Battelle
Columbus Laboratories

Form No. _____

CHAIN OF CUSTODY RECORD

Proj. No.: G486111-T3

Project Title: Source Determination Study

SAMPLERS: (Signature) G. Hendryx / D. Conner / B. Headingford

PO# 191762

DATE	TIME	SAMPLE I.D.	Helium (He)	Tritium (H3)	Container No.	Number of Containers	Remarks
02JUN05	1340	GARFIELD	X	X		2	
02JUN05	1052	Sunset	X	X		2	
02JUN05	1530	Bingham	X	X		2	
03JUN05	0930	LFWC-2	X	X		2	
03JUN05	1330	LAWC-3	X	X		2	
05JUN05	1130	MW-1		X		1	

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]	6-6-2005 16:00				
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature) Zofer Toyo	Date/Time 6/8/05	Remarks Sent to: University of Miami	

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Battelle
Columbus Laboratories

CHAIN OF CUSTODY RECORD

Form No. _____

Proj. No.: G486111-T3

Project Title: Source Determination Study

SAMPLERS: (Signature) D. Conner

PO # 191762

SAMPLE TYPE (√): Tritium, Rcv'd 8/18/05

DATE	TIME	SAMPLE I.D.	Tritium	Rcv'd 8/18/05	Container No.	Number of Containers	Remarks
7/26/2005	14:45	MW-21-2	X	✓			
7/26/2005	16:00	MW-21-1	X	✓			
8/1/2005	08:57	MW-20-5	X	✓			
8/1/2005	10:50	MW-20-4	X	✓			
8/1/2005	12:30	MW-20-3	X	✓			
8/1/2005	14:07	MW-20-2	X	✓			
8/1/2005	16:08	MW-20-1	X	✓			
8/15/2005	09:30	MW-17-5	X	✓			
8/15/2005	10:45	MW-17-4	X	✓			
8/15/2005	13:45	MW-17-2	X	✓			
8/15/2005	15:30	MW-17-1	X	✓			

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]	8-16-05 16:00				
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	8/18/05 10:00	[signature]			
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	
				To: University of Miami	

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Battelle
Columbus Laboratories

CHAIN OF CUSTODY RECORD

Form No. _____

Proj. No.: G486111-T3

Project Title: Source Determination Study

SAMPLERS: (Signature) D. Conner

PO # 191762

SAMPLE TYPE (√): Tritium, Rcv'd 8/18/05

DATE	TIME	SAMPLE I.D.	Tritium	Rcv'd 8/18/05	Container No.	Number of Containers	Remarks
7/19/2005	12:30	MW-25-5	X	✓			
7/19/2005	16:15	MW-25-2	X	✓			
7/20/2005	09:00	MW-19-5	X	✓			
7/20/2005	11:00	MW-19-4	X	✓			
7/20/2005	12:10	MW-19-3	X	✓			
7/20/2005	15:00	MW-19-1	X	✓			
7/21/2005	09:15	MW-18-5	X	✓			
7/21/2005	10:30	MW-18-4	X	✓			
7/21/2005	12:45	MW-18-3	X	✓			
7/21/2005	16:30	MW-18-2	X	✓			
7/21/2005	15:00	MW-18-1	X	✓			
7/25/2005	09:00	MW-24-4	X	✓			
7/25/2005	10:30	MW-24-3	X	✓			
7/25/2005	15:30	MW-24-5	X	✓			
7/26/2005	08:30	MW-21-5	X	✓			
7/26/2005	10:30	MW-21-4	X	✓			
7/26/2005	12:15	MW-21-3	X	✓			

Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
[signature]	8-16-05 16:00				
Relinquished by: (Signature)	Date/Time	Received by: (Signature)	Relinquished by: (Signature)	Date/Time	Received by: (Signature)
	8/18/05 10:00	[signature]			
Relinquished by: (Signature)	Date/Time	Received for Laboratory by: (Signature)	Date/Time	Remarks	
				To: University of Miami	

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BATTELLE GROUNDWATER SAMPLES
Tien Shiao
Collected: June 2005; Analyzed: June/November 2005

SAMPLE	HELIUM 1E-8cc/g	NEON 1E-8cc/g	He corr. 1E-8cc/g	DEL He4 %	Del He3 %	R(3/4) in Ra	TRITIUM TU	UNCERT. +/-TU	3H-3He AGE (y)	UNCERT. (y)
GARFIELD	10.59	24.34	8.85	**97.1**	**17.3**	**0.592**	2.165	0.030	19.5	0.9
BANGHAM	8.89	26.60	6.56	**45.3**	**27.4**	**0.866**	2.589	0.039	23.1	0.7
SUNSET	7.04	20.31	6.56	**44.8**	**48.5**	**1.012**	5.671	0.050	20.4	0.4
LAWC-3	4.68	18.95	4.67	**2.3**	**0.0**	**0.961**	4.576	0.050	0.0	1.0
MW1	-	-	-	-	-	-	3.902	0.050	-	-
LFWC-2	-	-	-	-	-	-	5.079	0.050	-	-

NOTES:

1- HELIUM column denotes observed total helium
2- NEON column denotes observed total neon
3- He corr. column denotes corrected total helium based on excess neon.

4- DEL He4 column is the corrected helium excess in percent, above solubility equilibrium.
5-DEL He3 column is He3 excess in percent, above solubility equilibrium, i.e. assumed to be tritiogenic He3.
6- R(3/4) column is the He3/He4 ratio in sample normalized to the same ratio in air.
7- TRITIUM column is the tritium concentration in Tritium Units.
8- H3-He3 AGE column is the apparent tritium-helium age of the sample in years.
9- UNCERT.column is the analytical uncertainty in tritium-He3 age, in years.
MW1 and LFWC-2 helium samplers did not yield viable helium samples, hence no helium measurements.

BATTELLE TRITIUM MEASUREMENTS: FINAL RESULTS
12/12/2005

SAMPLE	TRIT.f(TU)	UNCER.(TU)
MW-17-1	2.929	0.037
MW-17-2	6.596	0.059
MW-17-3	7.75	0.054
MW-17-4	0.537	0.011
MW-17-5	0.865	0.026
MW-17-5	2.006	0.03
MW-18-1	2.472	0.037
MW-18-2	2.91	0.036
MW-18-3	2.394	0.036
MW-18-4	0.337	0.02
MW-18-5	0.136	0.014
MW-19-1	1.153	0.023
MW-19-2	11.763	0.071
MW-19-3	2.365	0.035
MW-19-4	3.927	0.059
MW-19-5	9.255	0.074
MW-20-1	4.355	0.044
MW-20-2	3.352	0.05
MW-20-3	2.475	0.031
MW-20-4	1.19	0.024
MW-20-5	0.079	0.008
MW-21-1	7.591	0.607
MW-21-2	8.04	0.064
MW-21-3	8.229	0.074
MW-21-4	3.878	0.047
MW-21-5	4.996	0.05
MW-24-1	3.131	0.039
MW-24-2	3.194	0.04
MW-24-3	0.788	0.016
MW-24-4	0.299	0.018
MW-24-5	0.171	0.017
MW-25-1	5.549	0.05
MW-25-2	2.299	0.034
MW-25-3	2.693	0.034
MW-25-4	2.436	0.03
MW-25-5	0.141	0.014

BATTELLE MEMORIAL INSTITUTE
Tien Shiao
Samples collected:June-Sep.2005; Analyses: Nov.-Dec., 2005

SAMPLE	HELIUM 1E-8cc/g	NEON 1E-8cc/g	He corr. 1E-8cc/g	DEL He4 %	Del He3 %	R(3/4) in Ra	TRITIUM TU	UNCERT. +/-TU	3H-3He AGE (y)	UNCERT. (y)
MW-17-3	6.41	22.12	5.32	18.5	29.0	1.073	7.750	0.054	11.7	0.4
MW-19-2	40.28	61.85	27.61	524.4	983.4	1.717	11.763	0.071	54.8	0.1
MW-24-1	5.39	18.35	5.32	19.3	4.5	0.863	3.131	0.039	5.4	1.1
MW-24-2	38.74	69.64	23.89	435.7	820.6	1.700	3.194	0.040	74.5	0.2
MW-25-1	19.88	47.11	11.48	158.7	190.1	1.111	5.549	0.050	40.1	0.2
MW-25-2	16.67	40.83	10.09	127.1	2.9	0.453	2.299	0.034	4.8	1.5
MW-25-3	17.67	48.70	8.85	98.4	121.7	1.105	2.693	0.034	44.6	0.3
MW-25-4	17.38	33.52	12.97	189.8	35.4	0.468	2.436	0.030	27.2	0.6

NOTES:

1- HELIUM column denotes observed total helium
2- NEON column denotes observed total neon
3- He corr. column denotes corrected total helium based on excess neon.
4- DEL He4 column is the corrected helium excess in percent, above solubility equilibrium.

5-DEL He3 column is He3 excess in percent, above solubility equilibrium, i.e. assumed to be tritiogenic He3.
6- R(3/4) column is the He3/He4 ratio in sample normalized to the same ratio in air.
7- TRITIUM column is the tritium concentration, at the time of measurement, in Tritium Units.
8- H3-He3 AGE column is the apparent tritium-helium age of the sample in years.
9- UNCERT.column is the analytical uncertainty in tritium-He3 age, in years.
10- With the exception of MW-17-3 and MW-24-1, all samples had very large air components in them. Correction for this component using neon increases the uncertainty in age determination well beyond the analytical uncertainty given under UNCERT. Column. Replicates were also run to minimize the uncertainty without much success: they contained just as much air. Therefore the real ages may be much shorter, in the 10-20y range.
11- MW-25-2 result is preliminary; the replicate for this sample could not be included with the rest, but it is now being re-analyzed. That result will be reported as an update within two weeks.

Shiao, Tien

From: Shiao, Tien
Sent: Friday, September 09, 2005 11:17 AM
To: 'Zafer Top'
Subject: RE: Tritium Sample Volume

Zafer,

The current situation is that you will receive two or three sample bottles for each location for the tritium analysis. The bottles are non-preserved and I am assuming contact with the air should not be a problem since the tritium samples are grab samples. In addition I am assuming there are no hold time issues.

How about if the samples are kept cool for a previous analysis but currently kept at ambient temperature, would that be a problem?

The following samples collected for other analysis and their collection dates are provided below. We are trying to retrieve them from other labs to send to you for tritium analysis.

Sample ID	Date Collected
MW-17-3	August 15
MW-19-2	July 20
MW-24-1	July 25
MW-24-2	July 25
MW-25-1	July 19
MW-25-3	July 19
MW-24-4	July 19

Please let me know if there are any additional issues you can think of. We want to cover all bases and be sure the samples we sent to you is fine for the tritium analysis. If not, than we will have to go back to the field to re-sample and we will need to know about this as soon as possible. Sorry about this and thank you for your help. I will keep you posted.

Thanks,
Tien

At 10:13 AM 9/9/2005 -0400, you wrote:

>Zafer,
>
>
>
>I left you a message on your voicemail this morning. The helium
>samplers will be sent to you early next week. I will let you know the
>exact date. Please let me know if you encounter any problems with the
>helium samplers we sent you. The helium samplers were taken in
>duplicate in case any of the clamps were over tightened.
>
>
>
>In addition, our field technician missed taking 7 tritium samples.
>Therefore, either we will go back to take the additional tritium
>samples or we can send you the bottles already collected for other
>analysis. Therefore we were wandering what the exact volume needed for
>tritium analysis is. Currently, we have been sending you 1 L
>polyethylene containers of water for tritium analysis. Please let me
>know about this as soon as you can. Any suggestions will be appreciated.
>
>

From: Shiao, Tien
Sent: Monday, September 12, 2005 6:16 PM
To: 'Zafer Top'
Cc: Ohart, Carolyn J; Conner, David J
Subject: Helium Samplers
Zafer,

8 He samplers are being sent to you today (09/12/05) to arrive to you tomorrow. You should receive the He samplers in duplicate. The sample IDs are:

MW-17-3
MW-19-2
MW-24-1
MW-24-2
MW-25-1
MW-25-2
MW-25-3
MW-25-4

Please confirm receipt of samples and to fax me the COCs when you have verified the actual samples corresponds with the sample IDs on the COCs. On a side note, you are probably not going to get the tritium samples tomorrow. I will keep you updated.

Thanks for your help!

Best Regards,

Tien Shiao

Battelle Memorial Institute
Environmental Restoration Dept.
505 King Ave., Columbus, OH 43204
Room: 10-1-80
Business: (614) 424-3754
Mobile: (614) 370-3939
Fax: (614) 458-3754
shiaoh@battelle.org
www.battelle.org

Shiao, Tien

From: Shiao, Tien
Sent: Tuesday, September 13, 2005 2:22 PM
To: 'Zafer Top'
Subject: FW: samples

Dr. Top,

You will receive the following samples from APC Labs.

Sample ID	Date Collected	Volume Required
MW-17-3	August 15	At least 400 mL
MW-19-2	July 20	At least 400 mL
MW-24-1	July 25	At least 400 mL
MW-24-2	July 25	At least 400 mL
MW-25-1	July 19	At least 400 mL
MW-25-3	July 19	At least 400 mL
MW-25-4	July 19	At least 400 mL

Combined with MIT, you will have more than 500 mL of non preserved samples for the tritium analysis. Please let me know if there are any problems/issues.

Sincerely,
Tien

From: Frank Dudas [mailto:fdudas@MIT.EDU]
Sent: Tuesday, September 13, 2005 2:11 PM
To: Shiao, Tien
Cc: ztop@rsmas.miami.edu; sbowring@mit.edu
Subject: samples

Dear Tien,

I sent the following samples to Dr. Top by FedEx this afternoon (picked up at 2 pm), standard overnight delivery. They should arrive tomorrow (9/14) afternoon. Each of the samples is at least 200 mL.

Sample ID	Date Collected	Volume Required
MW-17-3	August 15	At least 200 mL
MW-19-2	July 20	At least 200 mL
MW-24-1	July 25	At least 200 mL
MW-24-2	July 25	At least 200 mL
MW-25-1	July 19	At least 200 mL
MW-25-3	July 19	At least 200 mL
MW-25-4	July 19	At least 200 mL

Regards,
Frank

--
Dr. Francis Ö. Dudás
Laboratory Manager, 54-1116

Shiao, Tien

From: Zafer Top [ztop@rsmas.miami.edu]
Sent: Friday, September 23, 2005 9:39 AM
To: Shiao, Tien
Subject: Re: Tritium Samples

Tien:
I received the rest of the tritium samples and processed them. Helium and tritium measurements are independent and are reported separately. I will be away from the office until October 20.
Zafer

At 05:34 PM 9/22/2005 -0400, you wrote:

>Zafer,
>
>
>
>I left a voice message with you this afternoon. I wanted to check
>whether you received the tritium samples from MIT and APC Labs. I also
>wanted to check how the helium and the tritium are reported. For
>example, at locations where both tritum and helium samples are taken,
>will you be reporting a ratio for the results, or will tritium and
>helium be reported separately?
>
>
>
>Thanks,
>
>Tien
>
>