DMA-TR-15

Dade Moeller & Associates, Inc.

Technical Report

Supplemental Soil Sampling for Strontium-90 in the Runkle Canyon Development Simi Valley, California

Tracy A. Ikenberry, CHP

August 2005

Prepared for
GreenPark Runkle Canyon, LLC
1400 Quail Street
Newport Beach, CA 92660

Dade Moeller & Associates, Inc.
1835 Terminal Drive, Suite 200
Richland, WA 99354

JP
6-20-05
R

Detector ID	Sample ID	Alpha	Beta	Guard	Count Count Time	Event	Voltage	TOD
A1	BKGD	2	77	31446	60	0	1380	38523.21
A2	BKGD	5	99	31448	60	0	1380	38523.21
A3	BKGD	7	66	31448	60	0	1380	38523.21
A4	BKGD	1	83	31451	60	0	1380	38523.21
B1	BKGD	1	53	32379	60	0	1380	38523.21
B2	BKGD	7	67	32378	60	0	1380	38523.21
B3	BKGD	4	53	32377	60	0	1380	38523.21
B4	BKGD	9	58	32380	60	0	1380	38523.21
C1	BKGD	4	76	32792	60	0	1402.5	38523.21
C2	BKGD	2	88	32793	60	0	1402.5	38523.21
C3	BKGD	8	78	32790	60	0	1402.5	38523.21
C4	BKGD	4	61	32792	60	0	1402.5	38523.21
D1	BKGD	4	87	32806	60	0	1402.5	38523.21
D2	BKGD	4	59	32804	60	0	1402.5	38523.21
D3	BKGD	1	56	32806	60	0	1402.5	38523.21
D4	BKGD	9	63	32805	60	0	1402.5	38523.21

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Supplemental Soil Sampling for Strontium-90 in the Runkle Canyon Development, Simi Valley, California

Executive Summary. Runkle Canyon is a proposed residential development adjacent to existing neighborhoods on the southern edge of Simi Valley, California. Soil sampling of the project area in 1999 – 2003 showed the presence of low levels of the radionuclide strontium-90 (^{90}Sr). In early 2005 the State of California Department of Health Services (DHS) requested additional soil sampling at selected locations, and supplemental soil sampling for the presence of ^{90}Sr was conducted June 7, 2005. Soil samples were taken at five locations that had resulted in the highest soil concentrations during the previous sampling campaigns.

Sample results from the June 2005 sampling campaign showed ^{90}Sr soil concentrations that were much lower than the previously measured concentrations at the same locations and more in line with concentrations measured in other parts of the proposed development. New results ranged from non-detectable to 0.42 picocuries of ^{90}Sr per gram of soil (pCi/g). Results of split samples taken and analyzed by the DHS were similar, ranging from non-detectable to 0.14 pCi/g. Earlier results for these five locations had ranged from 3.6 to 12.3 pCi/g, although subsequent sampling at two of the sites had also indicated lower concentrations, less than the analytical detection limit of 2.2 pCi/g.

A risk analysis conducted using the earlier soil sampling data (Ikenberry 2005) determined the potential radiological risk of constructing, using, and residing at Runkle Canyon would be quite low – an incremental fatal cancer risk near or below 1×10^{-6} – and much less than the risk indicated by using the default preliminary remediation goal (PRG). This risk is at the low end of the U.S. Environmental Protection Agency's target risk range of 1×10^{-4} to 1×10^{-6}. The June 2005 supplemental ^{90}Sr soil sampling data indicate the potential risk would be even lower than initially calculated because of the lower concentrations encountered. Because of the low estimated individual risk, and because of the reduced ^{90}Sr concentration encountered during the supplemental soil sampling, it is concluded that no further sampling is necessary.

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Supplemental Soil Sampling for Strontium-90 in the Runkle Canyon Development, Simi Valley, California

1.0 Introduction

This report provides the results of a supplemental soil sampling campaign that was conducted at the request of the State of California Department of Health Services (DHS) on June 7, 2005. Five locations were identified where additional sampling for the radionuclide strontium-90 (^{90}Sr) was requested. These locations had resulted in the highest concentrations of ^{90}Sr in soil during previous soil sampling campaigns (see Section 2.0 Background).

2.0 Background

Runkle Canyon is a proposed residential development adjacent to existing neighborhoods at the southern edge of Simi Valley, California. The project site consists of approximately 1,595 acres that would include a mix of residential types, open space, a neighborhood park, a multi-use trail system and an area for the potential future development of a golf course. Residential development is proposed on approximately 140 acres in the northern portion of the project area, leaving approximately 1,456 acres in open space and recreational uses. A total of 461 residences are proposed, including 138 senior housing units, 62 of which would be affordable housing, 298 single-family homes, and 25 single-family estate homes (City of Simi Valley 2004).

As part of the environmental characterization of the site, several soil sampling campaigns have been conducted (QST 1999; Foster Wheeler 1999; Harding ESE 2000; Miller Brooks 2003a,b,c). The initial three campaigns provided numerical sampling data with low levels of detection and sampling statistics that were the basis of a subsequent risk analysis report (Ikenberry 2005). The most recent investigation (Miller Brooks 2003a,b,c) did not present numerical analysis data but rather provided results as "non-detectable" at the stated minimum detectable activity (MDA) of 2.2 picocuries per gram or pCi/g. These results were not adequate to provide additional definitive information that could be used in conjunction with the more detailed results from the earlier investigations.

The initial exploratory sampling campaign consisted of only four samples (QST 1999). The detection of ^{90}Sr in these samples led to additional sampling. The most detailed and extensive investigation took 58 surface soil samples from a 550-acre parcel containing the proposed residential area (Foster Wheeler 1999). The number and location of samples were taken using the methods directed by MARSSIM (Multi-Agency Radiation Survey and Site Investigation Manual), which is endorsed by the U.S. Environmental Protection Agency (EPA), U.S. Nuclear Regulatory Commission, and U.S. Department of Energy among numerous other Federal and state agencies (EPA 2001). An additional 17 soil samples were taken subsequently from other parcels in areas that would be open space with some portion available for recreational use (Harding ESE 2000). The surface soil sampling showed the presence of low levels of ^{90}Sr.

The three soil sampling campaigns noted above resulted in collection of 79 soil samples. The sample results from all three campaigns are included in this analysis to provide a large sample set and a more complete picture of the ^{90}Sr contamination in the Runkle Canyon area.

Figure 1 shows the sampling data from the lowest to highest concentration and also shows the uncertainty in the data as ± 2 standard deviations. This figure shows that most of the sample results (73, or over 90 percent of the samples taken) are less than 2 pCi/g; the five lowest results are less than zero (net results, corrected for background). The six highest results appear to be inconsistent with the other results, as shown by the deviation from the apparent straight line of the other data. The five highest results locations were selected by DHS for additional sampling; these sample results are circled in Figure 1. All of these five locations are in proposed open space that would be used for recreation, not residences.

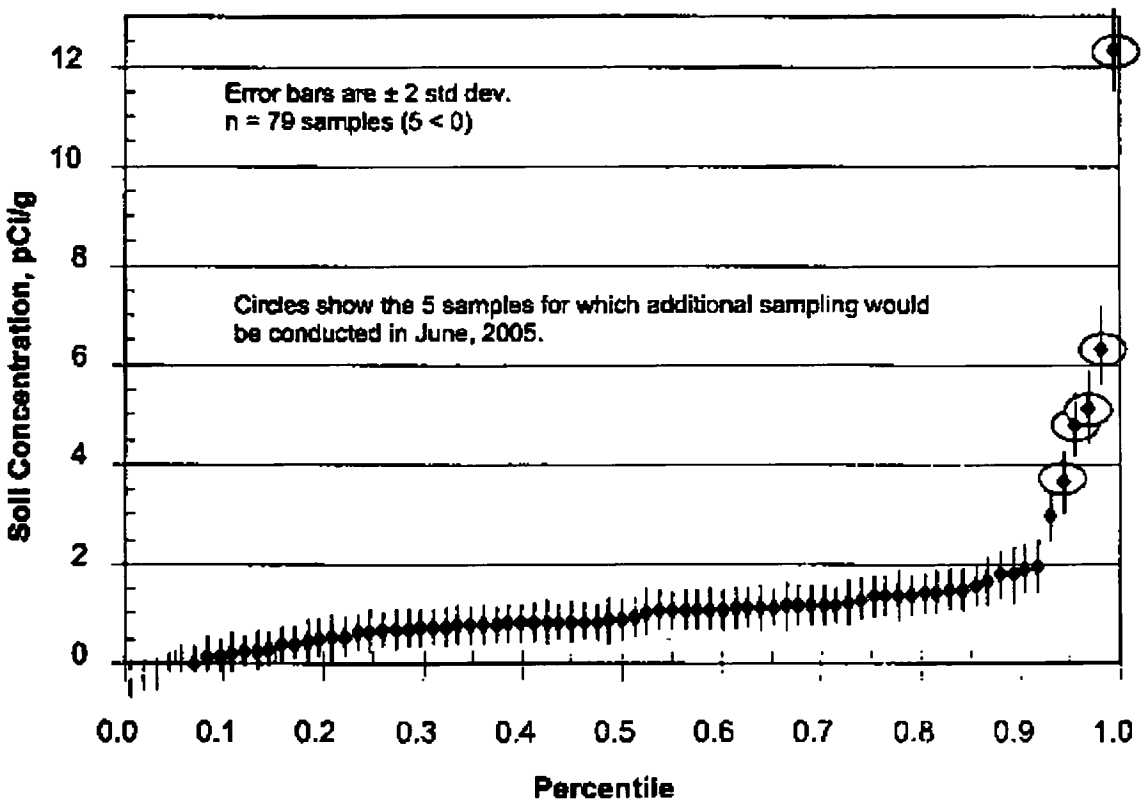

Figure 1. Distribution of Initial (1999-2000) Runkle Canyon ^{90}Sr Soil Sampling Results.

3.0 Soil Sampling

Soil sampling was conducted on June 7, 2005 by a DHS health physicist and a qualified technician representing GreenPark Runkle Canyon, LLC. Surface soil from approximately 0 to 3 inches (0 to 8 cm) depth was collected using the *Standard Practice for Sampling Surface Soil for Radionuclides* (ASTM 2000). Soil was sieved on location using a 10 mesh sieve, which excluded rocks greater than 2 mm in diameter as well as any vegetation and debris. Split samples of 500 ml volume were collected and shared between DHS and GreenPark.

Because samples were taken from previously identified sampling locations, the same sample designators were used for these samples. Three of the sample locations (GP-29, GP-44, and GP-52) had previously been recorded using GPS and could be accurately located. The remaining two sample locations (SS-3 and SS-6) were located as nearly as possible to the original locations using the available map of sample locations (Attachment 1). In these cases sample locations were determined to the satisfaction of the DHS representative. Latitude and longitude locations of the five samples recorded from the GPS unit are shown in Table 1.

Table 1. Latitude and Longitude of Sample Locations.

Sample Identification	Latitude	Longitude
SS-3	34.23330	118.73431
SS-6	34.22898	118.72218
GP-29	34.24492	118.72551
GP-44	34.23706	118.73130
GP-52	34.23386	118.72852

4.0 Results and Discussion

Table 2 shows the results of the June 7, 2005 soil sampling for ^{90}Sr at Runkle Canyon from both a commercial analytical laboratory and the State of California radiological laboratory[1]. Results were quite low in all cases, ranging from non-detectable (less than the laboratory counting background, reported as a negative value) to 0.42 pCi/g. Five of the six private laboratory sample results and all five of the State of California laboratory results were below the minimum detectable activity (MDA) at a 95 per cent level of confidence. One sample, GP-29, received a duplicate analysis in the private laboratory with one of the results being a negative value. Discussion of GP-29 will include only the higher result. Another sample, SS-3, had a negative value in the State of California results. The complete sampling and analysis information from the commercial laboratory are included as Attachment 2.

[1] State of California results reported in an e-mail from Robert Greger, DHS, to Tracy Ikenberry, Dade Moeller & Associates, July 9, 2005.

Table 2. Results of the June 7, 2005 Runkle Canyon Soil Sampling for ^{90}Sr.

Sample Identification	Commercial Laboratory			State of California Laboratory		
	Result (pCi/g)	Uncertainty (± 2 std. dev.)	MDA[1]	Result (pCi/g)	Uncertainty[2]	MDA[2]
SS-3	0.215	0.150	0.244	-0.022	0.206	0.348
SS-6	0.173	0.170	0.282	0.056	0.265	0.439
GP-29	-0.0645	0.185	0.327	0.068	0.242	0.399
GP-29	0.140	0.167	0.280	na	na	na
GP-44	0.247	0.180	0.293	0.013	0.179	0.299
GP-52	0.423	0.177	0.273	0.137	0.192	0.306

1. MDA = minimum detectable activity; 95% confidence.
2. Uncertainty and MDA parameters were not reported for the State laboratory; they are assumed similar.
3. na = not applicable; a duplicate analysis was performed for GP-29 at the private laboratory.

The DHS staff member responsible for the sampling and analysis of sample results provided the following description: "*No elevated Sr-90 was detected in any of the five samples by the state laboratory. One of the five samples had slightly elevated Sr-90 based on the developer's laboratory analyses; however, even this Sr-90 result was less than one-twentieth of the developer's previous Sr-90 sample results for this location.*"[2] The commercial laboratory reported higher sample results and had lower reported MDAs than did the State of California laboratory. All of these results are much lower than the initial values that had been reported in 1999 and 2000. Table 3 shows a comparison of the June 7, 2005 results to the earlier results. This comparison is for the original results; there is no correction for radioactive decay to present time of the earlier samples.

Figure 2 shows the initial ^{90}Sr soil sampling results from 1999-2000 decay-corrected to July 1, 2005 and compared to the new results from June of 2005. Taking into account the 29-year half life of ^{90}Sr and the fact that most of the samples were collected and analyzed 6 years ago, expected ^{90}Sr activity in soil would have decreased to about 87 percent of the original sample value. The June 2005 results are much less than would be expected from radioactive decay of the ^{90}Sr. It is noted the original results for these five locations were much higher than most the other sampling results, indicating there may have been differences in sampling or analysis error associated with the original results. Discussion with an individual who took the original samples indicate the sampling methods were similar. Another possibility is that ^{90}Sr in the surface soil may have leached into the deeper, less-accessible soil layersor may have been dispersed by physical processes such as water runoff; however, there was no physical indication of such processes at the sampling locations during the June 2005 sampling. Regardless of the reasons, the soil concentrations indicated by the June 2005 sample results are much lower and more in line with other soil concentrations sampled in 1999-2000.

[2] E-mail from Robert Greger, DHS, to Marie Rainwater, included as part of an August 2, 2005 e-mail from Marie Rainwater to interested parties who attended a July 27, 2005 SSFL Workgroup meeting.

Table 3. Comparison of June 2005 ^{90}Sr in Soil Sample Results with Earlier Results.

Sample Identification	June 2005 Results (pCi/g)	1999-2000		
		Result (pCi/g)	Uncertainty (± 2 std. dev.)	MDA[1]
SS-3	0.215	3.64	0.619	0.749
SS-6	0.173	4.76	0.633	0.643
GP-29	-0.0645	na	na	na
GP-29	0.140	5.13	0.69	0.84
GP-44	0.247	6.38	0.79	0.99
GP-52	0.423	12.3	0.86	0.59

1. MDA = minimum detectable activity; 95% confidence.
2. na = not applicable.

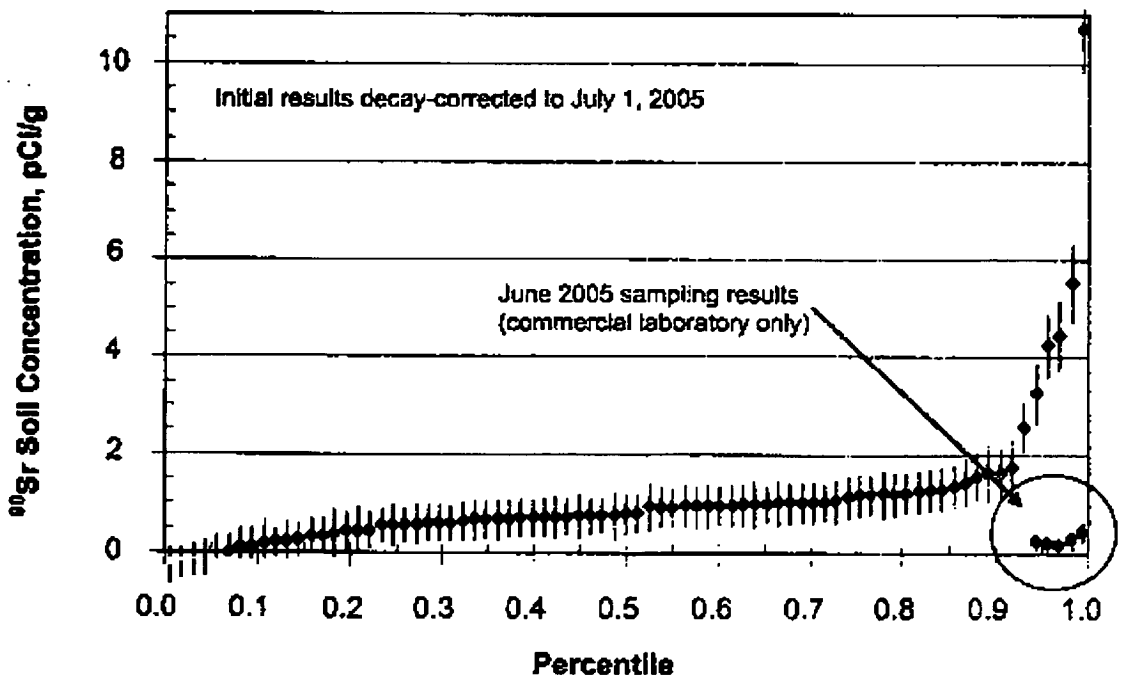

Figure 2. Comparison of Decay-Corrected Initial Sampling Results and June 2005 Results.

5.0 Conclusions

The soil sampling conducted during June 2005 showed current ^{90}Sr soil concentrations to be much lower than indicated by the initial sampling campaigns. This was confirmed by both a commercial analytical laboratory and a State of California laboratory analyzing split soil samples. A risk analysis conducted using the initial 1999-2000 soil sampling data (Ikenberry 2005) determined the potential radiological risk of constructing, using, and residing at Runkle Canyon would be quite low – an incremental fatal cancer risk near or below 1×10^{-6} – and much less than the risk indicated by using the default preliminary remediation goal (PRG). This risk is at the low end of the U.S. Environmental Protection Agency's target risk range of 1×10^{-4} to 1×10^{-6}. The June 2005 supplemental ^{90}Sr soil sampling data indicate the potential radiological risk would be even lower than initially calculated. Therefore, no further soil sampling is needed to demonstrate that potential radiological risk from ^{90}Sr is acceptably low and well within EPA guidelines.

6.0 References

ASTM. 2000. *Standard Practice for Sampling Surface Soil for Radionuclides*. ASTM C998-90 (2000). American Society for Testing and Materials, West Conshohocken, PA.

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Foster Wheeler Environmental Corporation. 1999. *Runkle Ranch Site Investigation , Simi Valley, California*. Final Report. Foster Wheeler Environmental Corporation, Costa Mesa, CA.

Harding ESE. 2000. *Results of Limited Soil Sampling, Rancho Simi Property. APN 6850-130-180, Simi Valley, California*. November 3, 2000. Harding ESE, Phoenix, AZ.

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Miller Brooks Environmental, Inc. 2003b. *Site Investigation Report of 550-Acre Parcel; GreenPark Runkle Canyon, LLC Runkle Canyon Property in Simi Valley, California*. September 17, 2003. Miller Brooks Environmental, Inc., Huntington Beach, CA.

Miller Brooks Environmental, Inc. 2003c. *Site Investigation Report of Southern 715-Acre Parcel; GreenPark Runkle Canyon, LLC Runkle Canyon Property in Simi Valley, California*. September 17, 2003. Miller Brooks Environmental, Inc., Huntington Beach, CA.

QST Environmental, Inc. 1999. "Results of Preliminary Soil Samples at Runkle Ranch in Simi Valley, California." Letter Report from John S. Kim to Ms. Marina Robertson, GreenPark Ventures, LLC, dated February 5, 1999.

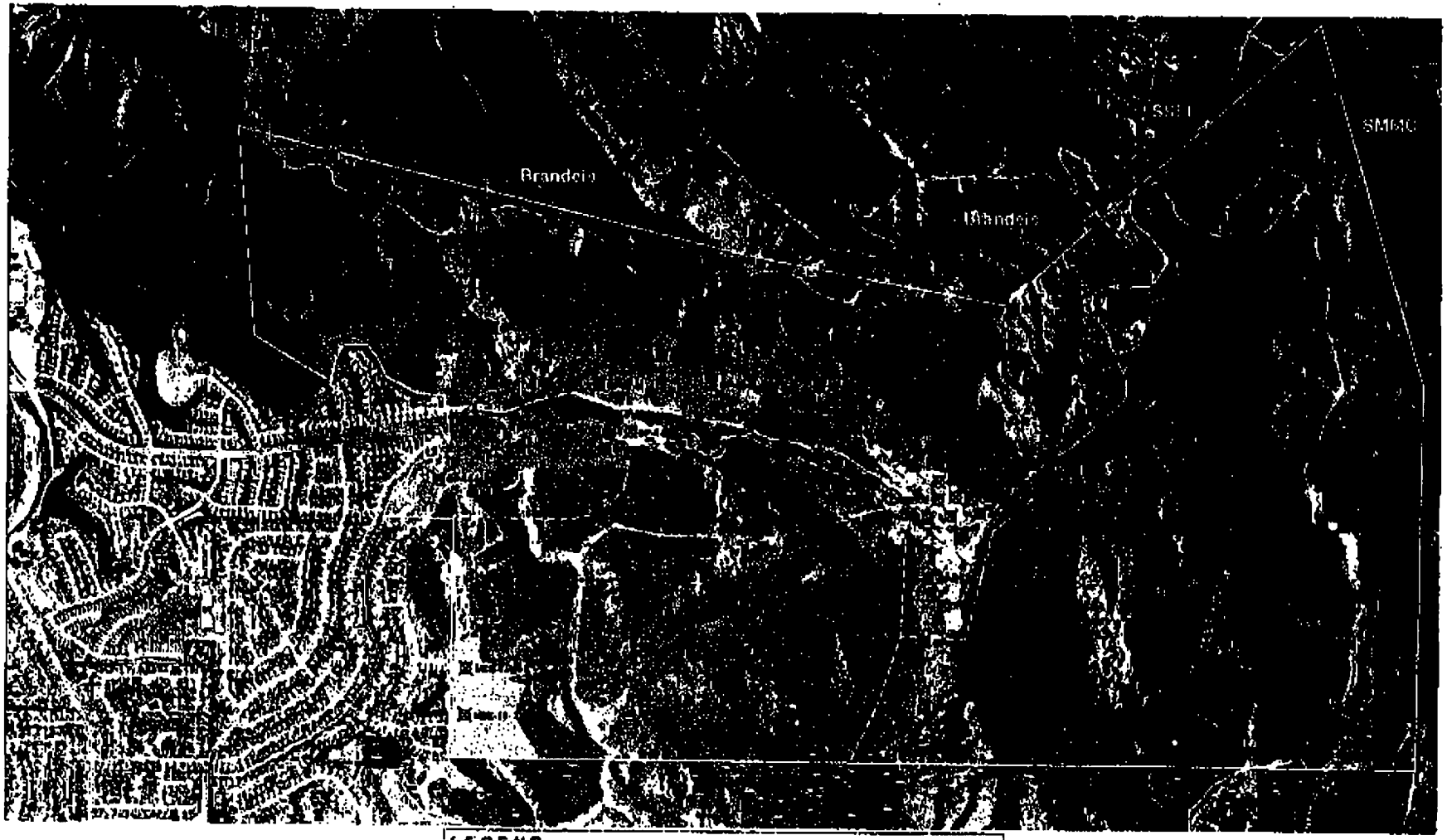
U.S. Environmental Protection Agency (EPA). 2001. *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*. EPA-402-R-97-016, Rev.1 (also NUREG-1575, Rev. 1, DOE/EH-0624, Rev. 1). U.S. Environmental Protection Agency, Washington, DC.

Attachments

Attachment 1. Environmental Sample Locations.

Attachment 2. Sampling and Analysis Report

Attachment 1



LEGEND

- Soil, Groundwater and Surface Water Sampling Locations for:
  - Total Petroleum Hydrocarbons (TPH)
  - Volatile Organic Compounds (VOC)
  - Semi-Volatile Organic Compounds (SVOC)
  - Polychlorinated Biphenyls (PCBs)
  - Pesticides
  - Radionuclides
- Residential
- Permanent Open Space
- Parcel Boundary

Source: GSF, Rusty Wheeler, Hensley SSF, Miller Brooks

GreenPark Runkle Canyon, LLC

Runkle Canyon

ENVIRONMENTAL SAMPLE LOCATIONS

2008

Attachment 2

MILLER BROOKS ENVIRONMENTAL

Runkle Canyon

STANDARD LEVEL IV
REPORT OF ANALYSIS

WORK ORDER #05-06045-OR

June 22, 2005

EBERLINE SERVICES/OAK RIDGE LABORATORY
OAK RIDGE, TN

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Eberline Services – Oak Ridge Laboratory

LABORATORY DATA SUPPORT CHECKLIST
MP-001-3

Eberline Services Work Order # 05-06045

The checklist items listed below are to be initialed by appropriate staff upon completion/verification.

Date for Partial	Initials	Date	Initials	Checklist Items
		6-9-05	KMB	Sample Log-In
		6/21/05	KBS	Data Compilation
		6/21/05	MLT	Technical Data Review MLT 6/21/05
		6/22/05	[illegible]	Data Entry/Electronic Deliverable
		6/22/05	[illegible]	Case Narrative
		6/22/05	[illegible]	Electronic Deliverable Proof
		6/22/05	[illegible]	Samples Analyzed within Holding Time YES
		6/22/05	[illegible]	QA/QC Review
				Invoiced by Laboratory

Technical/Clerical Corrections, Signatures Needed, Problems, Etc	Date/Initials

Date package approved by: [illegible] 6/23/05

Laboratory Manager Date

Copy No. _____

SECTION I

CHAIN OF CUSTODY

05-06045

Chain of Custody Record

№ 1604

Eberline Services
601 Scarboro Road
Oak Ridge, TN 37830
(865) 481-0683 Phone • (865) 483-4621 Fax

EBERLINE SERVICES

Page ___ of ___

Purchase Order #: _____

Project Name: Runkle Canyon	Project Number: 402-002-04
Send Report To: Jennie Canfield	Sampler (Print Name): Carmen Crouch
Address: Miller Brooks Enc.	Sampler (Print Name):
324 Main St. #200	Shipment Method:
Huntington Beach CA	Airbill Number:
Phone: 714-500-5400 92648	Laboratory Receiving:
Fax:	

Analysis Requested: Sr 90

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Sr 90	Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)
GP-29	4/26/05	1140	Soil	1	X		
GP-52	↓	1205	↓	↓	↓		
SS-6		1245					
SS-3		1325					
GP-44	↓	1345	↓	↓	↓		

4569

RECEIVED
JUN - 9 2005
EG&G Eberline
Las Vegas, AB

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
[signature]	K Bannister	6-9-05	0802
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:

Sample Custodian Remarks (Completed By Laboratory):

QA/QC Level	Turnaround	Sample Receipt	
	14 Day	Total # Containers Received?	
Level I ☐	Routine ☐	COC Seals Present?	
Level II ☐	24 Hour ☐	COC Seals Intact?	
Level III ☐	1 Week ☐	Received Containers Intact?	
Other ☐	Other ____	Temperature?	

005

EBERLINE SERVICES Oak Ridge Laboratory	Internal Chain of Custody	Work Order #	05-06045
		Lab Deadline	6/21/2005
		Analysis	Sr090 - Level 4
		Sample Matrix	Soil/Solid

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
	04	53	G1.3
	05	39	G1.3
	06	51	G1.3
	07	49	G1.3
	08	64	G1.3

	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room 0930	Kenny Sellers	6-9-05
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room 0810	Kenny Sellers	6-10-05
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[illegible]	6-10-05 0810
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[illegible]	6-20-05 1314
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[illegible]	6-20-05 1315
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[illegible]	6-20-05 1630
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		

Printed: 6/9/2005 8:39 AM

SECTION II

SAMPLE ACKNOWLEDGEMENT

Client Name	Contract/PO	Project Type	Date Received	Required Turnaround Days	[illegible]
Miller Brooks Environmental	402-0002-04	Environmental	06/09/2005	14	05-06045
Project Name	**Client WO**	**Sample Disp**	**Lab Deadline**	**Internal Deadline**	[illegible]
402-0002-04	Runkle Canyon	R	06/21/2005	06/22/2005	06/23/2005

Internal ID	Client ID	Sample Date	Matrix	Storage	5r080																											E
01	LCS	06/09/05	SO	G1.3	X																											1
02	BLANK	06/09/05	SO	G1.3	X																											1
03	DUP	06/09/05	SO	G1.3	X																											1
04	GP-29	06/07/05 11:40	SO	G1.3	X																											1
05	GP-52	06/07/05 12:05	SO	G1.3	X																											1
06	SS-6	06/07/05 12:45	SO	G1.3	X																											1
07	SS-3	06/07/05 13:25	SO	G1.3	X																											1
08	GP-44	06/07/05 13:45	SO	G1.3	X																											1
																																0
																																0
																																0
																																0
																																0
																																0
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																																0
																																0
																																0
																																0
																																0
Totals Per Analysis (non QA samples)					5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

EBERLINE SERVICES

Sample Log In Report

Oak Ridge Laboratory
601 Scarboro Rd.
Oak Ridge, TN 37830

Voice: (865) 481-0683
Fax: (865) 483-4621

Invoice	Accounts Payable Miller Brooks Environmental 2124 Main Street #200 Huntington Beach, CA 92648
Voice	714 500 5400
Fax	
Contact	Jennie Canfield
Voice	714-500-5400
Fax	

Report Data	Jennie Canfield Miller Brooks Environmental 2124 Main Street #200 Huntington Beach, CA 92648
Voice	714-500-5400
Fax	

eMail data to Tracy Ikenberry

Printed: 6/9/2005 8:38 AM

Eberline Services – Oak Ridge Laboratory

SAMPLE RECEIPT CHECKLIST

MP-001-2

WORK ORDER # 05-06045

SAMPLE MATRIX/MATRICES: (CIRCLE ONE OR BOTH)

AQUEOUS (NON-AQUEOUS)

(CIRCLE EITHER YES, NO, OR N/A)

WERE SAMPLES:

Received in good condition?	(Y)	OR	N	
If aqueous, properly preserved	Y	OR	N	(N/A)

WERE CHAIN OF CUSTODY SEALS:

Present on outside of package?	(Y)	OR	N
Unbroken on outside of package?	(Y)	OR	N
Present on samples?	(Y)	OR	N
Unbroken on samples?	(Y)	OR	N

Was chain of custody present upon sample receipt? yes

IF ANY OF THE ABOVE ARE CIRCLED, A DISCREPANT SAMPLE RECEIPT REPORT (DSR) HAS BEEN ISSUED.

REMARKS: _____

SIGNATURE: K Bannister DATE: 6-9-05

SECTION III

CASE NARRATIVE

EBS-OR-22574

June 22, 2005

Oak Ridge Laboratory
601 Scarboro Road
Oak Ridge, TN 37830
Phone (865) 481-0683
Fax (865) 483-4621

Jennie Canfield
Miller Brooks Environmental
2124 Main Street #200
Huntington Beach, CA 92648

CASE NARRATIVE
Work Order # 05-06045-OR

SAMPLE RECEIPT

This work order contains five soil samples received 06/09/05. These samples were analyzed for Strontium-90.

CLIENT ID	LAB ID	CLIENT ID	LAB ID
GP-29	05-06045-04	SS-3	05-06045-07
GP-52	05-06045-05	GP-44	05-06045-08
SS-6	05-06045-06		

ANALYTICAL METHODS

Strontium-90 was analyzed using EIChroM Method SRW01 Modified.

ANALYTICAL RESULTS

STRONTIUM-90

Samples were prepared by acid digestion as appropriate for the matrix. Chemical separations were conducted using EIChroM stabilized chemical resins. Subsequent extractions of Strontium-90 were conducted and Yttrium-90 was allowed to reach radioactive equilibrium. The Yttrium-90 fraction of each sample was selectively eluted onto a steel planchet and evaporated to dryness. Chemical recovery was determined by use of a stable Strontium carrier. Sample activities were determined by gas flow proportional counting. Sample results were corrected for Yttrium-90 decay after elution.

Samples demonstrated non-detect equivalent results for Strontium-90 activity. Chemical recovery was acceptable for all samples. Results for the Strontium-90 method blank demonstrated non-detect equivalent activity. Results for the Strontium-90 replicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Strontium-90 laboratory control sample demonstrated an acceptable percent recovery.

CERTIFICATION OF ACCURACY

I certify that this data report is in compliance with the terms and conditions of the Purchase Order, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the cognizant project manager or his/her designee to be accurate as verified by the following signature.

M.R. McDougall
Laboratory Manager

Date: 6/22/2005

SECTION IV

ANALYTICAL RESULTS SUMMARY

Eberline Services
Final Report of Analysis

Report To:	
Jennie Canfield	
Miller Brooks Environmental	
2124 Main Street #200	
Huntington Beach, CA 92648	

Work Order Details:	
SDG:	05-06045
Purchase Order:	402-0002-04
Analysis Category:	ENVIRONMENTAL
Sample Matrix:	SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	TPU	MDA	Report Units
05-06045-01	LCS	KNOWN	06/09/05 00:00	6/9/2005	6/20/2005	05-06045	Strontium-90	EIChroM SRW01 Modified	4.99E+01	2.74E-01			pCi/g
05-06045-01	LCS	SPIKE	06/09/05 00:00	6/9/2005	6/20/2005	05-06045	Strontium-90	EIChroM SRW01 Modified	5.55E+01	1.29E+00	7.60E+00	5.30E-01	pCi/g
05-06045-02	MBL	BLANK	06/09/05 00:00	6/9/2005	6/20/2005	05-06045	Strontium-90	EIChroM SRW01 Modified	-9.12E-02	3.31E-01	3.32E-01	5.81E-01	pCi/g
05-06045-03	DUP	GP-29	06/07/05 11:40	6/9/2005	6/20/2005	05-06045	Strontium-90	EIChroM SRW01 Modified	1.40E-01	1.87E-01	1.88E-01	2.80E-01	pCi/g
05-06045-04	DO	GP-29	06/07/05 11:40	6/9/2005	6/20/2005	05-06045	Strontium-90	EIChroM SRW01 Modified	-8.45E-02	1.65E-01	1.88E-01	3.27E-01	pCi/g
05-06045-05	TRG	GP-52	06/07/05 12:05	6/9/2005	6/20/2005	05-06045	Strontium-90	EIChroM SRW01 Modified	4.23E-01	1.77E-01	1.88E-01	2.73E-01	pCi/g
05-06045-06	TRG	SS-6	06/07/05 12:45	6/9/2005	6/20/2005	05-06045	Strontium-90	EIChroM SRW01 Modified	1.73E-01	1.70E-01	1.71E-01	2.82E-01	pCi/g
05-06045-07	TRG	SS-3	06/07/05 13:25	6/9/2005	6/20/2005	05-06045	Strontium-90	EIChroM SRW01 Modified	2.15E-01	1.50E-01	1.53E-01	2.44E-01	pCi/g
05-06045-08	TRG	GP-44	06/07/05 13:45	6/9/2005	6/20/2005	05-06045	Strontium-90	EIChroM SRW01 Modified	2.47E-01	1.80E-01	1.83E-01	2.93E-01	pCi/g

CU=Counting Uncertainty;TPU=Total Propagated Uncertainty;MDA=Minimal Detected Activity;LCS=Laboratory Control Sample; MBL=Blank; DUP=Duplicate; TRG=Normal Sample; DO=Duplicate Original

EBERLINE SERVICES

Oak Ridge Laboratory

601 Scarboro Road, Oak Ridge, TN 37830 865/481-0683 FAX 865/483-4621

SECTION V

ANALYTICAL STANDARD

Sr-90
13 MBq

National Institute of Standards & Technology

Certificate

Standard Reference Material 4234A
Strontium-90 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive strontium-90 chloride, non-radioactive strontium chloride, non-radioactive yttrium chloride, and hydrochloric acid dissolved 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 strontium-90 with a total activity of approximately 13 MBq. Strontium-90 decays by beta-particle emission to yttrium-90, which also decays by beta-particle emission. None of the beta particles escape from the SRM ampoule. The beta particles emitted from strontium-90 and yttrium-90 produce bremsstrahlung photons with energies up to 2 MeV. Most of these photons escape from the SRM ampoule and can represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. Appropriate shielding and/or distance should be used to minimize personnel exposure. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains hydrochloric acid (HCl) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

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 March 2005.

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) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group and D.B. Golas, Nuclear Energy Institute Research Associate.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
May 1995 (Text only revised November 1997)

Thomas E. Gills, Chief
Standard Reference Materials Program

*Notes and references are on pages 5 and 6.

EBERLINE SERVICES

QUALITY CONTROL PROGRAM

QCP-009

Rev.5; 11/10/03
Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE SOLUTIONS
PRIMARY DILUTION RECERTIFICATION
QCP 009-1

CURRENT DATE: 11/1/2004 0:00

SOLUTION REFERENCE #: NIST 4234A

SOLUTION #: Sr-13

Principal Radionuclide	Half Life, Years	Half Life, Days
^{90}Strontium	2.870E+01	1.048E+04

Radionuclide: ^{90}Strontium

Reference Date: 3/13/1995 0:00

Certified Activity: µCi

Certified Concentration: 6.7405E+01 µCi per gram

Ampoule /Solution Gross: 9.2400 Weight, Grams

Empty Ampoule: 4.1769 Weight, Grams

Solution Net: 5.0631 Weight, Grams

Total Activity in Ampoule: 341.2803 µCi

Chemical Composition of Standard Solution

$^{90}SrCl_2$ in 1M HCl

Dilution Instructions:

Dilution Solvent Used: 1M HCl

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 341.2803 µCi Which Equals 7.576E+08 dpm at the date listed above

And after dilution the activity of this solution is 7.576E+05 dpm/ml

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: November 1, 2005

Recertified By _____ Date: 11/6/04

Verified & Approved By _____ Date: 11/6/04

QC Approval _____ Date: 11/6/04

EBERLINE

QUALITY CONTROL PROGRAM
QCP-009

Rev 2; 11/10/03
Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE STANDARD SOLUTIONS
SECONDARY DILUTION RECERTIFICATION

QCP-009-1-A

Solution Reference #: NIST 4234A

Date: 11/1/2004 0:00

Solution #: Sr-13a

Principal Radionuclide	Half Life, Years	Half Life, Days
^{90}Sr	2.878E+01	1.051E+04

Radionuclide of Interest: ^{90}Sr

Parent Solution Conc.: 7.58E+05 dpm/ml

Reference Date: 3/13/1995 0:00

Chemical Composition of Standard Solution

$^{90}SrCl_2$ in 1M HCl

Dilution Instructions:

Dilution Solvent Used: 1M HCl

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution: 3.5558 ml

Total Activity: 2.6939E+06 dpm

Final Volume: 1000.00 ml

Final Activity Concentration: 2.6939E+03 dpm/ml

NOTES:

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: November 1, 2005

Recertified By: _____ Date: 11/1/04

Verified & Approved By: _____ Date: 11/1/04

QC Approval: _____ Date: 11/1/04

SECTION VI

QUALITY CONTROL SAMPLE RESULTS SUMMARY

Eberline Services
Analysis Control Chart

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
05-06045	Sr090	1	pCi	g	Miller Brooks Environmental

Laboratory Control Sample

Analyte	Normalized Difference	LCS Measured	TPU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	TPU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
SR-90	1.65	113.33%	13.70%	100.00%	0.55%	4.89E+01	2.74E-01	5.55E+01	7.60E+00	Sr-13a	2.10E+03	5.60E-01	8.17E-02

Matrix Spike

Analyte	Normalized Difference	MS Actual % Rec	Expected MS Result	Expected MS Uncert	Actual MS Result	Actual MS TPU	Sample Result	Sample TPU	Sample Aliquot	Standard ID	Standard ACT (dpm)	Standard Error %	Standard Added (g)

Replicate Sample

Analyte	Normalized Difference	RPD	Original Result	Original TPU	Replicate Result	Replicate TPU
SR-90	1.60	542.89	-5.45E-02	1.85E-01	1.40E-01	1.88E-01

QC Summary

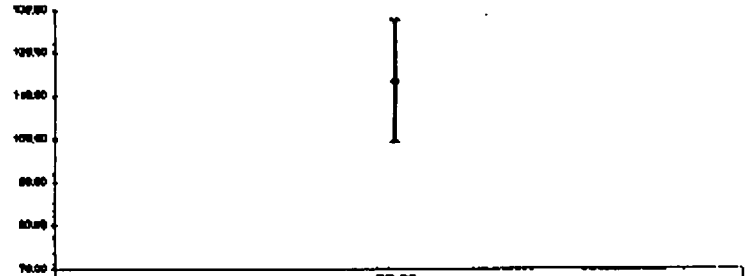
Analyte	LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
SR-90	1.13	OK	OK			INV	OK

Version

Eberline Services
Analysis Control Chart

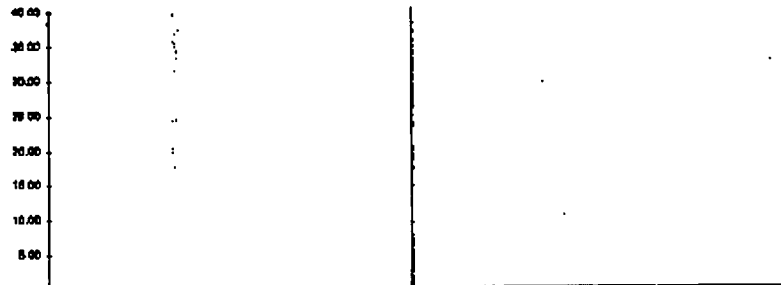
WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
05-06045	Sr090	1	pCi	g	Miller Brooks Environmental

LCS % Recovery



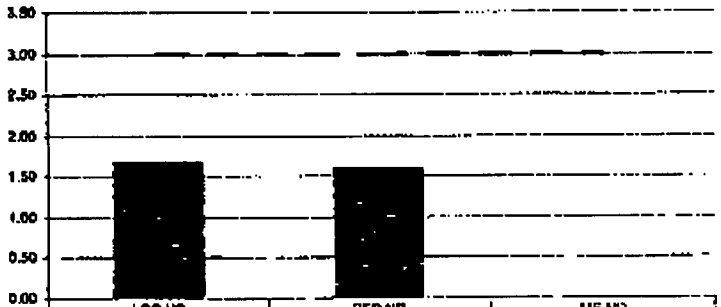
	SR-90
Lower Error	89.07
Upper Error	127.60
%R	113.33
LCL	80
Mean	100
UCL	120

Replicate Sample RPD



	SR-90
Lower Error	1818.34
Upper Error	-732.55
RPD	542.89
CL	35

Normalized Difference



	LCS ND	REP ND	MS ND
SR-90	1.66	1.60	0.00
UCL	3	3	3

No Matrix Spike

Version

SECTION VII

LABORATORY TECHNICIAN'S NOTES

EBERLINE SERVICES Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	05-06045
		Analysis Code	Sr090
		Run Number	1

#	Date	Dept.	User	Notes
1	06/10/05 15:49	CHEM	MROGERS	Aliquoted samples. Added spikes and Sr carrier. Added conc HNO3 and conc HCL. Took to near dryness. Added conc HNO3 and took to near dryness, twice. Added 8M HNO3, warmed, and transferred to c-tubes. Conditioned Sr columns with 8M HNO3. Syringe filtered and loaded samples. Rinsed with 8M HNO3. (T0=1355hrs) Eluted with 0.05M HNO3. Capped c-tubes and columns and set aside for ingrowth.
2	06/20/05 14:30	CHEM	MROGERS	Conditioned Sr columns with 8M HNO3. Added conc HNO3 to all samples. Loaded samples and collected liquid for Y90. (T1=0605hrs) Rinsed with 8M HNO3. Dried on planchets. Prepared for count room. Eluted Sr with 0.05M HNO3. Dried on tarred planchets. Weighed for gravimetric recoveries.

Michael Rogers 6-20-05

EBERLINE SERVICES

Reagents Used in an Analysis

Internal Work Order		
05-06045		
Analysis Code		Run
Sr090		1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
002707P	Hydrochloric Acid	Reagent Grade	MROGERS	6/10/2005
002863D04	Nitric Acid	0.05N	MROGERS	6/10/2005
002863D05	Nitric Acid	8N	MROGERS	6/10/2005
002882P	Nitric Acid	Reagent Grade	MROGERS	6/10/2005
002840P	SR Resin	Reagent Grade	MROGERS	6/10/2005
000050D03	Strontium Carrier	100 mg/ml	MROGERS	6/10/2005
002863D06	Nitric Acid	8N	MROGERS	6/20/2005
002882D06	Nitric Acid	1N	MROGERS	6/20/2005

Date	Sample #	Client	Load Time	CT. Time	Analysis	Tech
6-16-05	Dany Bkgd	Lab	0400	1HR	Bkgd	JDP
6-16-05	QC	Lab	0512	30min	Sr90	JDP
6-16-05	0506062AB(2-4)	CAS	1614	3HR	αβ	MR
6-16-05	0506063AB(2-4)	CAS	1614	3HR	αβ	MR
6-16-05	0506071AB(2,3,6)	CNF	1614	3HR	αβ	MR
6-16-05	0506062AB (1)	CAS	1615	30min	αβ	MR
6-16-05	0506063AB (1)	CAS	1647	30min	αβ	MR
6-16-05	0506071AB(1)	CNF	1717	30min	αβ	MR
6-17-05	Dany Bkgd	Lab	0357	1HR	Bkgd	JDP
6-17-05	QC	Lab	0503	30min	Sr90	JDP
6-17-05	0506054NP1(1-18)	Duratex	0633	10min	NP	JDP
6-17-05	0506057NP1(1-5)	SHAO	0715	10min	NP	JDP
6-17-05	0506027SA(1-7)	Lionville	0756	2HR	Sr	JDP
6-17-05	0506034A(1-3,5,7,9)	Duratex	1338	30min	Cl	MR
6-17-05	0506076A (1)	CAS	1640	30min	αβ	MR
6-17-05	0506076A(2-4)	CAS	1640	3HR	αβ	MR
6-17-05	0506084A(2-5)	Lowry	1641	30min	αβ	MR
6-17-05	0506084A(1)	Lowry	1641	3HR	αβ	MR
6-18-05	Weekly Bkgd	Lab	1255	8HR	Bkgd	MR
6-20-05	Dany Bkgd	Lab	0359	1HR	Bkgd	JDP
6-20-05	QC	Lab	0502	30min	Sr90	JDP
6-20-05	0506041CA(1-3,5)	Duratex	1039	30min	Cl-36	JDP
6-20-05	0506045AC 1-5)	MBE	1316	3HR	Sr 90	MR
6-20-05	0505129A(1-6)	CAS	1316	4HR	Sr 90	MR

SECTION VIII

ANALYTICAL DATA (STRONTIUM-90)

Eberline Services
Oak Ridge Laboratory
Analysis Sheet

05-06045
Sr090
Run 1

Work Order	05-06045
Analysis Code	Sr090
Run	1
Date Received	6/9/2005
Lab Deadline	6/21/2005
Client	Miller Brooks Environmental
Project	402-0002-04
Report Level	4
Activity Units	pCi
Aliquot Units	g
Matrix	SO
Method	EIChroM SRW01 Modified
Instrument Type	Alpha/Beta GPC
Radiometric Tracer	
Radiometric Sol#	
Tracer Act (dpm/g)	
Carrier	Strontium
Carrier Conc (mg/ml)	122.625

Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
01	LCS	LCS		06/09/05 00:00	1.0000E+00
02	MBL	BLANK		06/09/05 00:00	1.0000E+00
03	DUP	GP-29	53	06/07/05 11:40	2.0033E+00
04	DO	GP-29	53	06/07/05 11:40	2.0061E+00
05	TRG	GP-52	39	06/07/05 12:05	2.0037E+00
06	TRG	SS-6	51	06/07/05 12:45	2.0115E+00
07	TRG	SS-3	49	06/07/05 13:25	2.0130E+00
08	TRG	GP-44	64	06/07/05 13:45	2.0064E+00

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

Eberline Services
Oak Ridge Laboratory
Analysis Sheet

05-06045
Sr090
Run 1

Internal Fraction	Sample Desc	Tracer Aliquot (g)	Tracer Total ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	Grav Carrier Added (ml)	Grav Filter Tare (g)	Grav Filter Final (g)	Grav Filter Net (g)	Grav % Rec	Mean % Rec	SAF 1*	SAF 2*
01	LCS					0.100	7.4796	7.4910	0.0114	92.97	92.97	1.00	1.00
02	MBL					0.100	7.4703	7.4818	0.0115	93.78	93.78	1.00	1.00
03	DUP					0.100	7.4619	7.4717	0.0098	79.92	79.92	1.00	1.00
04	DO					0.100	7.4823	7.4917	0.0094	76.66	76.66	1.00	1.00
05	TRG					0.100	7.4896	7.4988	0.0092	75.03	75.03	1.00	1.00
06	TRG					0.100	7.5071	7.5169	0.0098	79.92	79.92	1.00	1.00
07	TRG					0.100	7.4560	7.4662	0.0102	83.18	83.18	1.00	1.00
08	TRG					0.100	7.5143	7.5233	0.0090	73.39	73.39	1.00	1.00

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

05-06045
Sr090
Run 1

Internal Fraction	Sample Desc	Rough Prep Date	Rough Prep By	Prep Date	Prep By	Sep t0 Date/Time	Sep t0 By	Sep t1 Date/Time	Sep t1 By
01	LCS			06/10/05 08:20	MROGERS	06/10/05 13:55	MROGERS	06/20/05 08:05	MROGERS
02	MBL			06/10/05 08:20	MROGERS	06/10/05 13:55	MROGERS	06/20/05 08:05	MROGERS
03	DUP			06/10/05 08:20	MROGERS	06/10/05 13:55	MROGERS	06/20/05 08:05	MROGERS
04	DO	06/10/05 07:49	KSALLINGS	06/10/05 08:20	MROGERS	06/10/05 13:55	MROGERS	06/20/05 08:05	MROGERS
05	TRG	06/10/05 07:49	KSALLINGS	06/10/05 08:20	MROGERS	06/10/05 13:55	MROGERS	06/20/05 08:05	MROGERS
06	TRG	06/10/05 07:49	KSALLINGS	06/10/05 08:20	MROGERS	06/10/05 13:55	MROGERS	06/20/05 08:05	MROGERS
07	TRG	06/10/05 07:49	KSALLINGS	06/10/05 08:20	MROGERS	06/10/05 13:55	MROGERS	06/20/05 08:05	MROGERS
08	TRG	06/10/05 07:49	KSALLINGS	06/10/05 08:20	MROGERS	06/10/05 13:55	MROGERS	06/20/05 08:05	MROGERS

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

Eberline Services
Oak Ridge Laboratory

Preliminary Data Report & Analytical Calculations

Work Order: 05-06045-Sr090-1

Client: Miller Brooks Environmental
Eberline Services Work Order: 05-06045
Analysis Code: Sr090
Run: 1

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	SR-90	LCS	LCS	pCi/g	5.55E+01	1.28E+00	5.30E-01	4.89E+01	113.33	OK		OK	
02	SR-90	MBL	BLANK	pCi/g	-9.12E-02	3.31E-01	5.81E-01					OK	OK
03	SR-90	DUP	GP-29	pCi/g	1.40E-01	1.67E-01	2.80E-01				INV	OK	
04	SR-90	DO	GP-29	pCi/g	-8.48E-02	1.85E-01	3.27E-01					OK	
05	SR-90	TRG	GP-52	pCi/g	4.23E-01	1.77E-01	2.73E-01					OK	
06	SR-90	TRG	SS-6	pCi/g	1.73E-01	1.70E-01	2.82E-01					OK	
07	SR-90	TRG	SS-3	pCi/g	2.15E-01	1.50E-01	2.44E-01					OK	
08	SR-90	TRG	GP-44	pCi/g	2.47E-01	1.60E-01	2.93E-01					OK	

Preliminary Data Report & Analytical Calculations

Work Order: 05-06045-Sr090-1

Client: Miller Brooks Environmental
Eberline Services Work Order: 05-06045
Analysis Code: Sr090
Rem: 1

Lab Position	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radioactivity % Rec	Grav % Rec	Mean % Rec	SAF	Step 10 Date/Time	Step 11 Date/Time
01	SR-90	LCS	06/09/05 00:00	1.00E+00		92.97	92.97	1.00	6/10/2005 13:55	6/20/2005 8:05
02	SR-90	MBL	06/09/05 00:00	1.00E+00		93.78	93.78	1.00	6/10/2005 13:55	6/20/2005 8:05
03	SR-90	DUP	06/07/05 11:40	2.00E+00		79.92	79.92	1.00	6/10/2005 13:55	6/20/2005 8:05
04	SR-90	DO	06/07/05 11:40	2.01E+00		78.66	78.66	1.00	6/10/2005 13:55	6/20/2005 8:05
05	SR-90	TRG	06/07/05 12:05	2.00E+00		75.03	75.03	1.00	6/10/2005 13:55	6/20/2005 8:05
06	SR-90	TRG	06/07/05 12:45	2.01E+00		79.92	79.92	1.00	6/10/2005 13:55	6/20/2005 8:05
07	SR-90	TRG	06/07/05 13:28	2.01E+00		83.18	83.18	1.00	6/10/2005 13:55	6/20/2005 8:05
08	SR-90	TRG	06/07/05 13:45	2.01E+00		73.39	73.39	1.00	6/10/2005 13:55	6/20/2005 8:05

Preliminary Data Report & Analytical Calculations
Work Order: 05-06045-Sr090-1

Client: Miller Brooks Environmental
Eberline Services Work Order: 05-06045
Analysis Code: Sr090
Run: 1

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Half-life (days)	Dataset	Carrier	Count Time	Counts	Bkg CPM	Eff
01	SR-90	LCS	06/20/05 13:18		LB4110R	A1	180	7915	1.283333333	0.401
02	SR-90	MBL	06/20/05 13:18		LB4110R	A2	180	284	1.85	0.409
03	SR-90	DUP	06/20/05 13:18		LB4110R	A3	180	232	1.1	0.409
04	SR-90	DO	06/20/05 13:18		LB4110R	A4	180	234	1.383333333	0.407
05	SR-90	TRG	06/20/05 13:18		LB4110R	B1	180	254	0.683333333	0.402
06	SR-90	TRG	06/20/05 13:18		LB4110R	B2	180	243	1.116666667	0.407
07	SR-90	TRG	06/20/05 13:18		LB4110R	B3	180	213	0.883333333	0.404
08	SR-90	TRG	06/20/05 13:18		LB4110R	B4	180	226	0.966666667	0.4

Count Room Report
Client: Miller Brooks Environment

05-06045-Sr090-1 (pCi/g) in SO
Tracer ID:

Internal Fraction	Sample Desc	Client ID	Sample Date	Sample Aliquot	Tracer Aliquot (g)	Tracer ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	SAF 1°	SAF 2°
01	LCS	LCS	06/09/05 00:00	1.0000					1.00	1.00
02	MBL	BLANK	06/09/05 00:00	1.0000					1.00	1.00
03	DUP	GP-29	06/07/05 11:40	2.0033					1.00	1.00
04	DO	GP-29	06/07/05 11:40	2.0061					1.00	1.00
05	TRG	GP-52	06/07/05 12:05	2.0037					1.00	1.00
06	TRG	SS-6	06/07/05 12:45	2.0115					1.00	1.00
07	TRG	SS-3	06/07/05 13:25	2.0130					1.00	1.00
08	TRG	GP-44	06/07/05 13:45	2.0064					1.00	1.00

Eberline Services
Oak Ridge Laboratory

Spike and Tracer Worksheet

Printed: 6/10/2005 6:20 AM

Internal Work Order	Run	Analysis Code	Date	Technician	Technician Initials	Witness Initials
05-06045	1	Sr090	6/10/2005 8:20	MROGERS	pcs	

LCS & Matrix Spikes					LCS	MS	LCSD	MSD	LCS		MS		LCSD		MSD	
Isotope	Sol #	Activity dpm/g	Solution Date	Approx Addition	Volume Used (g)	Volume Used (g)	Volume Used (g)	Volume Used (g)	Known pCi	Error Estimate	Added pCi	Error Estimate	Known pCi	Error Estimate	Added pCi	Error Estimate
SR-90	Sr-12a	2101.578	6/10/2005	0.020	0.0517				48.94	0.274	0.00	0.000	0.00	0.000	0.00	0.000

Tracers						
Fraction	Isotope	Sol #	Activity dpm/g	Solution Date	Volume Used (g)	Approx Addition

Balance Printer Tapes	
Tracer	LCS
	: = 0.0517 g
	Matrix Spike

Version 2.0 06/99

Ebasline Services - Oak Ridge
Version 2.0 6/1999

Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
05-06045	1	Sr090	grams	6/21/2005	MROGERS

Lab Fraction	Miller Brooks Environmental Client ID	Sample Type	Muffle Data Ratio. Post/Pre	Dilution Data No.of Dils	Dil Factor	Ratio	Aliquot Data Aliquot	Net Equiv	MS Aliquot Data Aliquot	Net Equiv	H-3 Solids Only Water Added (ml)	H3 Dist Aliq
01	LCS	LCS					1.0000E+00	1.0000E+00				
02	BLANK	MBL					1.0000E+00	1.0000E+00				
03	GP-29	DUP					2.0033E+00	2.0033E+00				
04	GP-29	DO					2.0061E+00	2.0061E+00				
05	GP-52	TRG					2.0037E+00	2.0037E+00				
06	SS-6	TRG					2.0115E+00	2.0115E+00				
07	SS-3	TRG					2.0130E+00	2.0130E+00				
08	GP-44	TRG					2.0084E+00	2.0084E+00				

Comments	

Technician: [signature] Date: 6/10/05

DMA-TR-15

Dade Moeller & Associates, Inc.

Technical Report

Supplemental Soil Sampling for Strontium-90 in the Runkle Canyon Development Simi Valley, California

Tracy A. Ikenberry, CHP

August 2005

Prepared for
GreenPark Runkle Canyon, LLC
1400 Quail Street
Newport Beach, CA 92660

Dade Moeller & Associates, Inc.
1835 Terminal Drive, Suite 200
Richland, WA 99354

LIMITATIONS

This technical report was prepared in accordance with our signed agreement with GreenPark Runkle Canyon, LLC. This report is based upon best information available at the time of document submittal.

Supplemental Soil Sampling for Strontium-90 in the Runkle Canyon Development, Simi Valley, California

Executive Summary. Runkle Canyon is a proposed residential development adjacent to existing neighborhoods on the southern edge of Simi Valley, California. Soil sampling of the project area in 1999 – 2003 showed the presence of low levels of the radionuclide strontium-90 (^{90}Sr). In early 2005 the State of California Department of Health Services (DHS) requested additional soil sampling at selected locations, and supplemental soil sampling for the presence of ^{90}Sr was conducted June 7, 2005. Soil samples were taken at five locations that had resulted in the highest soil concentrations during the previous sampling campaigns.

Sample results from the June 2005 sampling campaign showed ^{90}Sr soil concentrations that were much lower than the previously measured concentrations at the same locations and more in line with concentrations measured in other parts of the proposed development. New results ranged from non-detectable to 0.42 picocuries of ^{90}Sr per gram of soil (pCi/g). Results of split samples taken and analyzed by the DHS were similar, ranging from non-detectable to 0.14 pCi/g. Earlier results for these five locations had ranged from 3.6 to 12.3 pCi/g, although subsequent sampling at two of the sites had also indicated lower concentrations, less than the analytical detection limit of 2.2 pCi/g.

A risk analysis conducted using the earlier soil sampling data (Ikenberry 2005) determined the potential radiological risk of constructing, using, and residing at Runkle Canyon would be quite low – an incremental fatal cancer risk near or below 1×10^{-6} – and much less than the risk indicated by using the default preliminary remediation goal (PRG). This risk is at the low end of the U.S. Environmental Protection Agency's target risk range of 1×10^{-4} to 1×10^{-6}. The June 2005 supplemental ^{90}Sr soil sampling data indicate the potential risk would be even lower than initially calculated because of the lower concentrations encountered. Because of the low estimated individual risk, and because of the reduced ^{90}Sr concentration encountered during the supplemental soil sampling, it is concluded that no further sampling is necessary.

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Supplemental Soil Sampling for Strontium-90 in the Runkle Canyon Development, Simi Valley, California

1.0 Introduction

This report provides the results of a supplemental soil sampling campaign that was conducted at the request of the State of California Department of Health Services (DHS) on June 7, 2005. Five locations were identified where additional sampling for the radionuclide strontium-90 (^{90}Sr) was requested. These locations had resulted in the highest concentrations of ^{90}Sr in soil during previous soil sampling campaigns (see Section 2.0 Background).

2.0 Background

Runkle Canyon is a proposed residential development adjacent to existing neighborhoods at the southern edge of Simi Valley, California. The project site consists of approximately 1,595 acres that would include a mix of residential types, open space, a neighborhood park, a multi-use trail system and an area for the potential future development of a golf course. Residential development is proposed on approximately 140 acres in the northern portion of the project area, leaving approximately 1,456 acres in open space and recreational uses. A total of 461 residences are proposed, including 138 senior housing units, 62 of which would be affordable housing, 298 single-family homes, and 25 single-family estate homes (City of Simi Valley 2004).

As part of the environmental characterization of the site, several soil sampling campaigns have been conducted (QST 1999; Foster Wheeler 1999; Harding ESE 2000; Miller Brooks 2003a,b,c). The initial three campaigns provided numerical sampling data with low levels of detection and sampling statistics that were the basis of a subsequent risk analysis report (Ikenberry 2005). The most recent investigation (Miller Brooks 2003a,b,c) did not present numerical analysis data but rather provided results as "non-detectable" at the stated minimum detectable activity (MDA) of 2.2 picocuries per gram or pCi/g. These results were not adequate to provide additional definitive information that could be used in conjunction with the more detailed results from the earlier investigations.

The initial exploratory sampling campaign consisted of only four samples (QST 1999). The detection of ^{90}Sr in these samples led to additional sampling. The most detailed and extensive investigation took 58 surface soil samples from a 550-acre parcel containing the proposed residential area (Foster Wheeler 1999). The number and location of samples were taken using the methods directed by MARSSIM (Multi-Agency Radiation Survey and Site Investigation Manual), which is endorsed by the U.S. Environmental Protection Agency (EPA), U.S. Nuclear Regulatory Commission, and U.S. Department of Energy among numerous other Federal and state agencies (EPA 2001). An additional 17 soil samples were taken subsequently from other parcels in areas that would be open space with some portion available for recreational use (Harding ESE 2000). The surface soil sampling showed the presence of low levels of ^{90}Sr.

The three soil sampling campaigns noted above resulted in collection of 79 soil samples. The sample results from all three campaigns are included in this analysis to provide a large sample set and a more complete picture of the ^{90}Sr contamination in the Runkle Canyon area.

Figure 1 shows the sampling data from the lowest to highest concentration and also shows the uncertainty in the data as ± 2 standard deviations. This figure shows that most of the sample results (73, or over 90 percent of the samples taken) are less than 2 pCi/g; the five lowest results are less than zero (net results, corrected for background). The six highest results appear to be inconsistent with the other results, as shown by the deviation from the apparent straight line of the other data. The five highest results locations were selected by DHS for additional sampling; these sample results are circled in Figure 1. All of these five locations are in proposed open space that would be used for recreation, not residences.

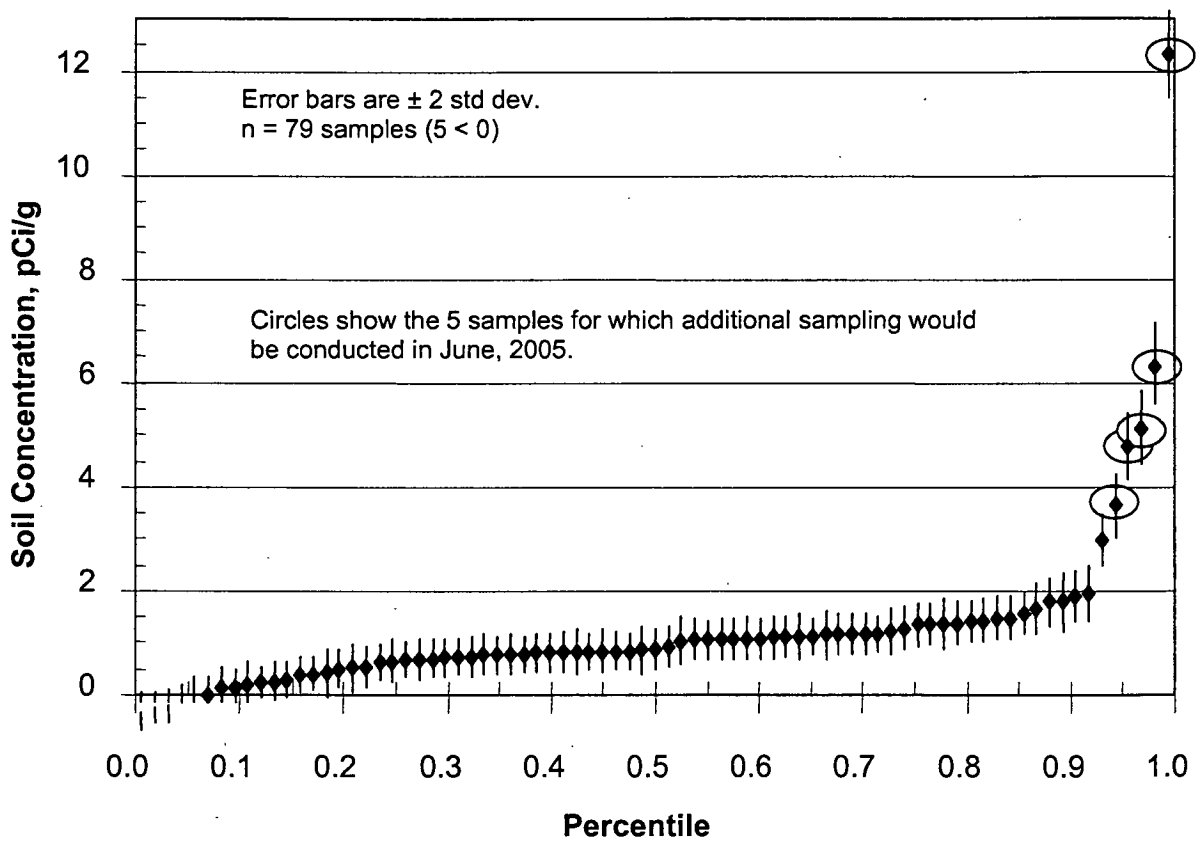

Figure 1. Distribution of Initial (1999-2000) Runkle Canyon ^{90}Sr Soil Sampling Results.

3.0 Soil Sampling

Soil sampling was conducted on June 7, 2005 by a DHS health physicist and a qualified technician representing GreenPark Runkle Canyon, LLC. Surface soil from approximately 0 to 3 inches (0 to 8 cm) depth was collected using the *Standard Practice for Sampling Surface Soil for Radionuclides* (ASTM 2000). Soil was sieved on location using a 10 mesh sieve, which excluded rocks greater than 2 mm in diameter as well as any vegetation and debris. Split samples of 500 ml volume were collected and shared between DHS and GreenPark.

Because samples were taken from previously identified sampling locations, the same sample designators were used for these samples. Three of the sample locations (GP-29, GP-44, and GP-52) had previously been recorded using GPS and could be accurately located. The remaining two sample locations (SS-3 and SS-6) were located as nearly as possible to the original locations using the available map of sample locations (Attachment 1). In these cases sample locations were determined to the satisfaction of the DHS representative. Latitude and longitude locations of the five samples recorded from the GPS unit are shown in Table 1.

Table 1. Latitude and Longitude of Sample Locations.

Sample Identification	Latitude	Longitude
SS-3	34.23330	118.73431
SS-6	34.22898	118.72218
GP-29	34.24492	118.72551
GP-44	34.23706	118.73130
GP-52	34.23386	118.72852

4.0 Results and Discussion

Table 2 shows the results of the June 7, 2005 soil sampling for ^{90}Sr at Runkle Canyon from both a commercial analytical laboratory and the State of California radiological laboratory[1]. Results were quite low in all cases, ranging from non-detectable (less than the laboratory counting background, reported as a negative value) to 0.42 pCi/g. Five of the six private laboratory sample results and all five of the State of California laboratory results were below the minimum detectable activity (MDA) at a 95 per cent level of confidence. One sample, GP-29, received a duplicate analysis in the private laboratory with one of the results being a negative value. Discussion of GP-29 will include only the higher result. Another sample, SS-3, had a negative value in the State of California results. The complete sampling and analysis information from the commercial laboratory are included as Attachment 2.

[1] State of California results reported in an e-mail from Robert Greger, DHS, to Tracy Ikenberry, Dade Moeller & Associates, July 9, 2005.

Table 2. Results of the June 7, 2005 Runkle Canyon Soil Sampling for ^{90}Sr.

Sample Identification	Commercial Laboratory			State of California Laboratory		
	Result (pCi/g)	Uncertainty (± 2 std. dev.)	MDA[1]	Result (pCi/g)	Uncertainty[2]	MDA[2]
SS-3	0.215	0.150	0.244	-0.022	0.206	0.348
SS-6	0.173	0.170	0.282	0.056	0.265	0.439
GP-29	-0.0645	0.185	0.327	0.068	0.242	0.399
GP-29	0.140	0.167	0.280	na	na	na
GP-44	0.247	0.180	0.293	0.013	0.179	0.299
GP-52	0.423	0.177	0.273	0.137	0.192	0.306

1. MDA = minimum detectable activity; 95% confidence.
2. Uncertainty and MDA parameters were not reported for the State laboratory; they are assumed similar.
3. na = not applicable; a duplicate analysis was performed for GP-29 at the private laboratory.

The DHS staff member responsible for the sampling and analysis of sample results provided the following description: "*No elevated Sr-90 was detected in any of the five samples by the state laboratory. One of the five samples had slightly elevated Sr-90 based on the developer's laboratory analyses; however, even this Sr-90 result was less than one-twentieth of the developer's previous Sr-90 sample results for this location.*"[2] The commercial laboratory reported higher sample results and had lower reported MDAs than did the State of California laboratory. All of these results are much lower than the initial values that had been reported in 1999 and 2000. Table 3 shows a comparison of the June 7, 2005 results to the earlier results. This comparison is for the original results; there is no correction for radioactive decay to present time of the earlier samples.

Figure 2 shows the initial ^{90}Sr soil sampling results from 1999-2000 decay-corrected to July 1, 2005 and compared to the new results from June of 2005. Taking into account the 29-year half life of ^{90}Sr and the fact that most of the samples were collected and analyzed 6 years ago, expected ^{90}Sr activity in soil would have decreased to about 87 percent of the original sample value. The June 2005 results are much less than would be expected from radioactive decay of the ^{90}Sr. It is noted the original results for these five locations were much higher than most the other sampling results, indicating there may have been differences in sampling or analysis error associated with the original results. Discussion with an individual who took the original samples indicate the sampling methods were similar. Another possibility is that ^{90}Sr in the surface soil may have leached into the deeper, less-accessible soil layersor may have been dispersed by physical processes such as water runoff; however, there was no physical indication of such processes at the sampling locations during the June 2005 sampling. Regardless of the reasons, the soil concentrations indicated by the June 2005 sample results are much lower and more in line with other soil concentrations sampled in 1999-2000.

[2] E-mail from Robert Greger, DHS, to Marie Rainwater, included as part of an August 2, 2005 e-mail from Marie Rainwater to interested parties who attended a July 27, 2005 SSFL Workgroup meeting.

Table 3. Comparison of June 2005 ^{90}Sr in Soil Sample Results with Earlier Results.

Sample Identification	June 2005 Results (pCi/g)	1999-2000		
		Result (pCi/g)	Uncertainty (± 2 std. dev.)	MDA[1]
SS-3	0.215	**3.64**	0.619	0.749
SS-6	0.173	**4.76**	0.633	0.643
GP-29	-0.0645	na	na	na
GP-29	0.140	**5.13**	0.69	0.84
GP-44	0.247	**6.38**	0.79	0.99
GP-52	0.423	**12.3**	0.86	0.59

1. MDA = minimum detectable activity; 95% confidence.
2. na = not applicable.

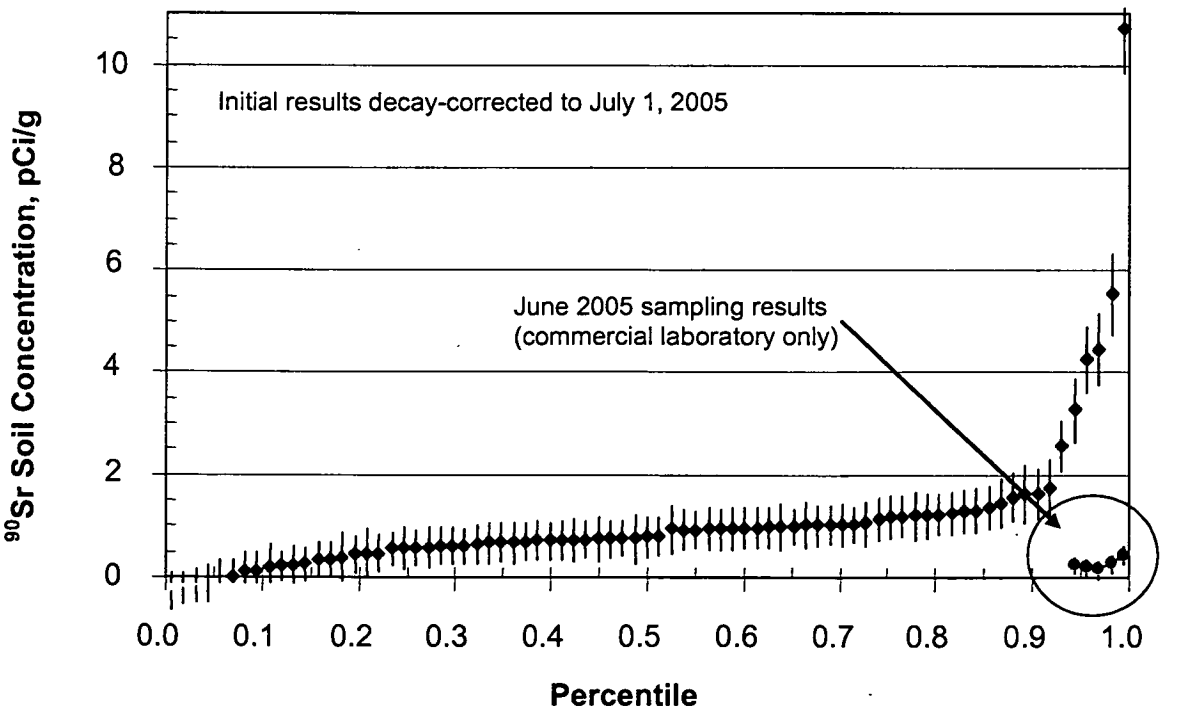

Figure 2. Comparison of Decay-Corrected Initial Sampling Results and June 2005 Results.

5.0 Conclusions

The soil sampling conducted during June 2005 showed current ^{90}Sr soil concentrations to be much lower than indicated by the initial sampling campaigns. This was confirmed by both a commercial analytical laboratory and a State of California laboratory analyzing split soil samples. A risk analysis conducted using the initial 1999-2000 soil sampling data (Ikenberry 2005) determined the potential radiological risk of constructing, using, and residing at Runkle Canyon would be quite low – an incremental fatal cancer risk near or below 1×10^{-6} – and much less than the risk indicated by using the default preliminary remediation goal (PRG). This risk is at the low end of the U.S. Environmental Protection Agency's target risk range of 1×10^{-4} to 1×10^{-6}. The June 2005 supplemental ^{90}Sr soil sampling data indicate the potential radiological risk would be even lower than initially calculated. Therefore, no further soil sampling is needed to demonstrate that potential radiological risk from ^{90}Sr is acceptably low and well within EPA guidelines.

6.0 References

ASTM. 2000. *Standard Practice for Sampling Surface Soil for Radionuclides.* ASTM C998-90 (2000). American Society for Testing and Materials, West Conshohocken, PA.

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Foster Wheeler Environmental Corporation. 1999. *Runkle Ranch Site Investigation , Simi Valley, California.* Final Report. Foster Wheeler Environmental Corporation, Costa Mesa, CA.

Harding ESE. 2000. *Results of Limited Soil Sampling, Rancho Simi Property. APN 6850-130-180, Simi Valley, California.* November 3, 2000. Harding ESE, Phoenix, AZ.

Ikenberry, T.A. 2005. *Radiological Health Risks from Strontium-90 in the Runkle Canyon Development Simi Valley, California.* DMA-TR-14. Dade Moeller & Associates, Richland Washington.

Miller Brooks Environmental, Inc. 2003a. *Site Investigation Report of Western 350-Acre Parcel; GreenPark Runkle Canyon, LLC Runkle Canyon Property in Simi Valley, California.* September 17, 2003. Miller Brooks Environmental, Inc., Huntington Beach, CA.

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Miller Brooks Environmental, Inc. 2003c. *Site Investigation Report of Southern 715-Acre Parcel; GreenPark Runkle Canyon, LLC Runkle Canyon Property in Simi Valley, California.* September 17, 2003. Miller Brooks Environmental, Inc., Huntington Beach, CA.

QST Environmental, Inc. 1999. "Results of Preliminary Soil Samples at Runkle Ranch in Simi Valley, California." Letter Report from John S. Kim to Ms. Marina Robertson, GreenPark Ventures, LLC, dated February 5, 1999.

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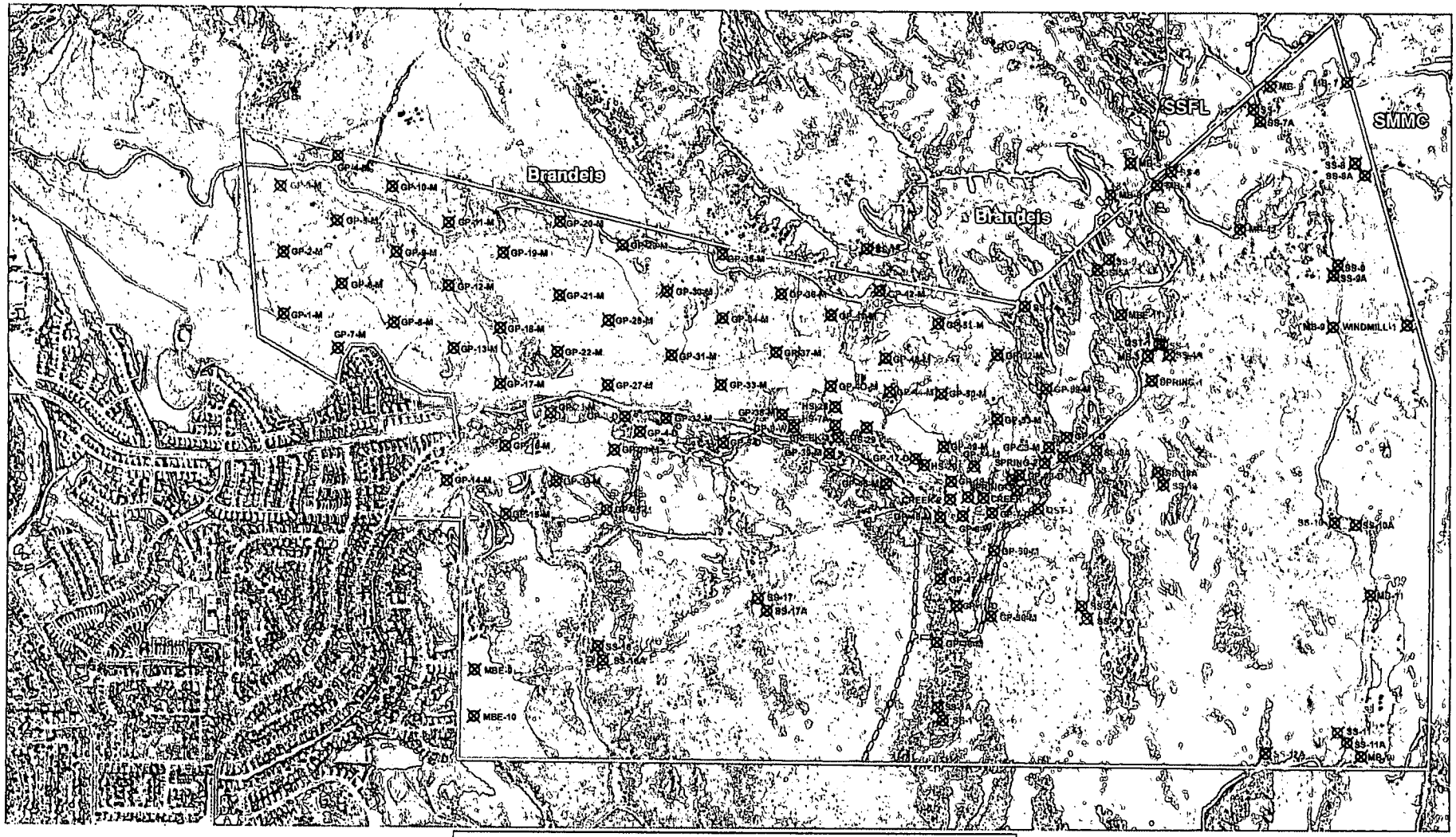
Attachments

Attachment 1. Environmental Sample Locations.

Attachment 2. Sampling and Analysis Report

Attachment 1



LEGEND

- Soil, Groundwater and Surface Water Sampling Locations for:
  - -Total Petroleum Hydrocarbons (TPH)
  - -Volatile Organic Compounds (VOC)
  - -Semi-Volatile Organic Compounds (SVOC)
  - -Polychlorinated Biphenyls (PCBs)
  - -Perchlorate
  - -Radionuclides
- Residential
- Permanent Open Space
- Parcel Boundary

Source: OST, Foster Wheeler, Harding ESE, Miller Brooks

GreenPark Runkle Canyon, LLC

Runkle Canyon

ENVIRONMENTAL SAMPLE LOCATIONS

2005

Not To Scale

Attachment 2

MILLER BROOKS ENVIRONMENTAL

Runkle Canyon

STANDARD LEVEL IV
REPORT OF ANALYSIS

WORK ORDER #05-06045-OR

June 22, 2005

EBERLINE SERVICES/OAK RIDGE LABORATORY
OAK RIDGE, TN

TABLE OF CONTENTS

SECTION	DESCRIPTION	PAGE
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II	Sample Acknowledgement	007
III	Case Narrative	010
IV	Analytical Results Summary	013
V	Analytical Standard	015
VI	Quality Control Sample Results Summary	019
VII	Laboratory Technician's Notes	022
VIII	Analytical Data (Strontium-90)	026
	Total Number of Pages 39	

Eberline Services – Oak Ridge Laboratory

LABORATORY DATA SUPPORT CHECKLIST
MP-001-3

Eberline Services Work Order # 05-06045

The checklist items listed below are to be initialed by appropriate staff upon completion/verification.

Date for Partial	Initials	Date	Initials	Checklist Items
		6-9-05	KAB	Sample Log-In
		6/21/05	KBS	Data Compilation
		6/21/05	MLT	Technical Data Review MRM 6/21/05
		6/22/05		Data Entry/Electronic Deliverable
		6/22/05		Case Narrative
		6/22/05		Electronic Deliverable Proof
		6/22/05		Samples Analyzed within Holding Time YES
		6/22/05		QA/QC Review
				Invoiced by Laboratory

Technical/Clerical Corrections, Signatures Needed, Problems,Etc	Date/Initials

Date package approved by: _____ 6/23/05
Laboratory Manager Date

SECTION I

CHAIN OF CUSTODY

05-06045

Chain of Custody Record

№ 1604

Eberline Services
601 Scarboro Road
Oak Ridge, TN 37830
(865) 481-0683 Phone • (865) 483-4621 Fax

EBERLINE SERVICES

Project Name: Runkle Canyon	Project Number: 402-0002-04
Send Report To: Jennie Canfield	Sampler (Print Name): Carson Crouch
Address: Miller Brooks Env.	Sampler (Print Name):
2124 Main St. #200	Shipment Method:
Huntington Beach CA	Airbill Number:
Phone: 714-500-5400 92648	Laboratory Receiving:
Fax:	

Page ___ of ___

Purchase Order #: _____

Analysis Requested: Sr 90

	Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Sr 90	Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)
4	GP-29	6/7/05	1140	Soil	1	X		
5	GP-52	↓	1205	↓	↓	↓		
6	SS-6		1245					
7	SS-3		1325					
8	GP-44		1345					

RECEIVED
JUN - 9 2005
Eberline
OAK RIDGE LAB

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
[signature]	K. Bannister	6-9-05	0802
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:

Sample Custodian Remarks (Completed By Laboratory):

QA/QC Level		Turnaround		Sample Receipt	
		14 Day		Total # Containers Received?	
Level I	☐	Routine	☐	COC Seals Present?	
Level II	☐	24 Hour	☐	COC Seals Intact?	
Level III	☐	1 Week	☐	Received Containers Intact?	
Other	☐	Other _____		Temperature?	

EBERLINE SERVICES Oak Ridge Laboratory	Internal Chain of Custody	Work Order #	05-06045
		Lab Deadline	6/21/2005
		Analysis	Sr090 - Level 4
		Sample Matrix	Soil/Solid

Comments	Sample Fraction	HP 210 / 270 Detector Activity	Storage Location
	04	53	G1.3
	05	39	G1.3
	06	51	G1.3
	07	49	G1.3
	08	64	G1.3

	Location (circle one)					Initials	Date
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room 0930	Kenny Sallings	6-9-05
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room 0810	Kenny Sallings	6-10-05
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[illegible]	6-10-05 0810
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[illegible]	6-20-05 1314
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[illegible]	6-20-05 1315
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room	[illegible]	6-20-05 1630
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Received by	Sample Storage	Rough Prep	Prep	Separations	Count Room		
Relinquished by	Sample Storage	Rough Prep	Prep	Separations	Count Room		

Printed: 6/9/2005 8:39 AM

SECTION II

SAMPLE ACKNOWLEDGEMENT

Client Name	Contract/PO	Project Type	Date Received	Required Turnaround Days	Eberline Services Work Order
Miller Brooks Environmental	402-0002-04	Environmental	06/09/2005	14	05-06045
Project Name	**Client WO**	**Sample Disp**	**Lab Deadline**	**Internal Deadline**	**Client Deadline**
402-0002-04	Runkle Canyon	R	06/21/2005	06/22/2005	06/23/2005

Internal ID	Client ID	Sample Date	Matrix	Storage	Sr090																							TP
01	LCS	06/09/05	SO	G1.3	X																							1
02	BLANK	06/09/05	SO	G1.3	X																							1
03	DUP	06/09/05	SO	G1.3	X																							1
04	GP-29	06/07/05 11:40	SO	G1.3	X																							1
05	GP-52	06/07/05 12:05	SO	G1.3	X																							1
06	SS-6	06/07/05 12:45	SO	G1.3	X																							1
07	SS-3	06/07/05 13:25	SO	G1.3	X																							1
08	GP-44	06/07/05 13:45	SO	G1.3	X																							1
																												0
																												0
																												0
																												0
																												0
																												0
																												0
																												0
																												0
																												0
																												0
																												0
				Totals Per Analysis (non QA samples)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

EBERLINE SERVICES

Sample Log In Report

Oak Ridge Laboratory
601 Scarboro Rd.
Oak Ridge, TN 37830

Voice: (865) 481-0683
Fax: (865) 483-4621

Invoice	Accounts Payable Miller Brooks Environmental 2124 Main Street #200 Huntington Beach, CA 92648
Voice	714-500-5400
Fax	
Contact	Jennie Canfield
Voice	714-500-5400
Fax	

Report Data	Jennie Canfield Miller Brooks Environmental 2124 Main Street #200 Huntington Beach, CA 92648
Voice	714-500-5400
Fax	

eMail data to Tracy Ikenberry

Printed: 6/9/2005 8:39 AM

Eberline Services – Oak Ridge Laboratory

SAMPLE RECEIPT CHECKLIST

MP-001-2

WORK ORDER # 05-06045

SAMPLE MATRIX/MATRICES: (CIRCLE ONE OR BOTH)

AQUEOUS NON-AQUEOUS

(CIRCLE EITHER YES, NO, OR N/A)

WERE SAMPLES:

Received in good condition?	Y	OR	N	
If aqueous, properly preserved	Y	OR	N	N/A

WERE CHAIN OF CUSTODY SEALS:

Present on outside of package?	Y	OR	N
Unbroken on outside of package?	Y	OR	N
Present on samples?	Y	OR	N
Unbroken on samples?	Y	OR	N

Was chain of custody present upon sample receipt? Yes

IF ANY OF THE ABOVE ARE CIRCLED, A DISCREPANT SAMPLE RECEIPT REPORT (DSR) HAS BEEN ISSUED.

REMARKS: _____

SIGNATURE: JCBannister DATE: 6-9-05

SECTION III

CASE NARRATIVE

EBERLINE SERVICES

Oak Ridge Laboratory
601 Scarboro Road
Oak Ridge, TN 37830
Phone (865) 481-0683
Fax (865) 483-4621

EBS-OR-22574

June 22, 2005

Jennie Canfield
Miller Brooks Environmental
2124 Main Street #200
Huntington Beach, CA 92648

CASE NARRATIVE
Work Order # 05-06045-OR

SAMPLE RECEIPT

This work order contains five soil samples received 06/09/05. These samples were analyzed for Strontium-90.

CLIENT ID	LAB ID	CLIENT ID	LAB ID
GP-29	05-06045-04	SS-3	05-06045-07
GP-52	05-06045-05	GP-44	05-06045-08
SS-6	05-06045-06		

ANALYTICAL METHODS

Strontium-90 was analyzed using EIChroM Method SRW01 Modified.

ANALYTICAL RESULTS

STRONTIUM-90

Samples were prepared by acid digestion as appropriate for the matrix. Chemical separations were conducted using EIChroM stabilized chemical resins. Subsequent extractions of Strontium-90 were conducted and Yttrium-90 was allowed to reach radioactive equilibrium. The Yttrium-90 fraction of each sample was selectively eluted onto a steel planchet and evaporated to dryness. Chemical recovery was determined by use of a stable Strontium carrier. Sample activities were determined by gas flow proportional counting. Sample results were corrected for Yttrium-90 decay after elution.

Samples demonstrated non-detect equivalent results for Strontium-90 activity. Chemical recovery was acceptable for all samples. Results for the Strontium-90 method blank demonstrated non-detect equivalent activity. Results for the Strontium-90 replicate demonstrated a high relative percent difference; however, normalized difference is within acceptable limits for the analytical technique. Results for the Strontium-90 laboratory control sample demonstrated an acceptable percent recovery.

CERTIFICATION OF ACCURACY

I certify that this data report is in compliance with the terms and conditions of the Purchase Order, both technically and for completeness, for other than the conditions detailed above. Release of the data contained in this hard copy data package has been authorized by the cognizant project manager or his/her designee to be accurate as verified by the following signature.

M.R. McDougall
Laboratory Manager

Date: 6/22/2005

SECTION IV

ANALYTICAL RESULTS SUMMARY

Eberline Services
Final Report of Analysis

Report To:		Work Order Details:	
Jennie Canfield		SDG:	05-06045
Miller Brooks Environmental		Purchase Order:	402-0002-04
2124 Main Street #200		Analysis Category:	ENVIRONMENTAL
Huntington Beach, CA 92648		Sample Matrix:	SO

Lab ID	Sample Type	Client ID	Sample Date	Receipt Date	Analysis Date	Batch ID	Analyte	Method	Result	CU	TPU	MDA	Report Units
05-06045-01	LCS	KNOWN	06/09/05 00:00	6/9/2005	6/20/2005	05-06045	Strontium-90	ElChroM SRW01 Modified	4.89E+01	2.74E-01			pCi/g
05-06045-01	LCS	SPIKE	06/09/05 00:00	6/9/2005	6/20/2005	05-06045	Strontium-90	ElChroM SRW01 Modified	5.55E+01	1.28E+00	7.60E+00	5.30E-01	pCi/g
05-06045-02	MBL	BLANK	06/09/05 00:00	6/9/2005	6/20/2005	05-06045	Strontium-90	ElChroM SRW01 Modified	-9.12E-02	3.31E-01	3.32E-01	5.81E-01	pCi/g
05-06045-03	DUP	GP-29	06/07/05 11:40	6/9/2005	6/20/2005	05-06045	Strontium-90	ElChroM SRW01 Modified	1.40E-01	1.67E-01	1.68E-01	2.80E-01	pCi/g
05-06045-04	DO	GP-29	06/07/05 11:40	6/9/2005	6/20/2005	05-06045	Strontium-90	ElChroM SRW01 Modified	-6.45E-02	1.85E-01	1.85E-01	3.27E-01	pCi/g
05-06045-05	TRG	GP-52	06/07/05 12:05	6/9/2005	6/20/2005	05-06045	Strontium-90	ElChroM SRW01 Modified	4.23E-01	1.77E-01	1.86E-01	2.73E-01	pCi/g
05-06045-06	TRG	SS-6	06/07/05 12:45	6/9/2005	6/20/2005	05-06045	Strontium-90	ElChroM SRW01 Modified	1.73E-01	1.70E-01	1.71E-01	2.82E-01	pCi/g
05-06045-07	TRG	SS-3	06/07/05 13:25	6/9/2005	6/20/2005	05-06045	Strontium-90	ElChroM SRW01 Modified	2.15E-01	1.50E-01	1.53E-01	2.44E-01	pCi/g
05-06045-08	TRG	GP-44	06/07/05 13:45	6/9/2005	6/20/2005	05-06045	Strontium-90	ElChroM SRW01 Modified	2.47E-01	1.80E-01	1.83E-01	2.93E-01	pCi/g

CU=Counting Uncertainty;TPU=Total Propagated Uncertainty;MDA=Minimal Detected Activity;LCS=Laboratory Control Sample; MBL=Blank; DUP=Duplicate; TRG=Normal Sample; DO=Duplicate Original

EBERLINE SERVICES

Oak Ridge Laboratory

601 Scarboro Road, Oak Ridge, TN 37830 865/481-0683 FAX 865/483-4621

SECTION V

ANALYTICAL STANDARD

Sr-212
13 uCi

National Institute of Standards & Technology

Certificate

Standard Reference Material 4234A
Strontium-90 Radioactivity Standard

This Standard Reference Material (SRM) consists of radioactive strontium-90 chloride, non-radioactive strontium chloride, non-radioactive yttrium chloride, and hydrochloric acid dissolved 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 strontium-90 with a total activity of approximately 13 MBq. Strontium-90 decays by beta-particle emission to yttrium-90, which also decays by beta-particle emission. None of the beta particles escape from the SRM ampoule. The beta particles emitted from strontium-90 and yttrium-90 produce bremsstrahlung photons with energies up to 2 MeV. Most of these photons escape from the SRM ampoule and can represent a radiation hazard. Approximate unshielded dose rates at several distances (as of the reference time) are given in note [a]*. Appropriate shielding and/or distance should be used to minimize personnel exposure. The SRM should be used only by persons qualified to handle radioactive material.

Chemical Hazard

The SRM ampoule contains hydrochloric acid (HCl) with a concentration of 1 mole per liter of water. The solution is corrosive and represents a health hazard if it comes in contact with eyes or skin. If the ampoule is to be opened to transfer the solution, the recommended procedure is given on page 2. The ampoule should be opened only by persons qualified to handle both radioactive material and strong acid solution.

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 March 2005.

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) both because of the radioactivity and because of the strong acid.

Preparation

This Standard Reference Material was prepared in the Physics Laboratory, Ionizing Radiation Division, Radioactivity Group, J.M.R. Hutchinson, Group Leader. The overall technical direction and physical measurements leading to certification were provided by L.L. Lucas of the Radioactivity Group and D.B. Golas, Nuclear Energy Institute Research Associate.

The support aspects involved in the preparation, certification, and issuance of this SRM were coordinated through the Standard Reference Materials Program by N.M. Trahey.

Gaithersburg, Maryland 20899
May 1995 (Text only revised November 1997)

Thomas E. Gills, Chief
Standard Reference Materials Program

*Notes and references are on pages 5 and 6.

EBERLINE SERVICES

QUALITY CONTROL PROGRAM

QCP-009

Rev.8; 11/10/03
Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE SOLUTIONS
PRIMARY DILUTION RECERTIFICATION
QCP 009-1

CURRENT DATE: 11/1/2004 0:00

SOLUTION REFERENCE #: NIST 4234A

SOLUTION #: Sr-13

Principal Radionuclide	Half Life, Years	Half Life, Days
^{90}Strontium	2.870E+01	1.048E+04

Radionuclide: ^{90}Strontium

Reference Date: 3/13/1995 0:00

Certified Activity: µCi

Certified Concentration: 6.7405E+01 µCi per gram

Ampoule /Solution Gross: 9.2400 Weight, Grams

Empty Ampoule: 4.1769 Weight, Grams

Solution Net: 5.0631 Weight, Grams

Total Activity in Ampoule: 341.2803 µCi

Chemical Composition of Standard Solution

$^{90}SrCl_2$ in 1M HCl

Dilution Instructions:

Dilution Solvent Used: 1M HCl

Dilute to a volume of 1000.00 milliliters

Certified Total Activity of 341.2803 µCi Which Equals 7.576E+08 dpm at the date listed above

And after dilution the activity of this solution is 7.576E+05 dpm/ml

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: November 1, 2005

Recertified By _____ Date: 11/6/04

Verified & Approved By _____ Date: 11/6/04

QC Approval _____ Date: 11/6/04

EBERLINE

QUALITY CONTROL PROGRAM

QCP-009

Rev 8; 11/10/03
Title: Radioactive Reference Standards Solutions & Records

EBERLINE SERVICES - OAK RIDGE LABORATORY
RADIOACTIVE REFERENCE STANDARD SOLUTIONS
SECONDARY DILUTION RECERTIFICATION

QCP-009-1-A

Solution Reference # NIST 4234A

Date 11/1/2004 0:00

Solution # Sr-13a

Principal Radionuclide	Half Life, Years	Half Life, Days
^{90}Sr	2.878E+01	1.051E+04

Radionuclide of Interest ^{90}Sr

Parent Solution Conc. 7.58E+05 dpm/ml

Reference Date 3/13/1995 0:00

Chemical Composition of Standard Solution

$^{90}SrCl_2$ in 1M HCl

Dilution Instructions:

Dilution Solvent Used 1M HCl

SECONDARY VOLUMETRIC DILUTION

Vol. Parent Solution: 3.5558 ml

Total Activity: 2.6939E+06 dpm

Final Volume: 1000.00 ml

Final Activity Concentration: 2.6939E+03 dpm/ml

NOTES:

This activity concentration is based on the original reference date listed above. All activities are corrected to the date and time of analysis by the laboratory data processing software.

Expiration Date: November 1, 2005

Recertified By _____ Date: 11/1/04

Verified & Approved By _____ Date: 11/1/04

QC Approval _____ Date: 11/1/04

SECTION VI

QUALITY CONTROL SAMPLE RESULTS SUMMARY

WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
05-06045	Sr090	1	pCi	g	Miller Brooks Environmental

Laboratory Control Sample

Analyte	Normalized Difference	LCS Measured	TPU Measured	LCS Expected	Uncert. Expected	Known	Known Error	Result	TPU	Standard ID	Standard ACT (dpm)	Standard Error	Standard Added (g)
SR-90	1.68	113.33%	13.70%	100.00%	0.56%	4.89E+01	2.74E-01	5.55E+01	7.60E+00	Sr-13a	2.10E+03	5.60E-01	5.17E-02

Matrix Spike

Analyte	Normalized Difference	MS Actual % Rec	Expected MS Result	Expected MS Uncert	Actual MS Result	Actual MS TPU	Sample Result	Sample TPU	Sample Aliquot	Standard ID	Standard ACT (dpm)	Standard Error %	Standard Added (g)

Replicate Sample

Analyte	Normalized Difference	RPD	Original Result	Original TPU	Replicate Result	Replicate TPU
SR-90	1.60	542.89	-6.45E-02	1.85E-01	1.40E-01	1.68E-01

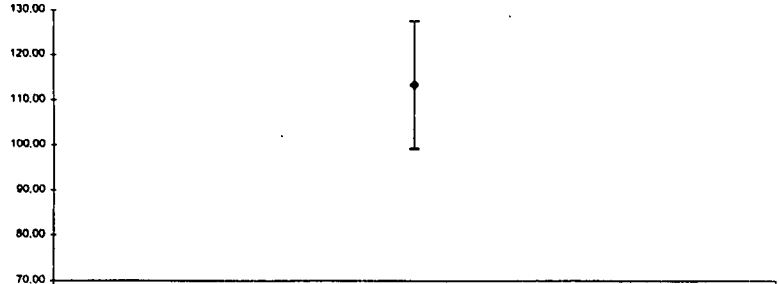
QC Summary

LCS Relative Bias	LCS % R	LCS ND	MS % R	MS ND	Rep RPD	Rep ND
1.13	OK	OK			INV	OK

Version

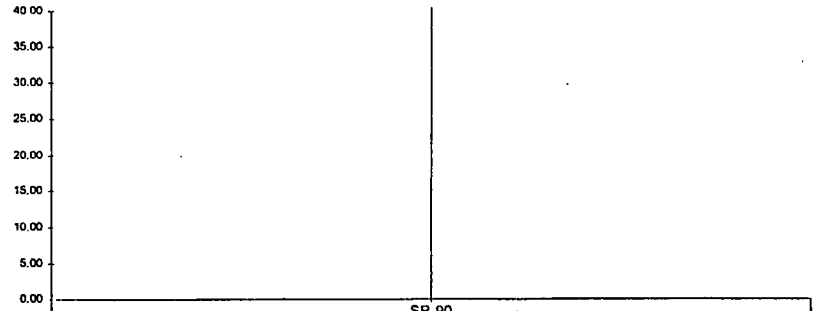
WO	Analysis	Run	Activity Units	Aliquot Units	Client Name
05-06045	Sr090	1	pCi	g	Miller Brooks Environmental

LCS % Recovery



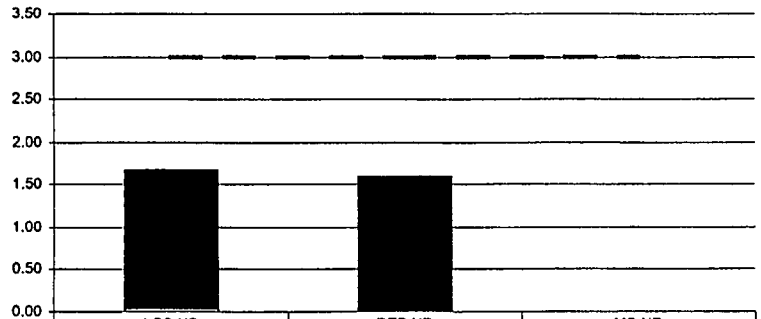
	SR-90
Lower Error	99.07
Upper Error	127.60
%R	113.33
LCL	80
Mean	100
UCL	120

Replicate Sample RPD



	SR-90
Lower Error	1818.34
Upper Error	-732.55
RPD	542.89
CL	35

Normalized Difference



	LCS ND	REP ND	MS ND
SR-90	1.68	1.60	0.00
UCL	3	3	3

No Matrix Spike

SECTION VII

LABORATORY TECHNICIAN'S NOTES

EBERLINE SERVICES Work Order Analysis Notes	Oak Ridge Laboratory 601 Scarboro Rd. Oak Ridge, TN 37830 Voice: 865.481.0683 www.eberlineservices.com	Internal Work Order	05-06045
		Analysis Code	Sr090
		Run Number	1

#	Date	Dept	User	Notes
1	06/10/05 15:49	CHEM	MROGERS	Aliquoted samples. Added spikes and Sr carrier. Added conc HNO3 and conc HCl. Took to near dryness. Added conc HNO3 and took to near dryness, twice. Added 8M HNO3, warmed, and transferred to c-tubes. Conditioned Sr columns with 8M HNO3. Syringe filtered and loaded samples. Rinsed with 8M HNO3. (T0=1355hrs) Eluted with 0.05M HNO3. Capped c-tubes and columns and set aside for ingrowth.
2	06/20/05 14:30	CHEM	MROGERS	Conditioned Sr columns with 8M HNO3. Added conc HNO3 to all samples. Loaded samples and collected liquid for Y90. (T1=0805hrs) Rinsed with 8M HNO3. Dried on planchets. Prepared for count room. Eluted Sr with 0.05M HNO3. Dried on tarred planchets. Weighed for gravimetric recoveries.

Mendel 6-20-05

EBERLINE SERVICES

Reagents Used in an Analysis

Internal Work Order	
05-06045	
Analysis Code	Run
Sr090	1

Reagent ID	Reagent Name	Reagent Concentration	Analyst ID	Date Recorded
002707P	Hydrochloric Acid	Reagent Grade	MROGERS	6/10/2005
002863D04	Nitric Acid	0.05N	MROGERS	6/10/2005
002863D05	Nitric Acid	8N	MROGERS	6/10/2005
002882P	Nitric Acid	Reagent Grade	MROGERS	6/10/2005
002840P	SR Resin	Reagent Grade	MROGERS	6/10/2005
000050D03	Strontium Carrier	100 mg/ml	MROGERS	6/10/2005
002863D06	Nitric Acid	8N	MROGERS	6/20/2005
002882D06	Nitric Acid	1N	MROGERS	6/20/2005

DATE	SAMPLE#	CLIENT	LOAD TIME	CT. TIME	ANALYSIS	TECH
6-16-05	DAILY BKGD	LAB	0402	1HR	BKGD	JDP
6-16-05	QC	LAB	0512	30min	Sr90	JDP
6-16-05	0506062AB(2-4)	CAS	1614	3HR	αβ	MR
6-16-05	0506063AB(2-4)	CAS	1614	3HR	αβ	MR
6-16-05	0506071AB(2,3,6)	CNF	1614	3HR	αβ	MR
6-16-05	0506062AB (1)	CAS	1615	30min	αβ	MR
6-16-05	0506063AB (1)	CAS	1647	30min	αβ	MR
6-16-05	0506071AB(1)	CNF	1719	30min	αβ	MR
6-17-05	DAILY BKGD	LAB	0357	1HR	BKGD	JDP
6-17-05	QC	LAB	0503	30min.	Sr90	JDP
6-17-05	0506054NP1(16-18)	DURATEX	0633	10min.	NP	JDP
6-17-05	0506057NP7(1-5)	SHAW	0715	10min.	NP	JDP
6-17-05	0506027SA(1-7)	LIONVILLE	0956	2HR	Sr	JDP
6-17-05	0506034A(1,3,5,7,9)	Duratek	1338	30min	Cl	MR
6-17-05	0506076A (1)	CAS	1640	30min	αβ	MR
6-17-05	0506076A(2-4)	CAS	1640	3HR	αβ	MR
6-17-05	0506084A(2-5)	LOWRY	1641	30min	αβ	MR
6-17-05	0506084A(1)	LOWRY	1641	3HR	αβ	MR
6-18-05	WEEKLY BKGD	LAB	1255	8HR	BKGD	MR
6-20-05	DAILY BKGD	LAB	0359	1HR	BKGD	JDP
6-20-05	QC	LAB	0502	30min	Sr90	JDP
6-20-05	0506041CLA(1,3,5)	DURATEX	1039	30min.	Cl-36	JDP
6-20-05	0506045AC(1-5)	MBE	1316	3HR	Sr90	MR
6-20-05	0505129A(1-6)	CAS	1316	4HR	Sr90	MR

SECTION VIII

ANALYTICAL DATA (STRONTIUM-90)

Work Order	05-06045
Analysis Code	Sr090
Run	1
Date Received	6/9/2005
Lab Deadline	6/21/2005
Client	Miller Brooks Environmental
Project	402-0002-04
Report Level	4
Activity Units	pCi
Aliquot Units	g
Matrix	SO
Method	ElChroM SRW01 Modified
Instrument Type	Alpha/Beta GPC
Radiometric Tracer	
Radiometric Sol#	
Tracer Act (dpm/g)	
Carrier	Strontium
Carrier Conc (mg/ml)	122.625

Internal Fraction	Sample Desc	Client ID	Login CPM	Sample Date	Sample Aliquot
01	LCS	LCS		06/09/05 00:00	1.0000E+00
02	MBL	BLANK		06/09/05 00:00	1.0000E+00
03	DUP	GP-29	53	06/07/05 11:40	2.0033E+00
04	DO	GP-29	53	06/07/05 11:40	2.0061E+00
05	TRG	GP-52	39	06/07/05 12:05	2.0037E+00
06	TRG	SS-6	51	06/07/05 12:45	2.0115E+00
07	TRG	SS-3	49	06/07/05 13:25	2.0130E+00
08	TRG	GP-44	64	06/07/05 13:45	2.0064E+00

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

05-06045
Sr090
Run 1

Internal Fraction	Sample Desc	Tracer Aliquot (g)	Tracer Total ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	Grav Carrier Added (ml)	Grav Filter Tare (g)	Grav Filter Final (g)	Grav Filter Net (g)	Grav % Rec	Mean % Rec	SAF 1*	SAF 2*
01	LCS					0.100	7.4796	7.4910	0.0114	92.97	92.97	1.00	1.00
02	MBL					0.100	7.4703	7.4818	0.0115	93.78	93.78	1.00	1.00
03	DUP					0.100	7.4619	7.4717	0.0098	79.92	79.92	1.00	1.00
04	DO					0.100	7.4823	7.4917	0.0094	76.66	76.66	1.00	1.00
05	TRG					0.100	7.4896	7.4988	0.0092	75.03	75.03	1.00	1.00
06	TRG					0.100	7.5071	7.5169	0.0098	79.92	79.92	1.00	1.00
07	TRG					0.100	7.4560	7.4662	0.0102	83.18	83.18	1.00	1.00
08	TRG					0.100	7.5143	7.5233	0.0090	73.39	73.39	1.00	1.00

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

05-06045
Sr090
Run 1

Internal Fraction	Sample Desc	Rough Prep Date	Rough Prep By	Prep Date	Prep By	Sep t0 Date/Time	Sep t0 By	Sep t1 Date/Time	Sep t1 By
01	LCS			06/10/05 08:20	MROGERS	06/10/05 13:55	MROGERS	06/20/05 08:05	MROGERS
02	MBL			06/10/05 08:20	MROGERS	06/10/05 13:55	MROGERS	06/20/05 08:05	MROGERS
03	DUP			06/10/05 08:20	MROGERS	06/10/05 13:55	MROGERS	06/20/05 08:05	MROGERS
04	DO	06/10/05 07:49	KSALLINGS	06/10/05 08:20	MROGERS	06/10/05 13:55	MROGERS	06/20/05 08:05	MROGERS
05	TRG	06/10/05 07:49	KSALLINGS	06/10/05 08:20	MROGERS	06/10/05 13:55	MROGERS	06/20/05 08:05	MROGERS
06	TRG	06/10/05 07:49	KSALLINGS	06/10/05 08:20	MROGERS	06/10/05 13:55	MROGERS	06/20/05 08:05	MROGERS
07	TRG	06/10/05 07:49	KSALLINGS	06/10/05 08:20	MROGERS	06/10/05 13:55	MROGERS	06/20/05 08:05	MROGERS
08	TRG	06/10/05 07:49	KSALLINGS	06/10/05 08:20	MROGERS	06/10/05 13:55	MROGERS	06/20/05 08:05	MROGERS

* SAF1 is used for Gross Alpha and all other radionuclides. SAF2 is used for Gross Beta only. ** Actual mass exceeded the calibration curve range. Results should be qualified as appropriate.

Eberline Services
Oak Ridge Laboratory

Preliminary Data Report & Analytical Calculations

Work Order: 05-06045-Sr090-1

Client: Miller Brooks Environmental
Eberline Services Work Order: 05-06045
Analysis Code: Sr090
Run: 1

Lab Fraction	Nuclide	Sample Desc	Client Identification	Activity Units	Results	Error Estimate	MDA	LCS Known	LCS %R	LCS Flag	RPD Flag	MDA Flag	Blank Flag
01	SR-90	LCS	LCS	pCi/g	5.55E+01	1.28E+00	5.30E-01	4.89E+01	113.33	OK		OK	
02	SR-90	MBL	BLANK	pCi/g	-9.12E-02	3.31E-01	5.81E-01					OK	OK
03	SR-90	DUP	GP-29	pCi/g	1.40E-01	1.67E-01	2.80E-01				INV	OK	
04	SR-90	DO	GP-29	pCi/g	-6.45E-02	1.85E-01	3.27E-01					OK	
05	SR-90	TRG	GP-52	pCi/g	4.23E-01	1.77E-01	2.73E-01					OK	
06	SR-90	TRG	SS-6	pCi/g	1.73E-01	1.70E-01	2.82E-01					OK	
07	SR-90	TRG	SS-3	pCi/g	2.15E-01	1.50E-01	2.44E-01					OK	
08	SR-90	TRG	GP-44	pCi/g	2.47E-01	1.80E-01	2.93E-01					OK	

Preliminary Data Report & Analytical Calculations

Work Order: 05-06045-Sr090-1

Client: Miller Brooks Environmental
Eberline Services Work Order: 05-06045
Analysis Code: Sr090
Run: 1

Lab Fraction	Nuclide	Sample Desc	Sample Date	Sample Aliquot	Radiometric % Rec	Grav % Rec	Mean % Rec	SAF	Sep t0 Date/Time	Sep t1 Date/Time
01	SR-90	LCS	06/09/05 00:00	1.00E+00		92.97	92.97	1.00	6/10/2005 13:55	6/20/2005 8:05
02	SR-90	MBL	06/09/05 00:00	1.00E+00		93.78	93.78	1.00	6/10/2005 13:55	6/20/2005 8:05
03	SR-90	DUP	06/07/05 11:40	2.00E+00		79.92	79.92	1.00	6/10/2005 13:55	6/20/2005 8:05
04	SR-90	DO	06/07/05 11:40	2.01E+00		76.66	76.66	1.00	6/10/2005 13:55	6/20/2005 8:05
05	SR-90	TRG	06/07/05 12:05	2.00E+00		75.03	75.03	1.00	6/10/2005 13:55	6/20/2005 8:05
06	SR-90	TRG	06/07/05 12:45	2.01E+00		79.92	79.92	1.00	6/10/2005 13:55	6/20/2005 8:05
07	SR-90	TRG	06/07/05 13:25	2.01E+00		83.18	83.18	1.00	6/10/2005 13:55	6/20/2005 8:05
08	SR-90	TRG	06/07/05 13:45	2.01E+00		73.39	73.39	1.00	6/10/2005 13:55	6/20/2005 8:05

Preliminary Data Report & Analytical Calculations
Work Order: 05-06045-Sr090-1

Client	Eberline Services Work Order	Analysis Code	Run
Miller Brooks Environmental	05-06045	Sr090	1

Lab Fraction	Nuclide	Sample Desc	Counting Date/Time	Halflife (days)	Detect	Carrier	Count Time	Counts	Bkg CPM	Eff
01	SR-90	LCS	06/20/05 13:18		LB4110R	A1	180	7915	1.283333333	0.401
02	SR-90	MBL	06/20/05 13:18		LB4110R	A2	180	284	1.65	0.409
03	SR-90	DUP	06/20/05 13:18		LB4110R	A3	180	232	1.1	0.409
04	SR-90	DO	06/20/05 13:18		LB4110R	A4	180	234	1.383333333	0.407
05	SR-90	TRG	06/20/05 13:18		LB4110R	B1	180	254	0.883333333	0.402
06	SR-90	TRG	06/20/05 13:18		LB4110R	B2	180	243	1.116666667	0.407
07	SR-90	TRG	06/20/05 13:18		LB4110R	B3	180	213	0.883333333	0.404
08	SR-90	TRG	06/20/05 13:18		LB4110R	B4	180	228	0.966666667	0.4

Count Room Report [redacted] 05-06045-Sr090-1 (pCi/g) in SO [redacted]

Client: Miller Brooks Environment

Tracer ID:

Internal Fraction	Sample Desc	Client ID	Sample Date	Sample Aliquot	Tracer Aliquot (g)	Tracer ACT (dpm)	Radiometric Tracer (pCi)	Radiometric % Rec	SAF 1*	SAF 2*
01	LCS	LCS	06/09/05 00:00	1.0000					1.00	1.00
02	MBL	BLANK	06/09/05 00:00	1.0000					1.00	1.00
03	DUP	GP-29	06/07/05 11:40	2.0033					1.00	1.00
04	DO	GP-29	06/07/05 11:40	2.0061					1.00	1.00
05	TRG	GP-52	06/07/05 12:05	2.0037					1.00	1.00
06	TRG	SS-6	06/07/05 12:45	2.0115					1.00	1.00
07	TRG	SS-3	06/07/05 13:25	2.0130					1.00	1.00
08	TRG	GP-44	06/07/05 13:45	2.0064					1.00	1.00

Eberline Services
Oak Ridge Laboratory

Spike and Tracer Worksheet

Printed: 6/10/2005 8:20 AM

Internal Work Order	Run	Analysis Code	Date	Technician	Technician Initials	Witness Initials
05-06045	1	Sr090	6/10/2005 8:20	MROGERS	MRS	

LCS & Matrix Spikes					LCS	MS	LCSD	MSD	LCS		MS		LCSD		MSD	
Isotope	Sol #	Activity dpm/g	Solution Date	Approx Addition	Volume Used (g)	Volume Used (g)	Volume Used (g)	Volume Used (g)	Known pCi	Error Estimate	Added pCi	Error Estimate	Known pCi	Error Estimate	Added pCi	Error Estimate
SR-90	Sr-13a	2101.578	6/10/2005	0.020	0.0517				48.94	0.274	0.00	0.000	0.00	0.000	0.00	0.000

Tracers

fraction	Isotope	Sol #	Activity dpm/g	Solution Date	Volume Used (g)	Approx Addition

Balance Printer Tapes

Tracer	LCS
	0.0517 g

Matrix Spike

Eberline Services - Oak Ridge
Version 2.0 8/1999

Aliquot Worksheet

Work Order	Run	Analysis Code	Rpt Units	Lab Deadline	Technician
05-06045	1	Sr090	grams	6/21/2005	MROGERS

Lab Fraction	Miller Brooks Environmental Client ID	Sample Type	Muffle Data Ratio Post/Pre	Dilution Data No.of Dils	Dil Factor	Ratio	Aliquot Data Aliquot	Net Equiv	MS Aliquot Data Aliquot	Net Equiv	H-3 Solids Only Water Added (ml)	H3 Dist Aliq
01	LCS	LCS					1.0000E+00	1.0000E+00				
02	BLANK	MBL					1.0000E+00	1.0000E+00				
03	GP-29	DUP					2.0033E+00	2.0033E+00				
04	GP-29	DO					2.0061E+00	2.0061E+00				
05	GP-52	TRG					2.0037E+00	2.0037E+00				
06	SS-6	TRG					2.0115E+00	2.0115E+00				
07	SS-3	TRG					2.0130E+00	2.0130E+00				
08	GP-44	TRG					2.0064E+00	2.0064E+00				

Comments	

Technician: [illegible] Date: 6 / 10 / 05

Gravimetric Worksheet

Work Order	Run	Analysis Code	Gravimetric Carrier	Carrier Conc (mg/ml)	Technician
05-06045	1	Sr090	Strontium	122.6250	MROGERS

TRetec Fraction	Miller Brooks Environmental Client ID	Sample Type	Carrier Data: Carrier Added (ml)	Filter Data: Filter Tare (g)	Filter Data: Filter Final (g)	Filter Data: Filter Net (g)	Gravimetric: % Recovery
01	LCS	LCS	0.1000	7.4796	7.4910	0.0114	92.97
02	BLANK	MBL	0.1000	7.4703	7.4818	0.0115	93.78
03	DUP	DUP	0.1000	7.4619	7.4717	0.0098	79.92
04	GP-29	DO	0.1000	7.4823	7.4917	0.0094	76.66
05	GP-52	TRG	0.1000	7.4896	7.4988	0.0092	75.03
06	SS-6	TRG	0.1000	7.5071	7.5169	0.0098	79.92
07	SS-3	TRG	0.1000	7.4560	7.4662	0.0102	83.18
08	GP-44	TRG	0.1000	7.5143	7.5233	0.0090	73.39

Technician: Michael Rogers Date: 6/20/05

Eberline Services - Oak Ridge
Prep Logbook
Version 2.0 8/1999

Rough Sample Preparation Log Book

Work Order	Lab Deadline	Date Received in Prep	Date Sealed	Date Returned	Technician
05-06045	6/21/2005	6/9/2005	6/10/2005	6/11/2005	KSALLINGS

Eberline	Miller Brooks Environmental	Tare (g)	Gross (g)		Net (g)		Percent		Gamma		Special
Fraction	Client ID	Pan Wt	Wet Wt.	Dry Wt.	Wet Wt.	Dry Wt.	Liquid	Solid	Dry Wt.	LEPS Wt.	Info
04	GP-29	13.5300	475.8900	428.3000	462.3600	414.7700	10.29%	89.71%			
05	GP-52	13.5000	504.9300	493.4800	491.4300	479.9800	2.33%	97.67%			
06	SS-6	13.7000	583.8100	561.0100	570.1100	547.3100	4.00%	96.00%			
07	SS-3	13.6500	578.6100	564.5000	564.9600	550.8500	2.50%	97.50%			
08	GP-44	13.6300	505.1600	490.8300	491.5300	477.2000	2.92%	97.08%			

Comments	
Special Codes	H: Hot, O: Organic Hazard, P: PCB Hazard, R: Rush, T: Other (see comments)

Technician: Kenny Sellers

Date: Analysis: Rough Prep Logbook

MR 6/20/05

R

Detector ID	Sample ID	Alpha	Beta	Count Time	Voltage	TOD
A1	0506045-01	10	7915	180	1400	6/20/05 16:18
A2	0506045-02	27	284	180	1400	6/20/05 16:18
A3	0506045-03	26	232	180	1400	6/20/05 16:18
A4	0506045-04	35	234	180	1400	6/20/05 16:18
B1	0506045-05	14	254	180	1400	6/20/05 16:18
B2	0506045-06	34	243	180	1400	6/20/05 16:18
B3	0506045-07	19	213	180	1400	6/20/05 16:18
B4	0506045-08	24	228	180	1400	6/20/05 16:18

JP
6-20-05
R

Detector ID	Sample ID	Alpha	Beta	Guard	Count Count Time	Event	Voltage	TOD
A1	BKGD	2	77	31446	60	0	1380	38523.21
A2	BKGD	5	99	31448	60	0	1380	38523.21
A3	BKGD	7	66	31448	60	0	1380	38523.21
A4	BKGD	1	83	31451	60	0	1380	38523.21
B1	BKGD	1	53	32379	60	0	1380	38523.21
B2	BKGD	7	67	32378	60	0	1380	38523.21
B3	BKGD	4	53	32377	60	0	1380	38523.21
B4	BKGD	9	58	32380	60	0	1380	38523.21
C1	BKGD	4	76	32792	60	0	1402.5	38523.21
C2	BKGD	2	68	32793	60	0	1402.5	38523.21
C3	BKGD	8	78	32790	60	0	1402.5	38523.21
C4	BKGD	4	61	32792	60	0	1402.5	38523.21
D1	BKGD	4	87	32806	60	0	1402.5	38523.21
D2	BKGD	4	59	32804	60	0	1402.5	38523.21
D3	BKGD	1	56	32806	60	0	1402.5	38523.21
D4	BKGD	9	63	32805	60	0	1402.5	38523.21