLE ID	SAMPLE CONDITION		
		pH	Color	Remarks
0605177	2	7.0	yellow	MA
0605243	1	9.0	↓	↓

LAA 6/6/06

PARAGON ANALYTICS, INC.
Radiochemistry Data Package

Section 7

STANDARDS TRACEABILITY DOCUMENTS

7

PREPARE A WORKING DILUTION OF 486.1284.85 AT ~2500 dpm/mL

1. TRANSFER 486.1284.85 TO AN AMBER GLASS BOTTLE
MASS OF BOTTLE W/O LID: 259.20 g BAL26
MASS OF BOTTLE + STD: 261.25 g
NET MASS OF STD: 2.05 g

2. DILUTE TO 500 mL WITH DI WATER (SEE BELOW FOR ρ DETERMINATION)
MASS OF BOTTLE + STD + H_2O: 760.0 g BAL26
MASS OF BOTTLE (from above): 259.20 g
NET MASS OF DILUTED STD: 500.8 g

3. DETERMINE DENSITY OF DI WATER
MASS OF 100mL VOLUMETRIC FLASK: 56.4421 g BAL12
MASS OF FLASK + H_2O: 156.1980 g
NET MASS OF H_2O: 99.7559 g
ρ = 0.997559 g/mL

4. FINAL ACTIVITY CALCULATION

$$\frac{(127029.4 \text{ dpm/g})(9480044.38 \text{ dpm/mL})}{500.8 \text{ g}}(0.9976 \text{ g/mL})(2.05 \text{ g})\left(2.22 \frac{\text{dpm}}{\text{g}_i}\right) = 3871.3 \frac{\text{dpm}}{\text{mL}}$$

3/24/06

Stnd ID: 486.3020.23

Description: H-3
Expiration: 4/15/07
Activity: 3871.30 dpm/mL
2s Uncertainty: 193.57 dpm/mL
Ref. Date: 3/23/98
Ref Time: N/A
Prep Date: 3/24/06 Prep by: AF
Matrix/Comp. DI H20
Half Life (y): 1.24E+01

Reverification Log		
Analysis Date	Initials	Expiration Date

BG 4/17/06

Continued on Page

Read and Understood By

Signed	Date	Signed	Date
	3/24/06		4/17/06

Tritium Spike Solution 486 1284.85

Continued From Page

Soln # 486 1284.84 was diluted to form a Stock soln approx 100,000 dpm/ml as follows:

VOA Tare	27.9711 g
VOA + HS (486 1284.84)	42.6011 g
Final (dil w/ DI H2O)	62.7170 g
dil factor	

42.6011 g
− 27.9711 g
14.65 g STD
× 1014184.6 pCi/g
14835521 pCi
÷ (62.7170 g − 27.9711 g)
427,029.4 pCi/g
RG 8/17/04

Stnd ID: 486.1284.85

Description: 3H
Expiration: 7/30/05
Activity: 948004.38 dpm/mL
2s Uncertainty: 4740.02 dpm/mL
Ref. Date: 3/23/98
Ref Time: N/A
Prep Date: 7/29/04 Prep by: JLK
Matrix/Comp. DI H20
Half Life (y): 1.23E+01

RG 8/17/04

Verified 5/27/98 DLS

Standard re-verified 3/25/03. BG 3/28/03.
Expires 3/25/04.
Standard re-verified. New exp date: 7/30/05 RG 8/17/04 Continued on Page

Signed 5/3/00 Date

Read and Understood By

DLS 5/22/98 Signed Date

RG 9/6/05

Stnd ID: 486.1284.85
Description: 3H
Expiration: 8/11/06
Activity: 948004.38 dpm/mL
2s Uncertainty: 47400.22 dpm/mL
Ref. Date: 3/23/98
Ref Time: N/A
Prep Date: 5/3/00 Prep by: RTS
Matrix/Comp. DI Water
Half Life (y): 1.23E+01

RG 9/6/05

RG 3/28/03

Stnd ID: 486.1284.85

Description: H-3
Activity: 948004.38 dpm/ml
2s Uncertainty: 4740.02 dpm/ml
Ref. Date: 3/23/98
Ref Time: na
Prep Date: 5/3/00 Prep by: RTS
Expiration: ~~3/28/03~~ 3/25/04 RG 3/28/03
Matrix/Comp. DI H2O
Half Life (y): 1.23E+01

RG 3/28/03

MAY REQUIRE NCR FOR ICPT WORK.

RG 3/28/03

Stnd ID: 486.1284.85

Description: Tritium in Water Stock Solution
Activity: 427029 pCi/g or mL
Uncertainty: pCi/g or mL
Ref. Date: ~~3/30/98~~ 3/23/98 RT 1-7-02
Ref Time: 10:00 AM 3/30/98 CEM 10/4/02
Prep Date ~~3/30/98~~ Prep by: RTS
Expiration ~~3/29/03~~ ~~3/23/98~~ CEM 10/4/02
Matrix/Comp. DI Water 3/29/03 CEM 12/9/04
Short Lived -- Decay Correct with each use

RG 8/17/04

000036

14.
PROJECT Tritium Stock Solution 486.1284.84

Notebook No. 001404
Continued From Page

PAI solution number 486.1284.84 (Analytics 5183-55543-B07)

was transferred to a 40 ml VOA vial.

Certificate & R304 not available on 3/30/98 - Will obtain tomorrow.

Activity 51.054 uCi
Volume 50.34 grams
Matrix H2O

RG 8/13/04

Stnd ID: 486.1284.84

Description: 3H
Expiration: 7/30/05
Activity: 1014184.00 pCi/g or ml
2s Uncertainty: 50709.00 pCi/g or ml
Ref. Date: 3/23/98
Ref Time: N/A
Prep Date: 7/29/04 Prep by: JLK
Matrix/Comp. DI Water
Half Life (y): 1.23E+01

RG 8/13/04

Standard reverified on 7/30/04. Expires 7/30/05.
RG 8/13/04

7/3/03

Stnd ID: 486.1284.84

Description: H-3
Activity: 1014184.00 pCi/g or ml
2s Uncertainty: 50709.00 pCi/g or ml
Ref. Date: 3/23/98
Ref Time: 0.417
Prep Date: 3/30/98 Prep by: RTS
Expiration: 7/3/04
Matrix/Comp. DI Water
Half Life (y): 1.24E+01

7/3/03

Stnd ID: 486.1284.84

Description: Tritium in Water Stock Solution
Activity: 1014184 pCi/g or mL
Uncertainty: pCi/g or mL
Ref. Date: ~~3/23/98~~ 3/23/98 1-7-02
Ref Time: 10:00
Prep Date 3/30/98 Prep by: RTS
Expiration 3/29/03
Matrix/Comp. DI Water
Short Lived -- Decay Correct with each use

Verified 5/27/98 DCB

Standard re-verified on 7/3/03. Expires 7/3/04. 7/7/03

Continued on Page

Recertify
Signed 5/5/00 Date

Read and Understood By
Signed DCB Date 5/28/98

ANALYTICS

1380 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 · U.S.A.

Phone (404) 352-8677
Fax (404) 352-2837

PAID 486.
Rec'd 3-24-98

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

55543-307

H-3 in Water 50 mL in Flame Sealed Vial

This standard radionuclide source was prepared using an aliquot measured gravimetrically from a master radionuclide solution standard. The master radionuclide solution standard was calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France, as Number 24057. The calibration was checked by liquid scintillation counting after source preparation.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	H-3
ACTIVITY (dps):	1.889 E+06
CALIBRATION DATE:	March 23, 1998 12:00 EST
HALF-LIFE:	12.43 years
TOTAL UNCERTAINTY:	5.0%

50.34 grams of water.

P O NUMBER 21143, Item 1

PREPARED BY: M. D. Currie
M. D. Currie, Radiochemist

Q A APPROVED: [signature] 3/23/98

PARAGON ANALYTICS, INC.
Radiochemistry Data Package

Section 8

CHAIN OF CUSTODY

Paragon Analytics

Sample Number(s) Cross-Reference Table

Paragon OrderNum: 0605177
Client Name: Cordilleran Compliance Services, Inc.
Client Project Name: Battlement Mesa
Client Project Number: E04243
Client PO Number:

Client Sample	Lab Sample Number	COC Number	Matrix	Date Collected	Time Collected
BM3613 PW	0605177-1		WATER	17-May-06	8:58
BM2642	0605177-2		WATER	20-May-06	12:15

Paragon Analytics
A Division of DataChem Laboratories, Inc.

225 Commerce Drive Fort Collins, CO 80524
800-443-1511 or (970) 490-1511 (970) 490-1522 Fax

0605177
Accession Number (LAB ID) ~~0506177~~ pm 5/24/06

Chain-of-Custody Date _____ Page ___ of ___ Originator: Retain pink copy

Project Name / No.: PRESCO / E04243 Sampler(s): _____ Turnaround (circle one): (Standard) or Rush (Due _____) Dispose: Date _____ or Return to Client

Report To: James Hix
Phone: 303.237.2072
Fax: 303 237 2659
E-mail: jameshix@cordcomp.com
Company: Cordilleran Compliance Services
Address: 5550 Marshall street
Arvada, CO 80002

Circle method (right); provide additional information as needed (comments).

Sample ID	Date	Time *	Lab ID	Matrix	Preservative (indicate type)	No. of Containers	VOCs SW8260B E624 E524.2	BTEX (only) SW8021B	SVOCs SW8270C E625	OC Pesticides SW8081A E608	PCBs SW8082 E608	Herbicides SW8151A	Explosives SW8330	TCLP Organics SW1311 SW8260B 8270C 8081A 8151A	TCLP Metals SW1311 SW6010B SW7471	Total Metals by ICP SW6010B 7470 7471 E200 ILMO	Dissolved Metals by ICP SW6010B 7470 E200 ILMO	Total Metals by ICP/MS SW6020 E200.8 ILMO	Dissolved Metals by ICP/MS SW6020 E200.8 ILMO	Hexavalent Chromium SW7196A Alkaline Digest? Y / N	Inorganic Anions SW9056 E300.0 (specify in comments)	Solids: Total E160.3 FDS E160.1 TSS E160.2	pH SW9040B SW9045C	TPH GRO DRO SW8015B (both)	Gross Alpha / Beta SW9310 E900.0	Actinides by Paragon SOP Pu / U / Am / Th / Cm / ___	Tritium E906.0	Total Alpha-Emitting Radium SW9315 E903.0	Radium 226 E903.1 SW9320 E804.0	Strontium 89 05811-00 Strontium 90 05811-00	Gamma Isotopes E901.1
BM2642	5/22/06	1215	(2)			2																					✓				✓

5/23/06

* Time Zone: EST CST MST PST Matrix Key: O = oil, S = soil NS = non-soil solid, W = water, L = liquid, E = extract, F = filter

Comments:

Form 202r5.xls (4/5/04)

Relinquished By: (1)	Relinquished By: (2)
Signature	Signature
Printed Name Travis Marshall	Printed Name
Date 5/23/06 Time 1630	Date Time
Company Cord. Comp.	Company
Received By: (1)	**Received By:** (2)
Signature	Signature
Printed Name J. Romocki	Printed Name
Date 5/24/06 Time 0925	Date Time
Company Paragon	Company

000041

Paragon Analytics
A Division of DataChem Laboratories, Inc.

225 Commerce Drive Fort Collins, CO 80524
800-443-1511 or (970) 490-1511 (970) 490-1522 Fax

Accession Number (LAB ID) 0605177

Chain-of-Custody Date __ __ Page __ of __

Originator: Retain pink copy

Project Name / No.: _____ Sampler(s): _____ Turnaround (circle one): Standard or Rush (Due _____) Dispose: Date ____ or Return to Client

Report To: James Hix
Phone: 303.237.2072
Fax: 303.237.2659
E-mail: jameshix@cordcomp.com
Company: Cordilleran Compliance Services
Address: 5550 Marshall Street
Arvada, CO 80002

Circle method (right); provide additional information as needed (comments).

Sample ID	Date	Time *	Lab ID	Matrix	Preservative (indicate type)	No. of Containers	VOCs SW8260B E624 E524.2	BTEX (only) SW8021B	SVOCs SW8270C E625	OC Pesticides SW8081A E608	PCBs SW8082 E608	Herbicides SW8151A	Explosives SW8330	TCLP Organics SW1311 SW8260B 8270C 8081A 8151A	TCLP Metals SW1311 SW6010B SW7471	Total Metals by ICP SW6010B 7470 7471 E200 ILMO	Dissolved Metals by ICP SW6010B 7470 E200 ILMO	Total Metals by ICP/MS SW6020 E200.8 ILMO	Dissolved Metals by ICP/MS SW6020 E200.8 ILMO	Hexavalent Chromium SW7196A Alkaline Digest? Y / N	Inorganic Anions SW9056 E300.0 (specify in comments)	Solids: Total E160.3 TDS E160.1 TSS E160.2	pH SW9040B SW9045C	TPH GRO DRO SW8015B (both)	Gross Alpha / Beta SW9310 E900.0	Actinides by Paragon SOP Pu / U / Am / Th / Cm /	Tritium E906.0	Total Alpha-Emitting Radium SW9315 E903.0	Radium 226 E903.1 SW9320 E904.0	Strontium 89 D5811-00 Strontium 90 D5811-00	Gamma Isotopes E901.1
BM3613 PW	5/17/06	858	1	W	HNO_3 Ice	2																					✓				✓

* Time Zone: EST CST MST PST Matrix Key: O = oil, S = soil, NS = non-soil solid, W = water, L = liquid, E = extract F = filter

Comments:

Form 202r5.xls (4/6/04)

Relinquished By: (1)	Relinquished By: (2)
Signature James Hix	Signature
Printed Name James Hix	Printed Name
Date 05/17/06 Time	Date Time
Company Cordilleran Compliance	Company
Received By: (1)	**Received By: (2)**
Signature Sheri Lafferty	Signature
Printed Name Sheri Lafferty	Printed Name
Date 5:18:06 Time 0925	Date Time
Company paragon	Company

000042

CONDITION OF SAMPLE UPON RECEIPT FORM **Paragon Analytics**

Client: Cordilleran Workorder No: 0605177

Project Manager: ______ Initials: ______ Date: ______

#	Question		YES	NO
1.	Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2.	Are custody **seals** on **shipping containers** intact?	NONE	(YES)	NO
3.	Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4.	Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5.	Are the **COC and bottle labels complete and legible**?		(YES)	NO
6.	Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		(YES)	NO
7.	Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8.	Are all aqueous **samples requiring preservation preserved correctly**? (excluding volatiles)	N/A	YES	(NO) △
9.	Are all aqueous **non-preserved samples pH 4-9**?	N/A	(YES)	NO
10.	Is there **sufficient sample** for the requested analyses?		YES	(NO) ✭
11.	Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12.	Are all samples within **holding times** for the requested analyses?		(YES)	NO
13.	Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14.	Are all samples requiring no headspace (VOC, GRO, Rx CN/S, radon), headspace free? **Size of bubble**: ____ < green pea ____ > green pea	(N/A)	YES	NO
15.	Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
16.	Were the samples **shipped on ice**?		(YES)	NO
17.	Were cooler temperatures measured at 0.1-6.0°C? IR gun used*: (#2) #4	RAD ONLY	(YES)	NO

Cooler #:	1
Temperature (°C):	4.4
No. of custody seals on cooler:	2
External μR/hr reading:	14
Background μR/hr reading:	12

DOT Survey/ Acceptance Information

Were external μR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

✭ possible limited volume for tritium only 125ml recived
Volume OK

△ 1 liter Poly for RAD ANALYSIS recieved at PH 7
added 4ml HNO3 lot #B19075 @ 1000 5.18.06 final ph 1.6
SL

v. St. Sed m 8 ... include?

If applicable, was the client contacted? YES / NO / NA Contact: ______ Date/Time: ______

Project Manager Signature / Date: [signature] 5/18/06

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r19.xls (1/13/06)

FedEx Express **US Airbill** FedEx Tracking Number 8573 0923 5636

Recipient's Copy

1 From [redacted]

Date ?/?/06

Sender's Name James Hix Phone ???-???-?072

Company

Address 5??? Marshall Street Dept/Floor/Suite/Room

City Arvada State CO ZIP 80002

2 Your Internal Billing Reference E04293

3 To

Recipient's Name Phone 800 443-1311 / 970 490-1311

Company Paragon Analytics

Recipient's Address 225 Commerce Drive Dept/Floor/Suite/Room

We cannot deliver to P.O. boxes or P.O. ZIP codes.

Address

To request a package be held at a specific FedEx location, print FedEx address here.

City Fort Collins State CO ZIP

8573 0923 5636

4a Express Package Service — *Packages up to 150 lbs.*

- [x] FedEx Priority Overnight — Next business morning.* Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx Standard Overnight — Next business afternoon.* Saturday Delivery NOT available.
- [ ] FedEx First Overnight — Earliest next business morning delivery to select locations.* Saturday Delivery NOT available.
- [ ] FedEx 2Day — Second business day.* Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx Express Saver — Third business day.* Saturday Delivery NOT available.

FedEx Envelope rate not available. Minimum charge: One-pound rate. * To most locations.

4.4

4b Express Freight Service — *Packages over 150 lbs.*

- [ ] FedEx 1Day Freight* — Next business day.** Friday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx 2Day Freight — Second business day.** Thursday shipments will be delivered on Monday unless SATURDAY Delivery is selected.
- [ ] FedEx 3Day Freight — Third business day.** Saturday Delivery NOT available.

* Call for Confirmation. ** To most locations.

5 Packaging

- [ ] FedEx Envelope*
- [ ] FedEx Pak* — Includes FedEx Small Pak, FedEx Large Pak, and FedEx Sturdy Pak.
- [ ] FedEx Box
- [ ] FedEx Tube
- [x] Other

* Declared value limit $500.

6 Special Handling — Include FedEx address in Section 3.

- [ ] SATURDAY Delivery — Not available for FedEx Standard Overnight, FedEx First Overnight, FedEx Express Saver, or FedEx 3Day Freight.
- [ ] HOLD Weekday at FedEx Location — Not available for FedEx First Overnight.
- [ ] HOLD Saturday at FedEx Location — Available ONLY for FedEx Priority Overnight and FedEx 2Day to select locations.

Does this shipment contain dangerous goods? One box must be checked.

- [x] No
- [ ] Yes — As per attached Shipper's Declaration.
- [ ] Yes — Shipper's Declaration not required.
- [ ] Dry Ice — Dry Ice, 9, UN 1845 ___ x ___ kg
- [ ] Cargo Aircraft Only

Dangerous goods (including dry ice) cannot be shipped in FedEx packaging.

7 Payment Bill to: Enter FedEx Acct. No. or Credit Card No. below. Obtain Recip. Acct. No.

- [x] Sender — Acct. No. in Section 1 will be billed.
- [ ] Recipient
- [ ] Third Party
- [ ] Credit Card
- [ ] Cash/Check

[redacted]

P/F

Total Packages	Total Weight	Total Declared Value†	Total Charges
1	122	$ .00	

Credit Card Auth.

†Our liability is limited to $100 unless you declare a higher value. See back for details.

8 NEW Residential Delivery Signature Options If you require a signature, check Direct or Indirect.

- [ ] No Signature Required — Package may be left without obtaining a signature for delivery.
- [ ] Direct Signature — Anyone at recipient's address may sign for delivery. Fee applies.
- [ ] Indirect Signature — If no one is available at recipient's address, anyone at a neighboring address may sign for delivery. Fee applies.

520

Rev. Date 6/05 • Part #158281 • ©1994–2005 FedEx • PRINTED IN U.S.A. SRY

CONDITION OF SAMPLE UPON RECEIPT FORM **Paragon Analytics**

Client: Cordilleran Workorder No: ~~0605177~~ 0605177

Project Manager: LS Initials: JM Date: 5/24/06

1.	Does this project require any **special handling** in addition to standard Paragon procedures?		YES	(NO)
2.	Are custody **seals** on **shipping containers** intact?	(NONE)	YES	NO
3	Are Custody seals on **sample containers** intact?	(NONE)	YES	NO
4.	Is there a **COC (Chain-of-Custody) present** or other representative documents?		(YES)	NO
5.	Are the **COC and bottle labels complete and legible**?		(YES)	NO
6.	Is the **COC in agreement** with samples received? (IDs, dates, times, no. of samples, no. of containers, matrix, requested analyses, etc.)		YES	(NO) 2.
7	Were **airbills / shipping documents** present and/or removable?	DROP OFF	(YES)	NO
8	Are all aqueous **samples requiring preservation preserved correctly**? (excluding volatiles)	N/A	YES	(NO) 1.
9.	Are all aqueous **non-preserved samples pH 4-9**?	N/A	(YES)	NO
10.	Is there **sufficient sample** for the requested analyses?		(YES)	NO
11.	Were all samples placed in the **proper containers** for the requested analyses?		(YES)	NO
12.	Are all samples within **holding times** for the requested analyses?		(YES)	NO
13.	Were all sample containers received **intact**? (not broken or leaking, etc.)		(YES)	NO
14.	Are all samples requiring no headspace (VOC, GRO, Rx CN/S, radon), headspace free? **Size of bubble**: ____ < green pea ____ > green pea	(N/A)	YES	NO
15.	Were samples checked for and free from the presence of **residual chlorine?** (Applicable when PM has indicated samples are from a chlorinated water source; note if field preservation with sodium thiosulfate was not observed.)	(N/A)	YES	NO
16.	Were the samples **shipped on ice**?		(YES)	NO
17.	Were cooler temperatures measured at 0.1-6.0°C? **IR gun used*:** #2 (#4)	RAD ONLY	(YES)	NO

Cooler #:	1
Temperature (°C):	1.8
No. of custody seals on cooler:	0
DOT Survey/ Acceptance Information — External µR/hr reading:	12
DOT Survey/ Acceptance Information — Background µR/hr reading:	12

Were external µR/hr readings ≤ two times background and within DOT acceptance criteria? (YES) / NO / NA (If no, see Form 008.)

Additional Information: PROVIDE DETAILS BELOW FOR A NO RESPONSE TO ANY QUESTION ABOVE, EXCEPT #1 AND #16.

add on - sample # 2

1. See page 2
2. Bottle sent for tritium labelled as Gamma
Preserved bottle sent for Gamma labelled as tritium.

If applicable, was the client contacted? YES / (NO) / NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: 5/25/06

*IR Gun #2: Oakton, SN 29922500201-0066 *IR Gun #4: Oakton, SN 2372220101-0002

Form 201r19.xls (1/13/06)

000045

CONDITION OF SAMPLE UPON RECEIPT FORM **Paragon Analytics**

Client: Cardiller an Workorder No: 0605177 ~~0505177~~ JM 5/24/05

Project Manager: LS Initials: JM Date: 5/24/05

Additional Information:

N/A

Was the laboratory directed to proceed with the analysis of any samples yielding the presence of residual chlorine? YES / NO / NA

NOTE:

No pH adjustments shall be made without prior consent of Project Manager. After pH adjustments, hold metals and radchem samples ≥ 16 hrs. before analysis.

Was the pH of any sample adjusted by the laboratory? **YES** (See Table below) / **NO**

pH Excursion:

Paragon Sample ID	Client Sample ID	Initial pH	Final pH	Reagent Used	Volume Added (mL)	Lot No. of Reagent	Requested Analysis	Initials / Date / Time
0605177-2-2	BM2642	7	1.6	HNO_3	3.0	B19075	Gamma	JM 5/24/05 1050

If applicable, was the client contacted? YES / NO / NA Contact: _____ Date/Time: _____

Project Manager Signature / Date: 5/25

0605177
~~0506177~~
JVC 5/24/06

ORIGIN ID: GJTA (97) 263-7800
CANDY SMITH
CORDILLERAN COMPLICE SVCS. INC.
826 21 ROAD

GRAND JUNCTION, CO 1505
UNITED STATES US

Ship Date: 23MAY06
Actual Wgt: 25.0 LB MAN
System#: 144334/CAFE2285
Account: S 235727234

TO (800) 443-1511

PARAGON ANALYTICS
225 COMMERCE RIVE

FORT COLLINS, C(80524

FedEx
Express

E

CLS091905/08/15

12.0

1.8

REF E84243

Delivery Address Barcode

BILL SENDER

PRIORITY OVRNIGHT

WED
Deliver By:
24MAY06

TRK# 7290 1771 5077 Form 0201

DEN AA

:80524 -CO-US 72 FTCA

Part # 156148-434 NRIT 9-05

PARAGON ANALYTICS
Radiochemistry Data Package

Section 9

ADDITIONAL SUPPORTING DOCUMENTATION

9

Liquid Scintillation Counter

Instrument Calibration

Initial Efficiency Calibration Standards Traceability

LS6500 10mL geometry Tritium Background Determination

As noted in QASS 288299, the background count rate is determined from the average of the reagent blanks (not the method blank) from each batch.

Control limits for reagent blanks are established from 30 individual historical data points (10 batches). Limits are +/- 3 standard de from 30 individual historical data points. Individual reagent blanks and the average of reagent blanks from each batch are in contr Count Rate (CPM) is within the established control limits.

Updated on 6/13/2006. MBC 6/13/06.					Individual Reagent Blanks			Average of Reagent Blanks		
Sample ID	Count Duration (m)	Count Rate (CPM)	Total Cts.	Mean	LCL	UCL	Pass ?	LCL	UCL	Pass ?
3H060522-1CB1	100	10.67	1067.00		10.06	12.64	PASS			
3H060522-1CB2	100	10.83	1083.00		10.06	12.64	PASS			
3H060522-1CB3	100	10.98	1098.00	10.83	10.06	12.64	PASS	10.06	12.64	PASS

Paragon Analytics

QUALITY ASSURANCE SUMMARY SHEET

288299

PAI W.O. # / BATCH 411 ^{3}H - 10mL gec
TEST ^{3}H
METHOD LSC
SOP/REV (PREP) -
SOP/REV (ANAL) ~~7012~~ 704R7

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

Per technical manager's instructions, the count rate from the reagent blank(s) (not the method blank) for the batch will be used for background determination. Data quality is not believed to be affected.

Note - this is a permanent procedural change that will be reflected in the next revision of SOP 704.

LWS 5/17/05

TECHNICIAN/ANALYST Leah Bailey DATE 5/17/05

DEPARTMENT MANAGER David C Bruce DATE 5/17/05

FORM 302r6.doc (4/22/04)

Tritium "Window 2" Control Limits (LS 6500)

The background count rate is determined from the average of the reagent blanks for the batch.

Window 2 control limits are established using the average count rate from the three reagent blanks associated with each prep batch +/- 3X the estimated poisson uncertainty.

Updated 6/13/2006 MBC

Sample ID	Count uration (min	**Average count Duration (min.)**	Count Rate (CPM)	Batch Average Reagent Blank	**Lower Control Limit**	**Upper Control Limit**	**PASS / FAIL**
3H060522-1CB1	100		41.07				
3H060522-1CB2	100		40.16				
3H060522-1CB3	100	**100**	41.17	40.80	**38.88**	**42.72**	PASS

LS6500 10mL geometry Tritium Background Determination

As noted in QASS 288299, the background count rate is determined from the average of the reagent blanks (not the method blank) from each batch.

Control limits for reagent blanks are established from 30 individual historical data points (10 batches). Limits are +/- 3 standard de from 30 individual historical data points. Individual reagent blanks and the average of reagent blanks from each batch are in contr Count Rate (CPM) is within the established control limits.

Updated on 6/13/2006. MBC 6/13/06.					Individual Reagent Blanks			Average of Reagent Blanks		
Sample ID	Count Duration (m)	Count Rate (CPM)	Total Cts.	Mean	LCL	UCL	Pass ?	LCL	UCL	Pass ?
3H060606-2CB1	90	11.46	1031.40		10.06	12.64	PASS			
3H060606-2CB2	90	11.02	991.80		10.06	12.64	PASS			
3H060606-2CB3	90	11.12	1000.80	11.20	10.06	12.64	PASS	10.06	12.64	PASS

Tritium "Window 2" Control Limits (LS 6500)

The background count rate is determined from the average of the reagent blanks for the batch.

Window 2 control limits are established using the average count rate from the three reagent blanks associated with each prep batch +/- 3X the estimated poisson uncertainty.

Updated 6/13/2006 MBC

Sample ID	Count uration (min	**Average count Duration (min.)**	Count Rate (CPM)	Batch Average Reagent Blank	**Lower Control Limit**	**Upper Control Limit**
3H060606-2CB1	90		40.96			
3H060606-2CB2	90		41.18			
3H060606-2CB3	90	**90**	41.57	41.24	**39.21**	**43.27**

Tritium Efficiency Calibration (10ml geometry)

10ml sample + 10ml Ultima Gold LLT
2/12/2006 Count Time (Min.) = 60

Beckman LS 6500
Standard used: 699.2613.19

94000.71	dpm/ml as of	9/3/1998
1/2 life =	12.23	yrs.
Current Activity =	61645.12	dpm/ml
Volume =	0.20	ml
Average Spike Activity =	12329.02	dpm

Sample ID	WIND1 cpm	WIND2 cpm	%LUMEX	H#	
0516025-1	13.78	47.48	0.04	140.9	
0516025-2	12.82	45.83	0.04	140.6	
0516025-3	13.80	46.90	0.04	140.4	
0516025-7	2620.52	48.05	0.00	140.4	
0516025-8	2689.33	50.93	0.00	139.9	
0516025-9	2711.89	48.38	0.00	140.5	
Average LCS=	2673.91	46.74	0.02	140.5	averages
Average Bckgrd=	13.47				
Net cpm=	2660.45	WIND2 *	%LUMEX	H#	
/Known dpm=	12329.02	50.65	5.00	155.5	UCL
		42.82	0.00	125.5	LCL
Efficiency=	0.2158	See Tech. Mgr.	See Tech. Mgr.	Std. Addition	Corrective Action

*WIND2 cotrol limits are based on average of blanks. CL used for calibration only.

Instrument Technician: Kristin Bishop 2/15/06
Signature & Date

Supervisory Review: Renee Mahoney 2/15/06
Signature & Date

R:\INST\LSC\LS6500\2.12.06EFF_H310

ID: H3- 10 ML GEO. 12 FEB 2006 18:17
USER: 8 COMMENT:LS6500

PRESET TIME :	60.00							
DATA CALC :	CPM	H#	:YES	SAMPLE REPEATS:	1	PRINTER	: STD
COUNT BLANK :	NO	IC#	: NO	REPLICATES :	1	RS232	: OFF
TWO PHASE :	NO	AQC	: NO	CYCLE REPEATS :	1	DISK	:EDIT
SCINTILLATOR:	LIQUID	LUMEX:	NO	LOW SAMPLE REJ:	0		
LOW LEVEL :	YES	HALF LIFE CORRECTION DATE:				none	

CHAN: 100.0 - 320.0 %ERROR: 2.00 FACTOR: 1.000000 BKG. SUB: 0
CHAN: 380.0 - 990.0 %ERROR:20.00 FACTOR: 1.000000 BKG. SUB: 0

SAM NO	POS	TIME MIN	H#	WIND1 CPM	WIND1 %ERROR	WIND2 CPM	WIND2 %ERROR	LUMEX %	ELAPSED TIME
1	29-1	60.00	140.9	13.78	6.95	47.48	3.75	0.04	61.03
2	29-2	60.00	140.6	12.82	7.21	45.83	3.81	0.04	122.13
3	29-3	60.00	140.4	13.80	6.95	46.90	3.77	0.04	183.25
4	29-4	3.85	140.4	2620.52	1.99	48.05	14.70	0.00	187.74
5	29-5	3.75	139.9	2689.33	1.99	50.93	14.47	0.00	192.14
6	29-6	3.70	140.5	2711.89	2.00	48.38	14.95	0.00	196.49
7	29-7	60.00	141.3	51.58	3.60	46.25	3.80	0.02	257.59

LMS 2/15/06

306214

Paragon Analytics

LSC Run Log

Instrument ID: LS 6500

	Date	Sample ID	CountTime (min.)	Rack & Position	Test	User #	Batch ID	Position Check	Initials	Comments
1	2/11/06	060102S-1D	360	19 - 2	Ni63	12	N1060125-1	✓	✓	NA
2	↓	N1060125-1MB	↓	↓ - 3	↓	↓	↓	✓	✓	NA
3	2/12/06	↓ LCS	360	19 - 4	Ni63	12	↓	✓	✓	NA
4	↓	DAILY QC	10	1 - 1-4	-	1	-	✓	✓	NA
5	2/12/06	051602S-1	60	29 - 1	H3-10mL	8	051602S			H3-10mL Calib
6		-2	↓	- 2						
7		-3		- 3						
8		-7	3.85	- 4						
9		-8	3.75	- 5						
10		-9	3.70	- 6						
11		-13	60	- 7						
12				-						
13				-						
14				-						
15				-						
16				-						
17				-						
18				-						
19				-						
20				-						
21				-						
22				-						
23				-						
24				-						
25				-						
26				-						
27				-						
28				-						
29				-						
30				-						

✓ 2/14/06

Reviewed by / Date ✓ 2/14/06

FORM 762r4.XLS (12/24/2002)

306214

000057

Paragon Analytics, Inc.

Liquid Scintillation Benchsheet

Prep Batch: 16025H8.XLS

Prep Analyst: JRK
Prep Date: 4/27/2005
Prep SOP: 700R9

Non-Routine Pretreatment? Y / N
Re-extraction? Y / N

Matrix: WATER
File Name:

Lab Sample ID	Rack	Rack Pos	Matrix	Report Basis	Analysis Volume	Units	% Moisture	Water Added	Aliquot Volume	Spike Volume	Spike Standard	Spike Pipet	Remarks
0516025-1	29	1	WATER	AR	10	ML	100	0	50				
0516025-2	29	2	WATER	AR	10	ML	100	0	50				
0516025-3	29	3	WATER	AR	10	ML	100	0	50				
0516025-4			WATER	AR	5	ML	100	0	50				
0516025-5			WATER	AR	5	ML	100	0	50				
0516025-6			WATER	AR	5	ML	100	0	50				
0516025-7	29	4	WATER	AR	10	ML	100	0	49	1	699.2613.19	RS-005	
0516025-8	29	5	WATER	AR	10	ML	100	0	49	1	699.2613.19	RS-005	
0516025-9	29	6	WATER	AR	10	ML	100	0	49	1	699.2613.19	RS-005	
0516025-10			WATER	AR	5	ML	100	0	49	1	699.2613.19	RS-005	
0516025-11			WATER	AR	5	ML	100	0	49	1	699.2613.19	RS-005	
0516025-12			WATER	AR	5	ML	100	0	49	1	699.2613.19	RS-005	
0516025-13	29	7	WATER	AR	10	ML	100	0	49.5	0.5	466.2613.60	ST-002	
0516025-14			WATER	AR	5	ML	100	0	49.5	0.5	466.2613.60	ST-002	

Cocktail: UG LLT LOT# 97-050102
Balance #:

Scintillation Pipet: T-002
Aliquot Pipet: RS-007, RS-011

Spiked By: JRK on 4/27/05
Spike Witness: JLK on 4/27/05

Reviewed By: on
Received By:

r:\A-ra-sr\bench\16025H8.xls

16025H8.XLS

Liquid Scintillation Benchsheet

Page 1 of 1

5mL
3ea

Paragon Analytics, Inc.

Prep Batch: 16025H3.XLS

Matrix: WATER

Prep Analyst: JRK

Prep Date: 4/27/05

Prep SOP: 700R9

Non-Routine Pretreatment? Y / N

Re-extraction? Y / N

File Name:

Lab Sample ID	Rack	Rack Pos	Matrix	Report Basis	Analysis Volume	Units	% Moisture	Water Added	Aliquot Volume	Spike Volume	Spike Standard	Spike Pipet	Remarks
0516025-1			WATER	AR	10	ML	100	0	50				
0516026-2			WATER	AR	10	ML	100	0	50				
0516026-3			WATER	AR	10	ML	100	0	50				
0516026-4	18	1	WATER	AR	5	ML	100	0	50				
0516025-5		2	WATER	AR	5	ML	100	0	50				
0516025-6		3	WATER	AR	5	ML	100	0	50				
0516025-7			WATER	AR	10	ML	100	0	49	1	699.2613.19	RS-005	
0516026-8			WATER	AR	10	ML	100	0	49	1	699.2613.19	RS-005	
0516026-9			WATER	AR	10	ML	100	0	49	1	699.2613.19	RS-005	
0516026-10			WATER	AR	10	ML	100	0	49	1	699.2613.19	RS-005	
0516026-11	18	4	WATER	AR	5	ML	100	0	49	1	699.2613.19	RS-005	
0516025-12		5	WATER	AR	5	ML	100	0	49	1	699.2613.19	RS-005	
0516025-13		6	WATER	AR	5	ML	100	0	49	1	699.2613.19	RS-005	
0516026-14			WATER	AR	10	ML	100	0	49.6	0.6	486.2613.80	ST-002	
0516026-14	18	7	WATER	AR	5	ML	100	0	49.5	0.5	486.2613.80	ST-002	

DRAFT

Cocktail: UG LLT LOT# 97-050102

Balance #:

Scintillation Pipet: T-002

Aliquot Pipet: RS-007, RS-011

Spiked By: JRK on 4/27/05

Spike Witness: JLK on 4/27/05

Reviewed By: on

Received By: on 4/28/05

DRAFT

16025H3.XLS

Paragon Analytics, Inc.

TRITIUM RUN LOG

268468 Logbook/Page No. SOP 700 Rev 9 Form 999005rL.doc (3/30/2003)

Date	Workorder/ Sample Number	Column ID	Flask ID	Run No.	Comments	Technician's Initials
4/20/05	3H0504201 HS	D	T5	1	Batch 3H0504201	JKK
↓	3H0504201 LCS	E	T11	↓	↓	↓
4/25/05	0516024-1, -4	A	T5	1	De-I H_2O ^3H Calib	JKK
↓	-2, -5	B	T2	↓	↓	↓
↓	-3, -6	C	604 (605 struck)	↓	↓	↓
↓	0516024-7, -10	D	T10	↓	↓	↓
↓	-8, -11	E	T9	↓	↓	↓
↓	-9, -12	F	T3	↓	↓	↓
↓	0516024-13, -14	A	111	2	↓	↓
4/27/05	0516025-1, -4	A	T1	1	AP H_2O ^3H Calib	JKK
↓	-2, -5	B	T5	↓	↓	↓
↓	-3, -6	C	T10	↓	↓	↓
↓	0516025-7, -10	D	T11	↓	↓	↓
↓	-8, -11	E	103	↓	↓	↓
↓	-9, -12	F	111	↓	↓	↓
↓ (JKK 4/28/05)	0516025-13, -14	A	604	2	↓	↓
4/29/05	0504235-1	A	T1	1	Batch: 3H0504291	JKK
↓	-1D	B	T10	↓	↓	↓
↓	-1MS	C	T11	↓	↓	↓
↓	3H0504291 MB	D	111	↓	↓	↓
↓	3H0504291 LCS	E	604	↓	↓	↓
	CWB 5/5/05					

Reviewed by / Date CWB 5/5/05

Paragon Analytics

QUALITY ASSURANCE SUMMARY SHEET

PAI W.O. #/BATCH 45C

TEST 45C

METHOD 45C

SOP/REV (PREP) —

SOP/REV (ANAL) 704 r-7

Briefly document any QA or other problems or deviations associated with the analysis of samples. Problems could result from: log-in, color, odor, dilution, consistency, scheduling, equipment, or instrumentation, or may include documentation of minor deviations necessary due to unique DQO's or sample characteristics.

CMM 9/23/05

As of 9/22/05, control limits for the "Window 2" count rate are established using the average count rate from the three reagent blanks associated with each prep batch +/- 3X the estimated poisson uncertainty.

CMM 9/23/05

CMM 9/23/05

TECHNICIAN/ANALYST _____ DATE 9/23/05

DEPARTMENT MANAGER _____ DATE 9/23/05

293979

FORM302r6.doc (4/22/04)

Notebook No. 2613

699.2613.19 3H

Continued From Page

Prepare a working dilution of approx. 95,000 DPM/mL by diluting Std 699.2613.18 with DI water.

1) See Density on page 18 of logbook 2613

Sand ID: 699.2613.19
Description: 3H
Expiration: 8/11/05
Activity: 94000.71 dpm/mL
2σ Uncertainty: 676.81 dpm/mL
Ref. Date: 9/3/98
Ref Time: N/A
Prep Date: 7/29/04 Prep by: JLK
Matrix/Comp. DI Water
Half Life (y): 1.23E+01
Requires NCR for ICPT work

2) Transfer Std. 699.2613.18 to a 125 mL Amber glass bottle

Mass of bottle w/o lid	94.7589 g
Mass of bottle + Std	96.6785 g
Net mass of Std	1.9196 g

3) Add DI water to final Dilution

Mass of bottle w/o lid from above	94.7589 g
Mass of bottle Std + DI water	192.4426 g
Net mass of Std + DI water	97.6837 g

4) Final Activity Calculation

$$\frac{(634.7\ kBq/g)(\ldots)(60\ dpm/Bq)(1000\ Bq/kBq)(0.9858\ g/mL)(1.9196\ g)}{(35.5765\ g)\ (97.6837\ g)}$$

= 94,000.71 DPM/mL

Sand ID: 699.2613.19
Description: 3H
Expiration: 7/28/04
Activity: 94000.71 dpm/mL
2s Uncertainty: 676.81 dpm/mL
Ref. Date: 9/3/98
Ref Time: N/A
Prep Date: 7/28/03 Prep by: JRK
Matrix/Comp. DI Water
Half Life (y): 1.23E+01

Sand ID: 699.2613.19
Description: 3H
Expiration: 7/30/05
Activity: 94000.71 dpm/mL
2s Uncertainty: 676.81 dpm/mL
Ref. Date: 9/3/98
Ref Time: N/A
Prep Date: 7/29/04 Prep by: JLK
Matrix/Comp. DI Water
Half Life (y): 1.23E+01

7/28/03

8/1/03

PROJECT 677.2613.18 3H Notebook No. 2645

Continued From Page

Prepare a 1st dilution of Ampoule 679 by diluting with DI water.

1) Determine the density of DI water

Mass of empty Class A 100mL volumetric flask	67.7950 g Bal #4
Mass of flask + 100 mL of DI water	167.3755 g
Net mass of DI water	99.5791 g
	ρ = 0.9958 g/mL

2) Transfer contents of ampoule 679 into a 40 mL Amber glass VOA vile

Mass of VOA vile w/o lid	24.3883 g Bal #4
Mass of opened ampoule before transfer	40.8439 g
Mass of opened ampoule after transfer	36.0281 g
Net mass of Std transferred	4.8151 g

3) Add DI water to final dilution

Mass of VOA vile w/ ampoules from above	24.3883 g Bal #4
Mass of VOA vile, std + DI water	62.9648 g
Net mass of Std + DI water	38.5765 g

4) Final Activity Calculation

$$\frac{(634.7\ \text{kBq/g})(4.8151\ \text{g})\left(\frac{60\ \text{dpm}}{\text{Bq}}\right)(1000\ \text{Bq/kBq})(0.9958\ \text{g/mL})}{38.5765\ \text{g}}$$

= 4,733,412.57 dpm/mL

U.S. Department of Commerce
National Institute of Standards and Technology
SRM 4927F
Hydrogen-3
<4 MBq in distilled water
CAUTION
RADIOACTIVE

Continued on Page

Signature [signature] Date 7/28/03

Witnessed & Understood By [signature] Date 7/31/03

National Institute of Standards & Technology

Certificate

DATED 1999
Recd 5-04-03

Standard Reference Material 4927F
Hydrogen-3 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive hydrogen-3, as water, in 5 mL of distilled water. The solution is contained in a flame-sealed NIST borosilicate-glass ampoule. The SRM is intended for the calibration of beta-particle counting instruments and for the monitoring of radiochemical procedures.

Radiological Hazard

The SRM ampoule contains hydrogen-3 with a total activity of approximately 3.2 MBq. Hydrogen-3 decays by beta-particle emission. None of the beta particles escape from the SRM ampoule. During the decay process no photons are emitted. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. There is no detectable external radiation. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains only distilled water. There is no chemical hazard. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2.

Storage and Handling

The SRM should be stored and used at a temperature between 5 and 65 °C. The solution in an unopened ampoule should remain stable and homogeneous until at least September 2008.

The ampoule (or any subsequent container) should always be clearly marked as containing radioactive material. If the ampoule is transported it should be packed, marked, labeled, and shipped in accordance with the applicable national, international, and carrier regulations. The solution in the ampoule is a dangerous good (hazardous material) because of the radioactivity.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, L.R. Karam, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas and M.P. Unterweger of the Radioactivity Group.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by J.W.L. Thomas.

Bert M. Coursey, Chief
Ionizing Radiation Division

Nancy M. Trahey, Chief
Standard Reference Materials Program

Gaithersburg, Maryland 20899
June 1999
Half-life and text revised October 2000

*Notes and references are on pages 5 and 6

Recommended Procedure for Opening the SRM Ampoule

1) If the SRM solution is to be diluted, it is recommended that the diluting solution have a composition comparable to that of the SRM solution.

2) Wear eye protection, gloves, and protective clothing and work over a tray with absorbent paper in it. Work in a fume hood.

3) Shake the ampoule to wet all of the inside surface of the ampoule. Return the ampoule to the upright position.

4) Check that all of the liquid has drained out of the neck of the ampoule. If necessary, gently tap the neck to speed the process.

5) Holding the ampoule upright, score the narrowest part of the neck with a scribe or diamond pencil.

6) Lightly wet the scored line. This reduces the crack propagation velocity and makes for a cleaner break.

7) Hold the ampoule upright with a paper towel, a wiper, or a support jig. Position the scored line away from you. Using a paper towel or wiper to avoid contamination, snap off the top of the ampoule by pressing the narrowest part of the neck away from you while pulling the tip of the ampoule towards you.

8) Transfer the solution from the ampoule using a pycnometer or a pipet with dispenser handle. NEVER PIPETTE BY MOUTH.

9) Seal any rinsed SRM solution in a flame-sealed glass ampoule, if possible, to minimize the evaporation loss.

See also reference [4]*.

*Notes and references are on pages 5 and 6.

PROPERTIES OF SRM 4927F

Certified values

Solution density	(0.998 ± 0.002) g·mL^{-1} at 20.0 °C [b]*
Radionuclide	Hydrogen-3
Reference time	1200 EST, 3 September 1998
Massic activity of the solution [c]	634.7 kBq·g^{-1}
Relative expanded uncertainty (k=2)	0.72% [d] [e]

Uncertified values

Physical Properties:			
Source description	Liquid in flame-sealed NIST borosilicate-glass ampoule		
Ampoule specifications	Body outside diameter Wall Thickness Barium content Lead-oxide content Other heavy elements	(16.5 ± 0.5) mm (0.60 ± 0.04) mm Less than 2.5% Less than 0.02% Trace quantities	
Solution mass	Approximately 5.0 g		
Chemical Properties:			
Solution composition	Chemical Formula	Concentration (mol·L^{-1})	Mass Fraction (g·g^{-1})
	H_2O ^3HHO	55 6×10^{-7}	1.00 1×10^{-8}
Radiological Properties:			
Radionuclidic impurities	None detected [f]		
Half lives used	Hydrogen-3: (4500 ± 8) d [g]		
Calibration method and measuring instrument(s)	4πβ gas counting of SRM 4927E using the NIST length-compensated internal gas proportional counters and intercomparison of SRMs 4927E/4927F using two 4πβ liquid-scintillation counting systems [h]		

*Notes and references are on pages 5 and 6.

EVALUATION OF THE UNCERTAINTY OF THE MASSIC ACTIVITY [d]*

Input Quantity x_i, the source of uncertainty (and individual uncertainty components where appropriate)	Method Used To Evaluate $u(x_i)$, the standard uncertainty of x_i (A) denotes evaluation by statistical methods (B) denotes evaluation by other methods	Relative Uncertainty Of Input Quantity, $u(x_i)/x_i$, (%) [i]	Relative Sensitivity Factor, $\lvert \partial y/\partial x_i \rvert \cdot (x_i/y)$ [j]	Relative Uncertainty Of Output Quantity, $u_i(y)/y$, (%) [k]
Massic count rate of SRM 4927E, corrected for background and decay [h]	Standard deviation of the mean for 23 sets of γ-ray counting measurements (A)	0.18	1.0	0.18
Gram-mole measurements	Estimated (B)	0.20	1.0	0.20
Live-time [p]	Estimated (B)	0.10	1.0	0.10
Extrapolation of count-rate-versus-energy to zero energy	Estimated (B)	0.20	1.0	0.20
Half life of H-3	Standard uncertainty of the half life (A)	0.18 [m]	0.009 [n]	0.002
Liquid-scintillation intercomparison of SRM 4927F and SRM 4927E	Standard deviation of the mean for 7 sets of liquid-scintillation measurements (A)	0.06	1.0	0.06
Radionuclidic impurities	Limit of detection (B). [q]	100.	0.0005	0.05
Relative Combined Standard Uncertainty of the Output Quantity, $u_c(y)/y$, (%).				0.36
Coverage Factor, k				x 2
Relative Expanded Uncertainty of the Output Quantity, U/y, (%)				0.72

*Notes and references are on pages 5 and 6.

NOTES

[a] The Sievert is the SI unit for dose equivalent. See reference [1]. One-μSv is equal to 0.1 mrem.

Distance from Ampoule (m):	1	30	100
Approximate Dose Rate (μSv/h):	<0.1 (Not detectable)		

[b] The stated uncertainty is two times the standard uncertainty.

[c] *Massic activity* is the preferred name for the quantity activity divided by the total mass of the sample. See reference [1].

[d] The reported value, y, of massic activity (activity per unit mass) at the reference time was not measured directly but was derived from measurements and calculations of other quantities. This can be expressed as $y = f(x_1, x_2, x_3, \ldots x_n)$, where f is a mathematical function derived from the assumed model of the measurement process.

The value, x_i, used for each input quantity i has a standard uncertainty, $u(x_i)$, that generates a corresponding uncertainty in y, $u_i(y) = |\partial y/\partial x_i| \cdot u(x_i)$, called a component of combined standard uncertainty of y.

The combined standard uncertainty of y, $u_c(y)$, is the positive square root of the sum of the squares of the components of combined standard uncertainty.

The combined standard uncertainty is multiplied by a coverage factor of $k = 2$ to obtain U, the expanded uncertainty of y.

Since it can be assumed that the possible estimated values of the massic activity are approximately normally distributed with approximate standard deviation $u_c(y)$, the unknown value of the massic activity is believed to lie in the interval $y \pm U$ with a level of confidence of approximately 95 percent.

For further information on the expression of uncertainties, see references [2] and [3].

[e] The value of each standard uncertainty component, and hence the value of the expanded uncertainty itself, is a best estimate based upon all available information, but is only approximately known. That is to say, the "uncertainty of the uncertainty" is large and not well known. This is true for uncertainties evaluated by statistical methods (e.g., the relative standard deviation of the standard deviation of the mean for the massic response is approximately 50%) and for uncertainties evaluated by other methods (which could easily be over estimated or under estimated by substantial amounts). The unknown value of the expanded uncertainty is believed to lie in the interval $U/2$ to $2U$ (i.e., within a factor of 2 of the estimated value).

[f] The estimated limit of detection for radionuclidic impurities is 300 $Bq \cdot g^{-1}$.

[g] The stated uncertainty is the standard uncertainty. See reference [5].

[h] Extensive gas-counting measurements were made on the SRM 4927E solution during 1998 and 1999. The SRM 4927F solution was intercompared with the SRM 4927E solution using liquid-scintillation counting.

[i] Relative standard uncertainty of the input quantity x_i.

[l] The relative change in the output quantity y divided by the relative change in the input quantity x_i. If $|\partial y/\partial x_i| \cdot (x_i/y) = 1.0$, then a 1% change in x_i results in a 1% change in y. If $|\partial y/\partial x_i| \cdot (x_i/y) = 0.05$, then a 1% change in x_i results in a 0.05% change in y.

[k] Relative component of combined standard uncertainty of output quantity y, rounded to two significant figures or less. The relative component of combined standard uncertainty of y is given by $u_i(y)/y = |\partial y/\partial x_i| \cdot u(x_i)/y = |\partial y/\partial x_i| \cdot (x_i/y) \cdot u(x_i)/x_i$. The numerical values of $u(x_i)/x_i$, $|\partial y/\partial x_i| \cdot (x_i/y)$, and $u_i(y)/y$, all dimensionless quantities, are listed in columns 3, 4, and 5, respectively. Thus, the value in column 5 is equal to the value in column 4 multiplied by the value in column 3. The input quantities are independent, or very nearly so. Hence the covariances are zero or negligible.

[m] The relative standard uncertainty of $\lambda \cdot t$ is determined by the relative standard uncertainty of λ (i.e., of the half life). The relative standard uncertainty of t is negligible.

[n] $|\partial y/\partial x_i| \cdot (x_i/y) = |\lambda \cdot t|$

[p] The live time is determined by counting the pulses from a gated crystal-controlled oscillator.

[q] The standard uncertainty for each undetected impurity that might reasonably be expected to be present is estimated to be equal to the estimated limit of detection for that impurity, i.e. $u(x_i)/x_i = 100\%$. $|\partial y/\partial x_i| \cdot (x_i/y) = \{(\text{response per Bq of impurity})/(\text{response per Bq of H-3})\} \cdot \{(\text{Bq of impurity})/(\text{Bq of H-3})\}$. Thus $u_i(y)/y$ is the relative change in y if the impurity were present with a mass activity equal to the estimated limit of detection.

REFERENCES

[1] International Organization for Standardization (ISO), *ISO Standards Handbook – Quantities and Units*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900.

[2] International Organization for Standardization (ISO), *Guide to the Expression of Uncertainty in Measurement*, 1993. Available from the American National Standards Institute, 11 West 42nd Street, New York, NY 10036, U.S.A. 1-212-642-4900. (Listed under ISO miscellaneous publications as "ISO Guide to the Expression 1993".)

[3] B. N. Taylor and C. E. Kuyatt, *Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results*, NIST Technical Note 1297, 1994. Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402, U.S.A.

[4] National Council on Radiation Protection and Measurements Report No. 58, *A Handbook of Radioactivity Measurements Procedures*, Second Edition, 1985. Available from the National Council on Radiation Protection and Measurements, 7910 Woodmont Avenue, Bethesda, MD 20814 U.S.A.

[5] L.L. Lucas and M.P. Unterweger, *Comprehensive Review and Critical Evaluation of the Half-Life of Tritium*, J. Res. Natl. Inst. Stand. Technol. 105, 541-549 (2000).

DAILY INSTRUMENT PERFORMANCE CHECKS - LS6500

Daily IPCs consist of the following standards;

Efficiency Check

Beckman Tritium Standard	Beckman C-14 Standard	PAI Reagent Blank
Lot HNP0509	Lot CNP3311	10/13/2004
105800 dpm	101000 dpm	
10/29/2003 REF	10/29/2003 REF	
10/29/2008 EXP	10/29/2008 EXP	

Interim Control Limits 1/25/2006

	Decay Corrected Tritium	Carbon-14	Reagent Blank	Quench Factor
UCL	53731.57	73819.79	18.5	145.8
Mean Value	48824.45	67108.90	14.9	132.5
LCL	43962.20	60398.01	11.2	119.3

r:\inst\lsc\ls6500\prg\0805lsqa6500.xls

Date	H-3 CPM	Decay Corrected H-CPM		C-14 CPM		Reagent H-3 Bkg CPM		Quench H#	
2/6/2006	43114.8	49022.92	OK	66888.5	OK	12.1	OK	138.6	OK
2/7/2006	43619.6	49604.56	OK	67084.8	OK	12.7	OK	134.3	OK
2/8/2006	43544.1	49526.35	OK	67772.1	OK	14.9	OK	133	OK
2/10/2006	43536.4	49532.90	OK	67085.9	OK	12.9	OK	134.6	OK
2/11/2006	42704.3	48593.70	OK	67500.5	OK	13.4	OK	134.5	OK
2/12/2006	43445.7	49444.99	OK	67272.7	OK	16.1	OK	134.4	OK
2/13/2006	44224.3	50338.88	OK	66942.8	OK	16.3	OK	135.3	OK

Calibration Source Check

LS6500

Date:	2/12/2006
Nuclide:	H3
Half Life:	1.223E+01 yr.

Calibration Check Source:

Spike Standard:	486.2613.60	
Reference Date :	3/23/1998	
Spiked DPM :	2852.9	dpm/mL
Spike Volume :	0.5	mL
Spiked into :	49.5	mL
Current Spk. Act. :	8.30	pCi/mL

Calibration Check Source Count

Sample ID	Rack	Pos	Sam. Date	Cnt. Dur.	Anal. Vol.	GrsCPM	BkgCPM	Efficiency	Activity	Units	Chem. Yield
0516025-13	29	7	4/27/2005	60	10	51.58	13.47	0.2158	8.32	pCi/mL	100%

LCS Recovery:	**100.3%**
PAI Limits:	**85-115%**

60
PROJECT 486.2613.60 3H Notebook No. 2613
Continued From Page

PREPARE A WORKING DILUTION AT ~ 2500 dpm/ml OF 3H BY DILUTING STANDARD 486.1284.85 WITH DI WATER (ACTIVITY OF 486.1284.85 = 948004.38 dpm/ml) BG 9/27/04

1.) DETERMINE DENSITY OF DI WATER:
BAL 12 MASS OF EMPTY CLASS A 100 ml VOLUMETRIC FLASK: 62.6207 g
W/ MASS OF CLASS A VOLUMETRIC FLASK + 100 ml DI H_2O: 162.2711 g

NET MASS OF DI H_2O: 99.6504 g

ρ = 0.9965 g/ml

2.) TRANSFER STANDARD 486.1284.85 TO A 500 ml AMBER BOTTLE:
MASS OF BOTTLE W/O LID: 256.68 g BAL 26
MASS OF BOTTLE + STD: 258.18 g
NET MASS OF STD: 1.50 g

3.) ADD DI H_2O TO FINAL DILUTION:
MASS OF BOTTLE W/O LID (FROM ABOVE): 256.68 g
MASS OF BOTTLE + STD + DI H_2O: 753.4 g
NET MASS OF STD + DI H_2O: 496.7 g BG 9/27/04

4.) FINAL ACTIVITY CALCULATION:

$$\frac{(0.9965\ g/ml)(1.50\ g)(948004.38\ dpm/ml)}{496.7\ g} = 2852.9\ dpm/ml$$

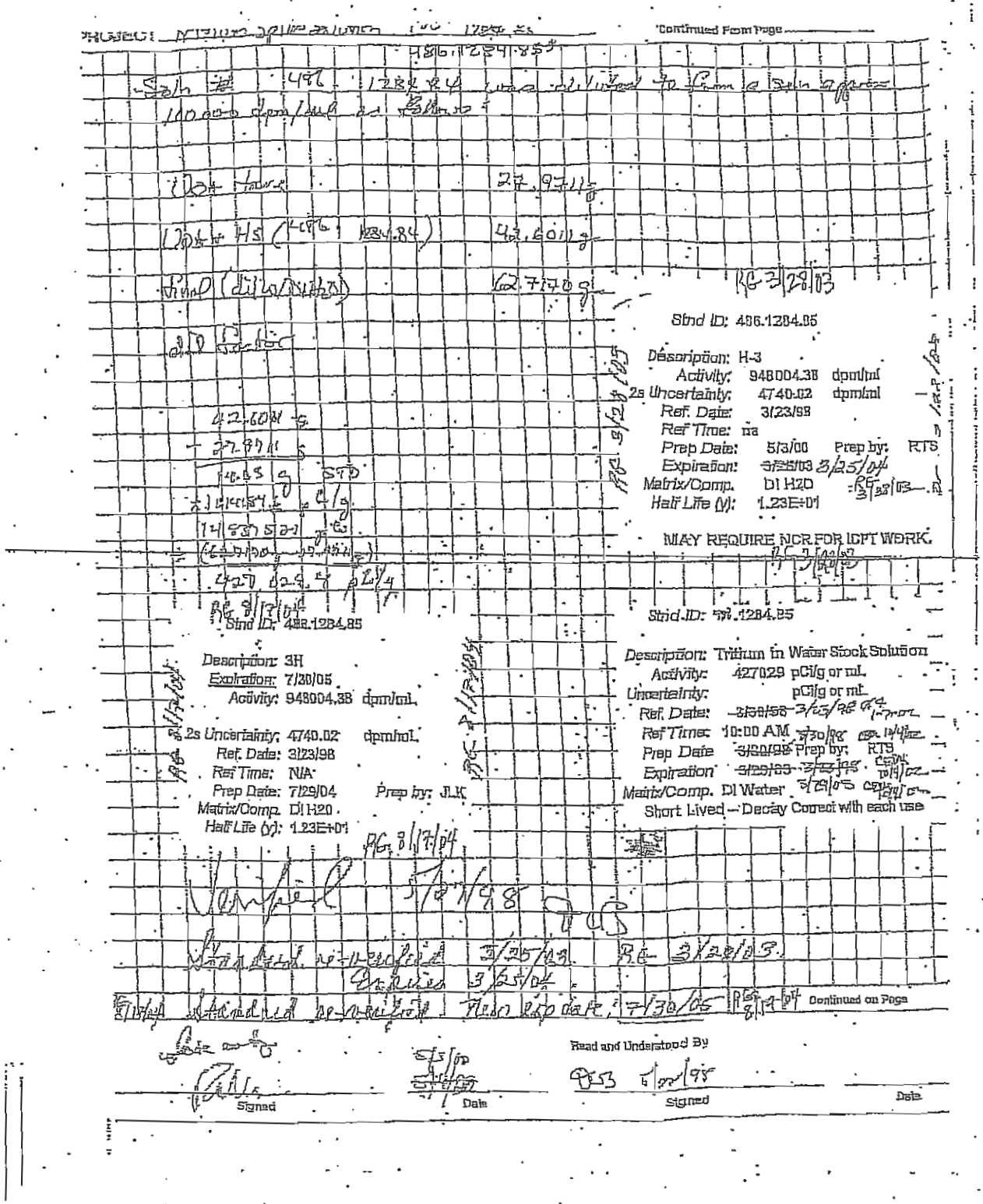
(2855.7 struck through; BG 9/27/04)

RG 10/5/04
Std ID: 486.2613.60
Description: 3H
Expiration: 9/28/05
Activity: 2852.90 dpm/mL
2s Uncertainty: 95.10 dpm/mL
Ref. Date: 3/23/99
Ref Time: N/A
Prep Date: 9/27/04 Prep by: AF
Matrix/Comp. DI H2O
Half Life (y): 1.24E+01
RG 10/5/04
Requires NCR for ICPT work.
RC 10/5/04

Std ID: 486.2613.60 RG 4/12/05
Description: 3H
Expiration: 8/11/06
Activity: 2852.90 dpm/mL
2s Uncertainty: 95.10 dpm/mL
Ref. Date: 3/23/98
Ref Time: N/A
Prep Date: 9/27/04 Prep by: AF
Matrix/Comp. DI H2O
Half Life (y): 1.24E+01
RG 9/28/05

Continued on Page

Read and Understood By
Signed [signature] Date 10/5/04 Signed [signature] Date 10/5/04



Continued From Page

Stnd ID: 486.1284.85

Description: H-3
Activity: 948004.38 dpm/ml
2s Uncertainty: 4740.02 dpm/ml
Ref. Date: 3/23/98
Ref Time: na
Prep Date: 5/3/00 Prep by: RTS
Expiration: ~~3/25/03~~ 3/25/04
Matrix/Comp. DI H2O
Half Life (y): 1.23E+01

MAY REQUIRE NCR FOR ICPT WORK.

Stnd ID: 486.1284.85

Description: 3H
Expiration: 7/30/05
Activity: 948004.38 dpm/mL
2s Uncertainty: 4740.02 dpm/mL
Ref. Date: 3/23/98
Ref Time: NIA
Prep Date: 7/29/04 Prep by: JLK
Matrix/Comp. DI H20
Half Life (y): 1.23E+01

Stnd.ID: ~~486~~.1284.85

Description: Tritium in Water Stock Solution
Activity: 427029 pCi/g or mL
Uncertainty: pCi/g or mL
Ref. Date: ~~3/30/98~~ 3/23/98
Ref Time: 10:00 AM
Prep Date ~~3/30/98~~ Prep by: RTS
Expiration ~~3/25/03~~ ~~3/25/04~~ ~~3/25/05~~ 7/30/05
Matrix/Comp. DI Water
Short Lived – Decay Correct with each use

Continued on Page

Read and Understood By

Signed Date Signed Date

000073

PROJECT Tritium Stock Solution 486.1284.84

Notebook No. ______

Continued From Page ______

Std ID: 486.1284.84

Description: 3H
Expiration: 7/30/05
Activity: 1014184.00 pCi/g or ml
2s Uncertainty: 50709.00 pCi/g or ml
Ref. Date: 3/23/98
Ref Time: N/A
Prep Date: 7/29/04 Prep by: JLK
Matrix/Comp. DI Water
Half Life (y): 1.23E+01

Std ID: 486.1284.84

Description: H-3
Activity: 1014184.00 pCi/g or ml
2s Uncertainty: 50709.00 pCi/g or ml
Ref. Date: 3/23/98
Ref Time: 0.417
Prep Date: 3/30/98 Prep by: RTS
Expiration: 7/3/04
Matrix/Comp. DI Water
Half Life (y): 1.24E+01

Std ID: 486.1284.84

Description: Tritium in Water Stock Solution
Activity: 1014184 pCi/g or mL
Uncertainty: pCi/g or mL
Ref. Date: ~~3/23/98~~ 3/23/98 7-7-02
Ref Time: 10:00
Prep Date 3/30/98 Prep by: RTS
Expiration 3/29/03
Matrix/Comp. DI Water
Short Lived—Decay Correct with each use

Continued on Page

Read and Understood By

Signed 5/5/00 Date

Signed Date

ANALYTICS

1300 Seaboard Industrial Blvd.
Atlanta, Georgia 30318 • U.S.A.
Phone (404) 352-8677
Fax (404) 352-2837

PAT-0048
rec'd 3-24-98

CERTIFICATE OF CALIBRATION

Standard Radionuclide Source

55543-307

H-3 in Water 50 mL in Flame Sealed Vial

This standard radionuclide source was prepared using an aliquot measured gravimetrically from a master radionuclide solution standard. The master radionuclide solution standard was calibrated by the Department Des Applications Et De La Metrologie Des Rayonnements Ionisants (DAMRI), Paris, France, as Number 24057. The calibration was checked by liquid scintillation counting after source preparation.

ANALYTICS maintains traceability to the National Institute of Standards and Technology through Measurements Assurance Programs as described in USNRC Reg. Guide 4.15, Revision 1.

ISOTOPE:	H-3
ACTIVITY (dps):	1.889 E+06
CALIBRATION DATE:	March 23, 1998 12:00 EST
HALF-LIFE:	12.43 years
TOTAL UNCERTAINTY:	5.0%

50.34 grams of water.

P O NUMBER 21143, Item 1

PREPARED BY: M. D. Currie
M. D. Currie, Radiochemist

Q A APPROVED: 3/23/98

Liquid Scintillation Counter

Quality Control Data

Daily Instrument Performance Checks

DAILY INSTRUMENT PERFORMANCE CHECKS - LS6500

Daily IPCs consist of the following standards;

Efficiency Check

Beckman Tritium Standard	Beckman C-14 Standard	PAI Reagent Blank
Lot HNP0509	Lot CNP3311	10/13/2004
105800 dpm	101000 dpm	
10/29/2003 REF	10/29/2003 REF	
10/29/2008 EXP	10/29/2008 EXP	

Historical Control Limits 3/4/2006

	Decay Corrected Tritium	Carbon-14	Reagent Blank	Quench Factor
UCL	50655.48	68696.60	18.9	138.8
Mean Value	49177.70	67446.32	14.9	135.1
LCL	47699.92	66196.05	11.0	131.4

r:\inst\lsc\ls6500\prg\0805lsqa6500.xls

*Auto calibration perfomed, data used only to verify control limits. KB 4/07/06

Date	H-3 CPM	Decay Corrected H-CPM		C-14 CPM		Reagent H-3 Bkg CPM	<MAM g CPM		Quench H#	
6/10/2006	42856.3	49671.78	OK	66167.5	Low	12.9	OK		140.2	OK
6/11/2006	41557.2	48173.53	OK	66079.2	Low	17	OK		141.7	OK
6/12/2006	42498.0	49271.73	OK	66066.2	Low	13.8	OK		140.9	OK

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*Auto calibration perfomed, data used only to verify control limits. KB 4/07/06

Date	H-3 CPM	Decay Corrected H-CPM		C-14 CPM		Reagent H-3 Bkg CPM	MAM g CPM		Quench H#	
6/20/2006	42742.5	49616.50	OK	66965.7	OK	17.5	OK		141.3	OK
6/22/2006	42547.6	49405.52	OK	67231	OK	15.7	OK		140	OK