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PSC-17/18

RADIOLOGICAL SURVEY REPORT FOR REMEDIATION ACTIVITIES AT THE NAVAL AIR STATION, JACKSONVILLE, FLORIDA

ADDENDUM 1

Under Contract No. N62467-93-D-0936

Prepared by Bechtel Environmental, Inc.
Oak Ridge, Tennessee

July 1996

Revision 0

Bechtel Job No. 22567

Prepared by: E. Walker — Senior Scientist — 7-11-96 Date

Approved: N. H. Francis — Project Manager — 7-15-96 Date

rpt016a

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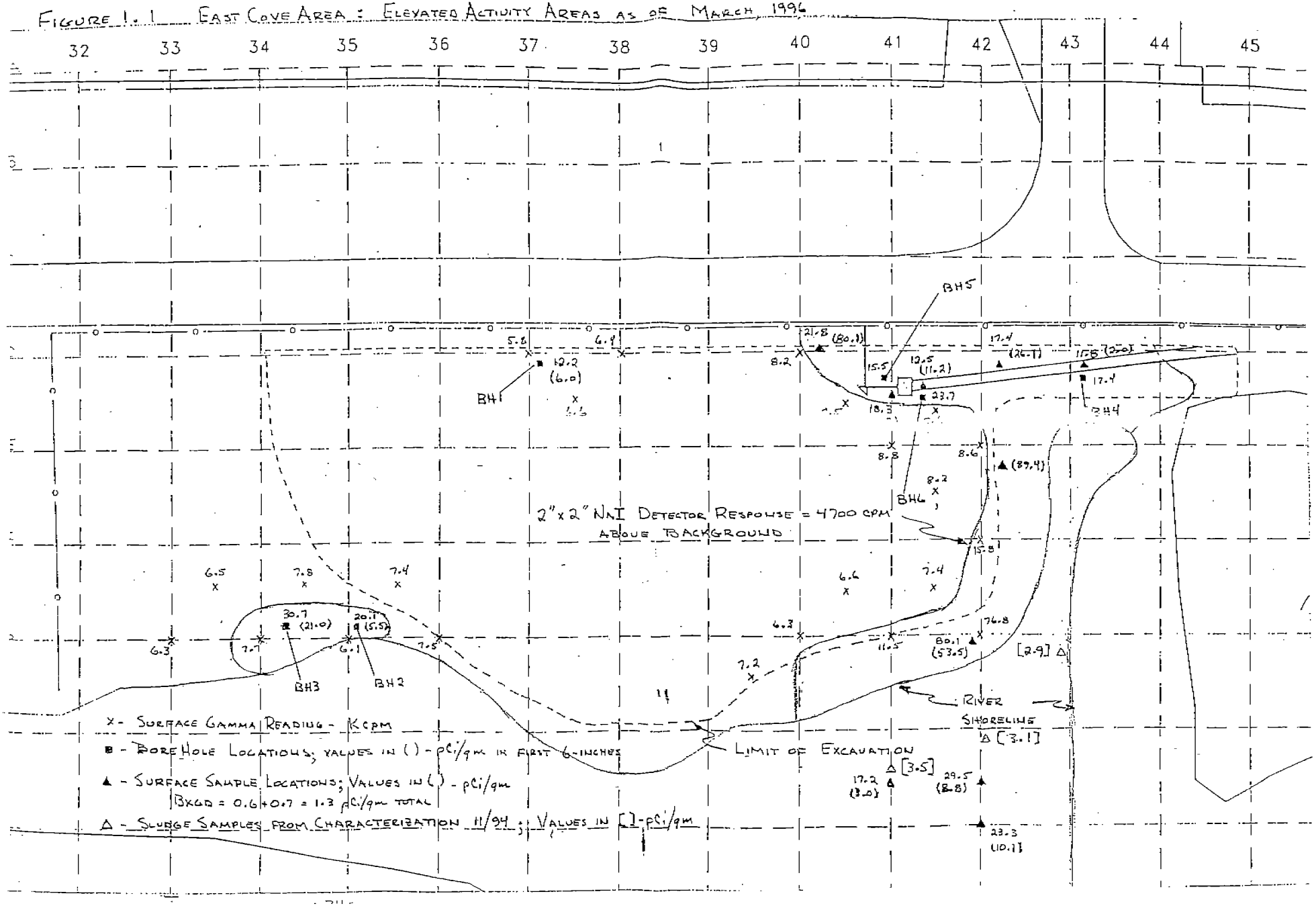
FIGURE 1.1 EAST COVE AREA : ELEVATED ACTIVITY AREAS AS OF MARCH 1996

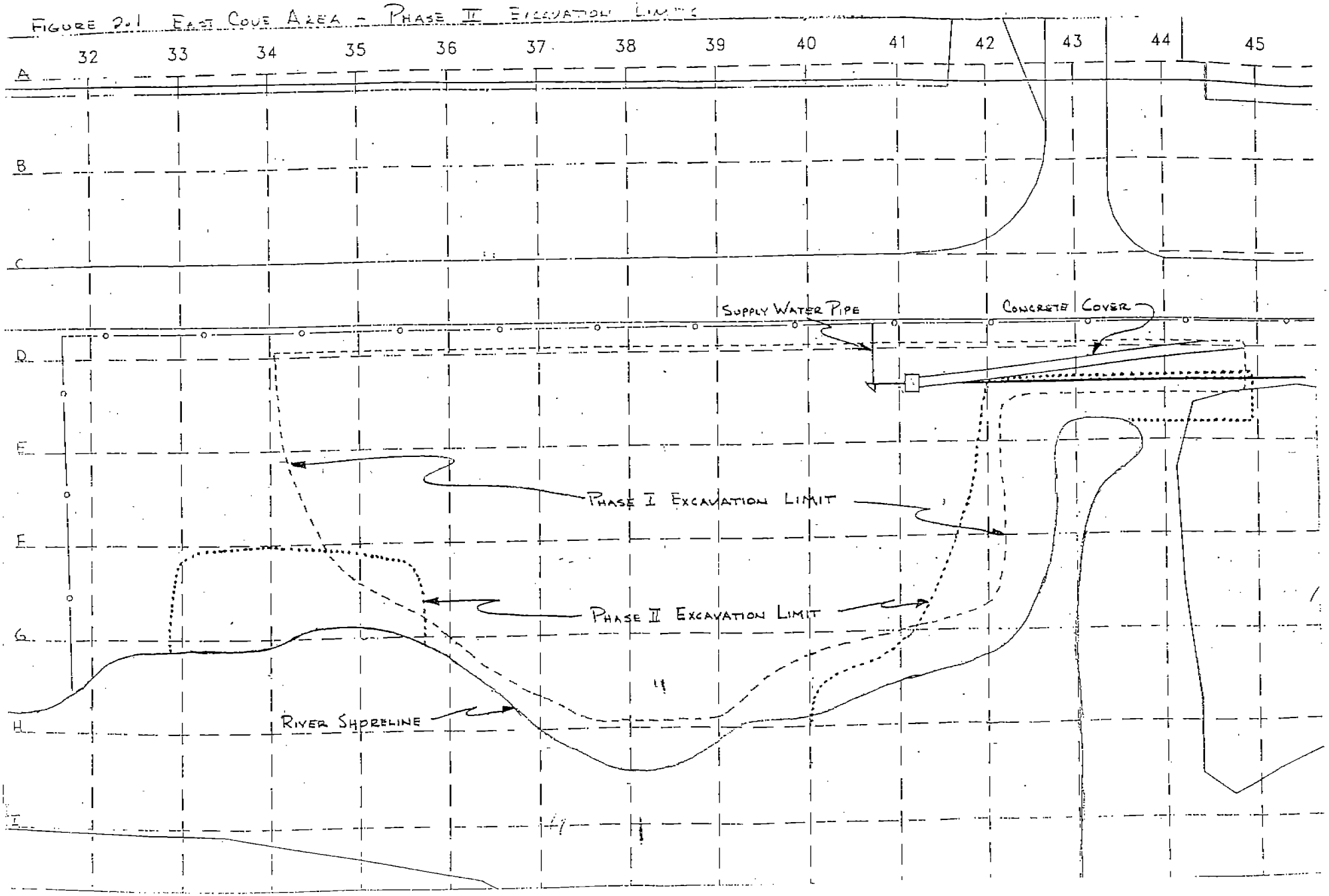


2.0 PHASE II REMEDIATION ACTIVITIES

The remediation plan for these additional elevated radioactive residual areas was executed upon receipt of the required approvals to extend into the designated wet lands region. The objective was to remove material from these areas until gamma readings, using a 2"x2" NaI detector, were less than local background plus 4,700 cpm. The additional excavation is shown on Figure 2.1. The excavation removed the residual radioactive materials up to the river shoreline. It did not extend into the river bottom sediments. During this excavation, the supply water pipe was exposed and found to be running parallel to Birmingham Avenue, and not under the concrete cover as originally thought. Material was removed from around this pipe to the extent that further removal activity could possible compromise the integrity of the pipe.

This additional Phase II excavation covered approximately 8,000 ft^2 and resulted in 550 yd^3 of contaminated material removed. This material was taken to PSC-26 for final stabilization.

FIGURE 2.1 EAST COVE AREA - PHASE II EXCAVATION LIMITS



3.0 RADIOLOGICAL CHARACTERIZATION - POST-REMEDIATION

At the completion of excavation activity, the excavated area was scanned using the 2"x2" NaI gamma detector. If the scan readings were within 4,750 cpm above background, the area was characterized using the originally established grid. The characterization consisted of in situ gamma readings and composite soil samples.

3.1 GAMMA MEASUREMENTS

Grid measurements were taken using the same grid that was established for the initial characterization. The gamma measurements were taken at each grid intersection point and in the center of each grid block that was directly involved in the excavation activity. Readings were taken at contact with the surface, at 1 ft above the surface, and 3 ft above the surface. The contact readings were used to evaluate the effectiveness of the excavation. The elevated readings were used to determine if surface readings and sample results may have been influenced by local hot spots. If the activity is approximately constant or slowly varying with height above the surface, activity on or beneath the surface is uniformly distributed (no hot spots). The results of these in situ gamma measurements are summarized on Figure 3-1 and in Table 3-1. The field logs for these measurements are provided in Attachment A.

Several isolated spots of elevated activity may be noted on Figure 3-1. These are:

(1) Center of grid block G-H/41-42, at edge of waterline
(2) Along grid line E/43-44, surface of water at outfall
(3) In grid blocks D-E/42-43-44-45, adjacent to water pipe

The first two spots are at or within normally water-covered locations. The activity along the waterpipe is associated with residue material that is adhered to the surface of the pipe. This is discussed further in Section 3.3.

3.2 SOIL SAMPLE ANALYSIS

After scan surveys indicated that the excavation activities had removed the residual radioactive material to levels below the criteria for release, composite soil samples were obtained, using the grid system for location identification. These samples were then analyzed by gamma spectroscopy for radium-226 and thorium-232 content. The results of these analyses are shown on Figure 3-2 and are summarized in Table 3-2. The lab analysis data sheets are provided in Attachment B. None of the composite samples from the excavated areas contained residual activity in excess of the unrestricted reuse criteria of 5 pCi/gm total radium-226 and thorium-232 above background. The highest composite sample activity was obtained from grid block G-H/40-41, along the south shore of the river. This sample contained a total activity of:

$$A = A_T - \text{Bkgd.}$$

$$A = (6.0 - 1.3)\ \text{pCi/gm}$$

$$A = 4.7\ \text{pCi/gm} < 5\ \text{pCi/gm}$$

3.3 HOT SPOT ELEVATIONS

As noted in Section 3.1, elevated in situ gamma readings were obtained along the water pipe that runs parallel to Birmingham Avenue. This activity appears to be associated with residual material adhering to

the wall surface of the pipe. Further remediation of this water pipe involves risk of damage to the pipe. This was considered unacceptable, as this water line is a main source of supply for the base. The consequences of leaving this residual activity is place was analyzed in the Phase I post-remediation report (Ref. 2). This evaluation was based on an infinite slab source producing an unshielded dose rate of $\approx 70\ \mu R/hr$. This is a factor of 2-3 greater than dose rates observed in this area and is based on the highest soil sample analysis concentration which is not uniform. As such, this provides a very conservative basis for assessing the residue on the water pipe. In Reference 2, it was determined that a backfill of at least 18 in. of sand would reduce an infinite slab source to approximately twice background. The uneven distribution of activity in situ and the shielding effectiveness will result in actual surface dose rates that are essentially indistinguishable from the natural background variations. An unshielded dose rate along the water pipe of approximately 0.07 mR/hr will not pose a significant risk to future maintenance workers and is well below the value of 2.5 mR/hr that requires initiation of radiation controls.

FIGURE 3.1 2"x2" NaI GAMMA READINGS : EAST COVE AREA - PHASE II POST REMEDIATION

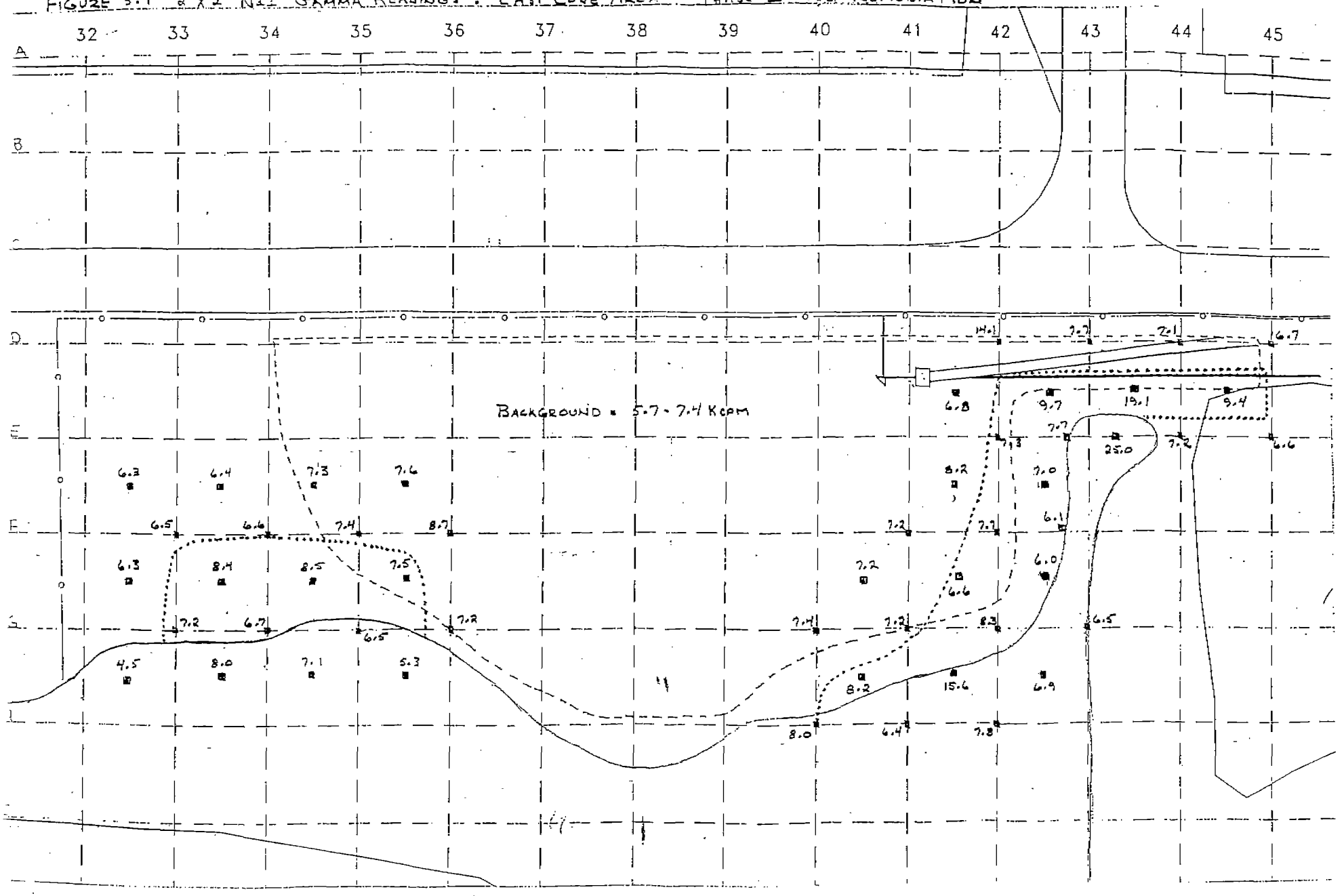


Table 3-1

East Cove Phase II
Post Excavation Grid Survey: Gamma (cpm)

Grid	Background	Contact	1 Ft	3 Ft
H41	[1]6,524 ± 680	6,401	7,371	7,726
H40		8,032	7,890	7,292
H42		7,782	7,587	7,928
G43		6,485	6,119	5,817
G-H/42-43		6,908	7,270	7,493
G-H/41-42		15,582	13,374	9,917
G-H/40-41		8,163	7,475	6,988
G40		7,372	7,433	6,838
G41		7,226	7,516	7,043
G42		8,349	8,317	7,699
F-G/42-43		6,042	6,317	5,987
F-G/41-42		6,602	7,178	7,091
F-G/40-41		7,187	7,050	6,744
F41		7,232	7,127	6,860
F42		7,689	7,782	7,161
F43		6,113	6,323	6,133
E-F/42-43		7,037	6,996	7,188
E-F/41-42		8,161	7,858	6,858
E42		7,274	7,449	6,917
E42-43		7,742	8,763	10,010
D-E/41-42		6,832	7,281	6,836
D-E/42-43		9,654	10,277	8,742
D-E/43-44		19,137	15,442	11,066
D-E/44-45		9,366	9,265	7,572
E44		7,179	6,812	6,381
E45		6,621	6,629	6,081
D45		6,713	6,461	6,120
D44		7,138	6,832	6,323
D43		7,667	7,318	7,126
D42		14,126	13,322	10,250
F33		6,509	6,463	5,804
F34		6,612	6,315	6,097
F35		7,411	7,373	6,785
F36		8,740	8,235	6,997
E-F/35-36		7,611	7,496	6,967
E-F/34-35		7,313	7,151	6,626
E-F/33-34		6,355	6,122	4,922
E-F/32-33		6,320	6,265	5,802
F-G/32-33		6,300	6,494	6,165

[1]Average of seven onsite locations.

Table 3-1 (continued)

Grid	Background	Contact	1 Ft	3 Ft
F-G/33-34	[1]6,524 ± 680	8,377	7,495	6,465
F-G/34-45		8,544	6,827	6,261
F-G/35-36		7,464	7,864	6,369
G36		7,218	7,004	6,132
G35		6,497	6,584	5,963
G34		6,747	6,370	5,599
G33		7,505	6,194	6,070
G-H/32-33		4,476	4,890	5,009
G-H/33-34		8,042	7,160	5,917
G-H/34-35		7,121	6,560	5,468
G-H/35-36		5,304	5,480	5,380

[1]Average of seven onsite locations.

FIGURE 3.2 SOIL SAMPLE CONCENTRATION RA-226+TH-232 : EAST COVE AREA - PHASE II POST REMEDIATION

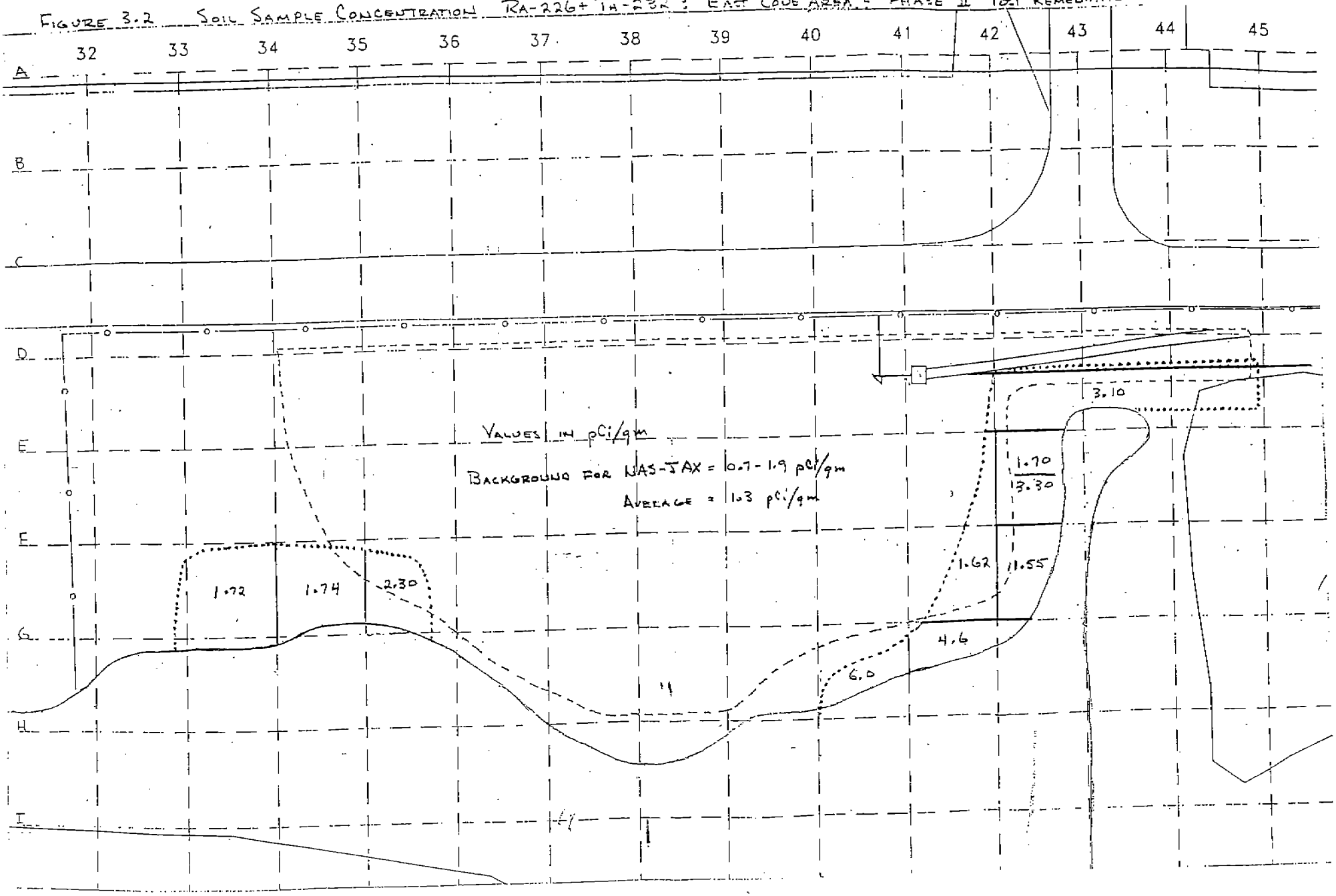


Table 3-2
East Cove Area - Phase II: Post-Excavation Grid Composite Soil Samples

Grid	Sample ID	Ra-226 (pCi/gm)	Th-232 (pCi/gm)	Total (pCi/gm)
D0.5-E/42-43-44-45	531	1.9	1.2	3.10
E-F/42-43	532	0.83	0.87	1.70
F-G/42-43	533	0.84	0.71	1.55
Dup of 532	534	2.2	1.1	3.30
G-H/40-41	535	4.5	1.5	6.0
G-h/41-42	536	3.1	1.5	4.6
E-F-G/41-42	537	0.72	0.90	1.62
F-G/35-36	538	1.20	1.10	2.30
F-G/34-35	540	0.93	0.81	1.74
F-G/33-34	539	0.72	1.0	1.72
Site Background Average		0.59	0.72	1.31

4.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the post-excavation radiological characterization and evaluation, the following conclusions are offered:

(1) With the exception of the exposed pipeline structure and adjacent soil, the excavation areas are below the remediation criteria of 5 pCi/gm above background.

(2) Two hot spots, resulting from sediment in or along the river, were identified. This coupled with sediment sampling reported in Reference 2, confirms the presence of activity above the remediation criteria of 5 pCi/gm. However, this activity is normally underwater. The highest activity sample contained approximately 10 pCi/gm, twice the remediation criteria.

(3) The maximum dose rate from the residual activity around the water supply pipeline is less than 0.07 mR/hr. This is well below the limit of 2.5 mR/hr that would require radiological controls for future maintenance work on the system.

(4) Eighteen inches of sand cover over the water pipeline will reduce the surface dose rate above the pipe to levels indistinguishable from the variations observed in the natural background at the site.

Based on these conclusions, the following activities should be considered:

(1) Complete backfilling the excavated area.

(2) Cover the water supply pipeline with at least 18 in. of sand backfill.

(3) Re-evaluate the necessity of additional remediation of the river bottom sediments at the mouth of the cove. It is recommended that a RESRAD computer model calculation be performed to show negligible consequences of leaving this material in place.

(4) Release the excavated/backfilled area for unrestricted use.

5.0 REFERENCES

Walker, E. "PSC-17/18 Radiological Survey Report for the Naval Air Station, Jacksonville, Florida," prepared for the U.S. Navy, Southern Division - Naval Facilities Engineering Command, by Bechtel Environmental, Inc., October 1995.

Walker, E. "PSC-17/18 Radiological Survey Report for the Remediation Activities at the Naval Air Station, Jacksonville, Florida," prepared for the U.S. Navy, Southern Division - Naval Facilities Engineering Command, by Bechtel Environmental, Inc., March 1995.

ATTACHMENT 1

East Cove Area - Phase II

Post Excavation Grid Surveys (2"x2" NaI Detector)

6-20-96

Grid Point	Grnd	1'	3'
DE/~~42-43~~ 43-44	19137	15442	11066
DE/~~43-44~~ 44-45	9366	9265	7572
E 44	7179	6892	6381
E 45	6621	6629	6008
D 45	6713	6461	6120
D 44	7138	6832	6323
D 43	7667	7318	7126
D 42	14126	13322	10250
F 33	6509	6463	5804
F 34	6612	6315	6094
F 35	7411	7373	6785
F 36	8740	8235	6997 @ Stockpile
EF/35-36	7611	7496	6967
EF/35-34	7313	7151	6622
EF/34-33	6355	6122	4922
EF/33-32	6320	6265	5802
FG/33-32	6300	6494	6165
FG/33-34	8377	7495	6465
FG/34-35	8544	6827	6261
FG/35-36	7464	7864	6369
G 36	7218	7004	6132
G 35	6497	6514	5963
G 34	6747	6370	5599
G 33	7505	6194	6070

GH/32-33	4476	4890	5009
GH/33-34	8042	7160	5917
GH/34-35	7121	6560	5468
GH/35-36	5304	5480	5380

6-20-96

Bkg @ Site

D31 -	5693
D32 -	5841
G31 -	6222
G32 -	6300
E34	7011
E36	7175
E38	7428

6524 + 4750 = 11,274 cpm

Efficency of 0.087

10 minute Background - 4218.5 cpm

6-20-96

GRID	GRND	1'	3'	
H41	6401	7371	7726	
H40	8032	7890	7292	
H42	7782	7587	7928	
G43	6485	6119	5817	(≅ 3/4 way to 43 Line)
GH/43-42	6908	7270	7493	
GH/42-41	15582	13374	9917	@ water
GH/41-40	8163	7475	6988	
G40	7372	7433	6838	
G41	7226	7516	7043	
G42	8349	8317	7659	
FG/42-43	6042	6317	5987	
FG/42-41	6602	7178	7091	
FG/41-40	7187	7050	6744	
F41	7232	7127	6860	
F42	7689	7782	7161	
F43	6113	6323	6133	(≅ 3/4 way to F43)
EF/43-42	7037	6996	7188	
EF/42-41	8161	7858	6858	
E42	7274	7449	6917	
E42-43	7742	8763	10070	≅ 2/3 to E43

1' over water on "E" Line @ 1" Above water

25050 cpm

DE/41-42	6832	7281	6836
PE/42-43	9654	10277	8744

TO : Ed Walker X 2202
FROM : Tom Rountree
RE : Site 18 Sample Locations
Date : 6-26-96

Sample ID	Location (Designated by NW Corner)
JX00531	1/3rd of Grids D42, 43, 44 & 45
532	E42
533	F42
534	Duplicate of E42 (#532)
535	1/2 of G42 & G40
536	G41
537	1/3 of E41 & 1/2 of F41
538	1/2 of F35 & 1/8 of F32
539	F33
540	F34
541	Equipment Rinsate

ATTACHMENT 2

East Cove Area - Phase II

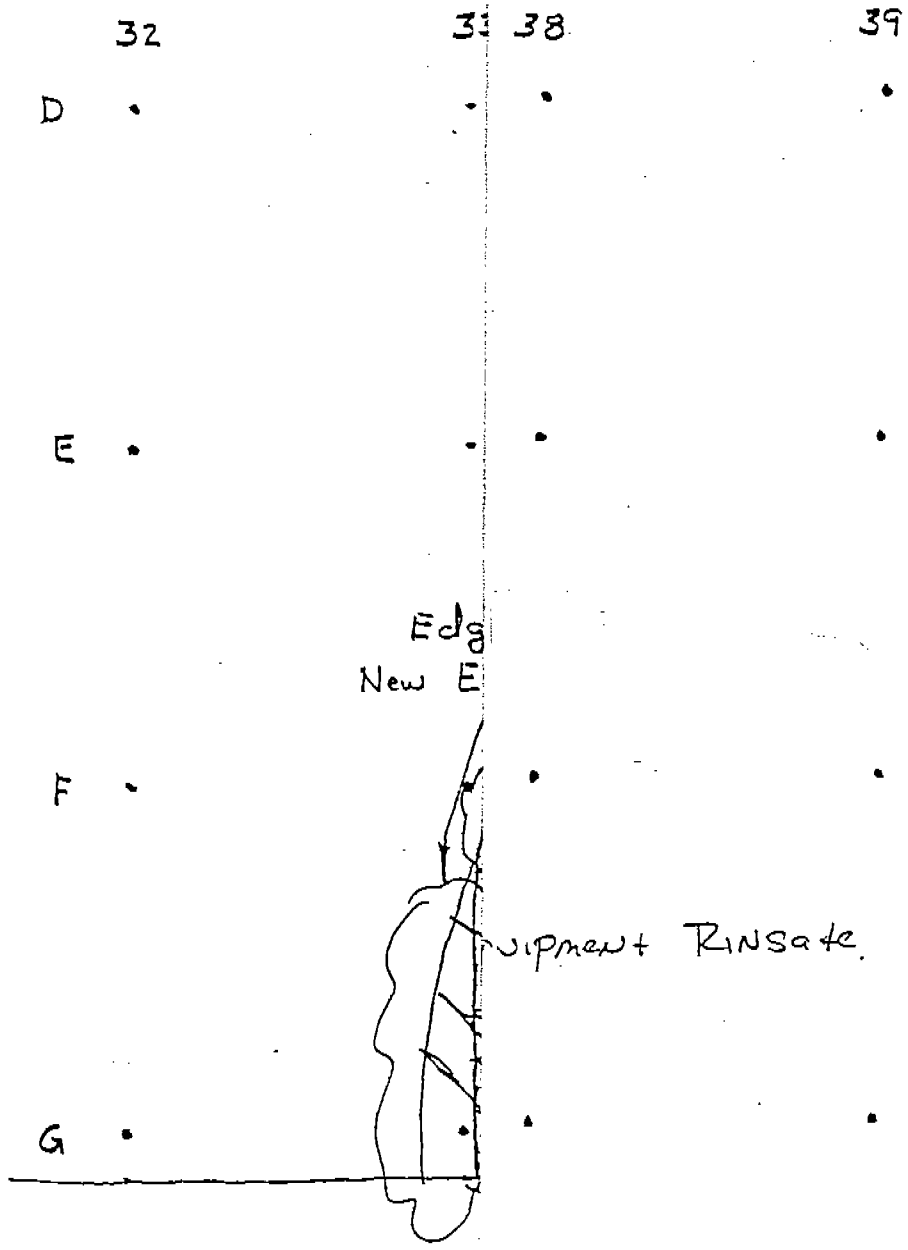
Post-Excavation Grid Composite Soil Sample Analysis

CALC. NO.

SIGNATURE DATE

PROJECT Site 18 Remediat

SUBJECT Remediation of SHEET OF SHEETS

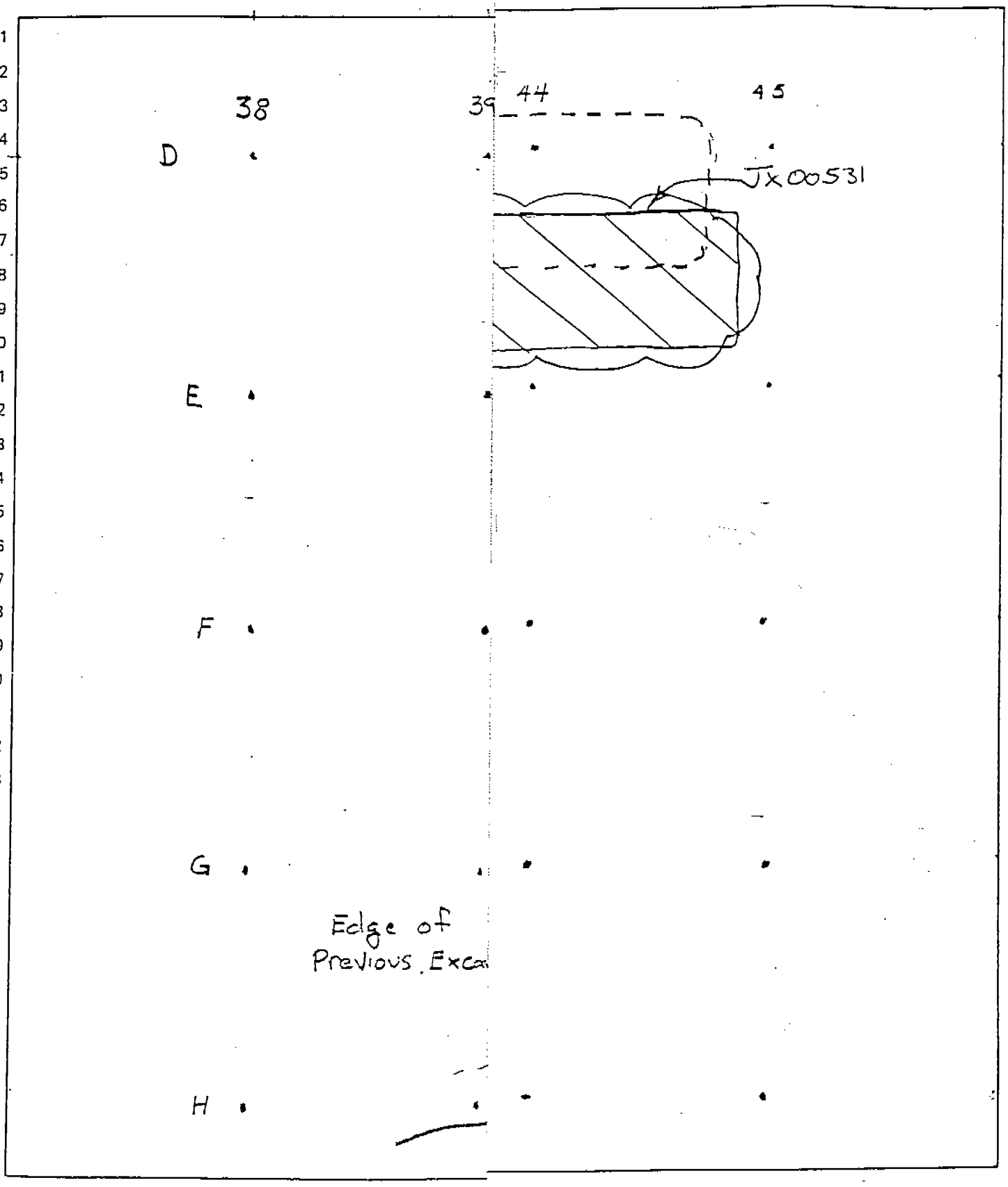


CALC. NO.

SIGNATURE DATE

PROJECT Site 18 Remedia

SUBJECT Remediation of Soil SHEET OF SHEETS



HO - 90098 (4/79)

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CERTIFICATE OF ANALYSIS

Client: Bechtel
PO Box 350
Oak Ridge, Tennessee 37831-0350
Contact: Ms. Lori Davenport
Project Description: Cecil Field/IX

cc: BECH00394 Report Date: June 17, 1996

Sample ID	: IX00531 SPS
Lab ID	: 9606239-01
Matrix	: Soil
Date Collected	: 06/12/96
Date Received	: 06/13/96
Priority	: Urgent
Collector	: Client

Parameter	Qualifier	Result		DL	RL	Units	DF	Analyst	Date	Time	Batch	M	C
Radiological													
Evaporative Loss @ 105 C		9.3		1.0	1	wt%	1.0	JTO	06/17/96	1300	86083	1	N
Gamma PHA - 10 liters													
Cesium-137	J	0.06	+/- 0.0308	0.03	0.10	pCi/g	1.0	SCM	06/14/96	1408	85996	2	N
Potassium-40	J	3.2	+/- 0.558	0.40	5	pCi/g	1.0						
Radium-226		1.9	+/- 0.231	0.07	1	pCi/g	1.0						
Radium-228		1.2	+/- 0.227	0.20	1	pCi/g	1.0						
Thorium-228	J	1.2	+/- 0.144	0.06	5	pCi/g	1.0						
Thorium-230	J	1.9	+/- 0.231	0.07	5	pCi/g	1.0						
Thorium-232	J	1.2	+/- 0.144	0.06	5	pCi/g	1.0						
Thorium-234	J	2.6	+/- 1.54	1.2	15	pCi/g	1.0						
Uranium-235	U	0.20	+/- 0.206	0.30	5	pCi/g	1.0						
Uranium-238	J	2.6	+/- 1.54	1.2	15	pCi/g	1.0						

M = Method	Method Description
M 1	GL-OA-E-020
M 2	HASL 300

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte between DL (Detect Limit) and RL (Report Limit)
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicate that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

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Contact: Ms. Lori Davenport
Project Description: Cecil Field/IX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : JX00531 SFS

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790			

This data report has been prepared and reviewed in accordance with General Engineering Laboratories standard operating procedures. Please direct any questions to your Project Manager, Valerie Davis at (803) 769-7391.

Analytical Report Specialist

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PO Box 350
Oak Ridge, Tennessee 37831-0350
Contact: Ms. Lori Davenport
Project Description: Cecil Field/IX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : IX00532 SF3
Lab ID : 9606239-02
Matrix : Soil
Date Collected : 06/12/96
Date Received : 06/13/96
Priority : Urgent
Collector : Client

Parameter	Qualifier	Result		DL	RL	Units	DF	Analyst	Date	Time	Batch	M	C
Radiological													
Evaporative Loss @ 105 C		19.1		1.0	1	wt%	1.0	JTO	06/17/96	1300	86083	1	N
Gamma PHA - 10 items													
Cesium-137	U	-.006	+/- 0.0128	0.03	0.10	pCi/g	1.0	SCM	06/14/96	1412	85996	2	1
Potassium-40	J	2.9	+/- 0.388	0.30	5	pCi/g	1.0						
Radium-226	J	0.83	+/- 0.0688	0.04	1	pCi/g	1.0						
Radium-228	J	0.84	+/- 0.102	0.07	1	pCi/g	1.0						
Thorium-228	J	0.87	+/- 0.047	0.04	5	pCi/g	1.0						
Thorium-230	J	0.83	+/- 0.0688	0.04	5	pCi/g	1.0						
Thorium-232	J	0.87	+/- 0.0469	0.04	5	pCi/g	1.0						
Thorium-234	J	0.70	+/- 0.681	0.70	15	pCi/g	1.0						
Uranium-235	U	0.20	+/- 0.0819	0.20	5	pCi/g	1.0						
Uranium-238	J	0.70	+/- 0.681	0.70	15	pCi/g	1.0						

M = Method	Method-Description
M 1	GL-OA-E-020
M 2	HASL 300

C = Container	Lab. Container ID	Reference ID
C 1	9606239-02.01	

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Project Description: Cecil Field/JX

cc: BECH00394 Report Date: June 17, 1996

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GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WY - 235
WI - 999887790			

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Contact: Ms. Lori Davenport
Project Description: Cecil Field/JX

cc: BECH00394 Report Date: June 17, 1996

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GEL Laboratory Certifications EFI Laboratory Certifications

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CERTIFICATE OF ANALYSIS

Client: Bechtel
PO Box 350
Oak Ridge, Tennessee 37831-0350
Contact: Ms. Lori Davenport
Project Description: Cecil Field/IX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : IX00533 SFS
Lab ID : 9606239-03
Matrix : Soil
Date Collected : 06/12/96
Date Received : 06/13/96
Priority : Urgent
Collector : Client

Parameter	Qualifier	Result		DL	RL	Units	DF	Analyst	Date	Time	Batch	M	C
Radiological													
Evaporative Loss @ 105 C		18.4		1.0	1	wt%	1.0	JTO	06/17/96	1300	86083	1	N
Gamma PHA - 10 liters													
Cesium-137	J	0.05	+/- 0.0219	0.03	0.10	pCi/g	1.0	SCM	06/14/96	1413	85996	2	1
Potassium-40	J	2.5	+/- 0.483	0.40	5	pCi/g	1.0						
Radium-226	J	0.84	+/- 0.0938	0.06	1	pCi/g	1.0						
Radium-228	J	0.62	+/- 0.114	0.10	1	pCi/g	1.0						
Thorium-228	J	0.71	+/- 0.0507	0.04	5	pCi/g	1.0						
Thorium-230	J	0.84	+/- 0.0938	0.06	5	pCi/g	1.0						
Thorium-232	J	0.71	+/- 0.0506	0.04	5	pCi/g	1.0						
Thorium-234	U	0.80	+/- 0.978	1.0	15	pCi/g	1.0						
Uranium-235	U	0.20	+/- 0.0902	0.20	5	pCi/g	1.0						
Uranium-238	U	0.80	+/- 0.978	1.0	15	pCi/g	1.0						

M = Method	Method-Description
M 1	GL-OA-E-020
M 2	HASL 300

C = Container	Lab. Container ID	Reference ID
C 1	9606239-03.01	

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Client: Bechtel
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Contact: Ms. Lori Davenport
Project Description: Cecil Field/JX

oc: BECH00394 Report Date: June 17, 1996

Sample ID : JX00533 SFS

C = Container	Lab. Container ID	Reference ID

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte between DL (Detect Limit) and RL (Report Limit)
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicate that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790			

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Contact:	Ms. Lori Davenport
Project Description:	Cecil Field/JX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : JX00533 SFS

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Client: Bechtel
PO Box 350
Oak Ridge, Tennessee 37831-0350
Contact: Ms. Lori Davenport
Project Description: Cecil Field/IX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : JX00534 SFS
Lab ID : 9606239-04
Matrix : Soil
Date Collected : 06/12/96
Date Received : 06/13/96
Priority : Urgent
Collector : Client

Parameter	Qualifier	Result		DL	RL	Units	DF	Analyst	Date	Time	Batch	M	C
Radiological													
Evaporative Loss @ 105 C		9.2		1.0	1	wt%	1.0	JTO	06/17/96	1300	86083	1	N
Gamma PHA - 10 items													
Cesium-137	U	-.001	+/- 0.0381	0.07	0.10	pCi/g	1.0	SCM	06/14/96	1415	85996	2	1
Potassium-40	J	3.2	+/- 0.769	0.60	5	pCi/g	1.0						
Radium-226		2.2	+/- 0.183	0.20	1	pCi/g	1.0						
Radium-228	J	0.91	+/- 0.241	0.30	1	pCi/g	1.0						
Thorium-228	J	1.1	+/- 0.11	0.09	5	pCi/g	1.0						
Thorium-230	J	2.2	+/- 0.183	0.20	5	pCi/g	1.0						
Thorium-232	J	1.1	+/- 0.109	0.09	5	pCi/g	1.0						
Thorium-234	U	1.1	+/- 1.79	1.6	15	pCi/g	1.0						
Uranium-235	U	0.20	+/- 0.196	0.40	5	pCi/g	1.0						
Uranium-238	U	1.1	+/- 1.79	1.6	15	pCi/g	1.0						

M = Method	Method-Description
M 1	*GL-OA-E-020*
M 2	HASL 300

C = Container	Lab. Container ID	Reference ID
C 1	9606239-04.01	

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Contact:	Ms. Lori Davenport
Project Description:	Cecil Field/IX

cc: BECH00394 Report Date: June 17, 1996

	Sample ID	: IX00534 SFS
C = Container	Lab. Container ID	Reference ID

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte between DL (Detect Limit) and RL (Report Limit)
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicate that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790			

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CERTIFICATE OF ANALYSIS

Client: Bechtel
PO Box 350
Oak Ridge, Tennessee 37831-0350
Contact: Ms. Lori Davenport
Project Description: Cecil Field/TX

cc: BECHD0394 Report Date: June 17, 1996

Sample ID : IX00534 SF3

GEL Laboratory Certifications EPI Laboratory Certifications

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Client: Bechtel
PO Box 350
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Contact: Ms. Lori Davenport
Project Description: Cecil Field/IX

cc: BECHD0394 Report Date: June 17, 1996

Sample ID : JX00535 SFS
Lab ID : 9606239-05
Matrix : Soil
Date Collected : 06/12/96
Date Received : 06/13/96
Priority : Urgent
Collector : Client

Parameter	Qualifier	Result		DL	RL	Units	DF	Analyst	Date	Time	Batch	M	C
Radiological													
Evaporative Loss @ 105 C		30.7		1.0	1	wt%	1.0	JTO	06/17/96	1300	86083	1	N
Gamma PHA - 10 items													
Cesium-137		0.23	+/- 0.082	0.07	0.10	pCi/g	1.0	SCM	06/14/96	1900	85996	2	1
Potassium-40	J	3.5	+/- 0.861	0.70	5	pCi/g	1.0						
Radium-226		4.5	+/- 0.232	0.20	1	pCi/g	1.0						
Radium-228		1.5	+/- 0.333	0.30	1	pCi/g	1.0						
Thorium-228	J	1.5	+/- 0.141	0.20	5	pCi/g	1.0						
Thorium-230	J	4.5	+/- 0.232	0.20	5	pCi/g	1.0						
Thorium-232	J	1.5	+/- 0.141	0.20	5	pCi/g	1.0						
Thorium-234	J	2.8	+/- 2.45	2.1	15	pCi/g	1.0						
Uranium-235	U	0.50	+/- 0.255	0.50	5	pCi/g	1.0						
Uranium-238	J	2.8	+/- 2.45	2.1	15	pCi/g	1.0						

M = Method	Method-Description
M 1	GL-OA-E-020
M 2	HASL 300

C = Container	Lab. Container ID	Reference ID
C 1	9606239-05.01	

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Contact:	Ms. Lori Davenport
Project Description:	Cecil Field/JX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : JX00535 SFS

C = Container	Lab. Container ID	Reference ID

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte between DL (Detect Limit) and RL (Report Limit)
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicate that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
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Project Description:	Cecil Field/JX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : JX00535 SFS

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Contact: Ms. Lori Davenport
Project Description: Cecil Field/IX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : IX00536 SFS
Lab ID : 9606239-06
Matrix : Soil
Date Collected : 06/12/96
Date Received : 06/13/96
Priority : Urgent
Collector : Client

Parameter	Qualifier	Result		DL	RL	Units	DF	Analyst	Date	Time	Batch	M	C
Radiological													
Evaporative Loss @ 105 C		24.2		1.0	1	wt%	1.0	JTO	06/17/96	1300	85083	1	N
Gamma PHA - 10 hours													
Cesium-137		0.33	+/- 0.0468	0.04	0.10	pCi/g	1.0	SCM	06/14/96	1902	85996	2	1
Potassium-40		8.1	+/- 0.747	0.40	5	pCi/g	1.0						
Radium-226		3.1	+/- 0.155	0.07	1	pCi/g	1.0						
Radium-228		1.4	+/- 0.215	0.20	1	pCi/g	1.0						
Thorium-228	J	1.5	+/- 0.0791	0.06	5	pCi/g	1.0						
Thorium-230	J	3.1	+/- 0.155	0.07	5	pCi/g	1.0						
Thorium-232	J	1.5	+/- 0.0789	0.06	5	pCi/g	1.0						
Thorium-234	J	3.2	+/- 1.73	1.4	15	pCi/g	1.0						
Uranium-235	U	0.30	+/- 0.264	0.30	5	pCi/g	1.0						
Uranium-238	J	3.2	+/- 1.73	1.4	15	pCi/g	1.0						

M = Method	Method-Description
M 1	GL-OA-E-020
M 2	HASL 300

C = Container	Lab. Container ID	Reference ID
C 1	9606239-06.01	

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Contact: Ms. Lori Davenport
Project Description: Cecil Field/IX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : JX00536 SFS

C = Container	Lab. Container ID	Reference ID

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte between DL (Detect Limit) and RL (Report Limit)
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicate that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

GEL Laboratory Certifications		KPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
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Contact:	Ms. Lori Davenport
Project Description:	Cecil Field/IX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : IX00536 SFS

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Client: Bechtel
PO Box 350
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Contact: Ms. Lori Davenport
Project Description: Cecil Field/TX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : IX000537 SFS
Lab ID : 9606239-07
Matrix : Soil
Date Collected : 06/12/96
Date Received : 06/13/96
Priority : Urgent
Collector : Client

Parameter	Qualifier	Result		DL	RL	Units	DF	Analyst	Date	Time	Batch	M	C
Radiological													
Evaporative Loss @ 105 C		15.3		1.0	1	wt%	1.0	JTO	06/17/96	1300	86083	1	N
Gamma PHA - 10 items													
Cesium-137	U	0.00	+/- 0.012	0.03	0.10	pCi/g	1.0	SCM	06/14/96	1904	85996	2	1
Potassium-40	J	4.5	+/- 0.366	0.20	5	pCi/g	1.0						
Radium-226	J	0.72	+/- 0.0645	0.04	1	pCi/g	1.0						
Radium-228	J	0.90	+/- 0.113	0.07	1	pCi/g	1.0						
Thorium-228	J	0.90	+/- 0.0476	0.04	5	pCi/g	1.0						
Thorium-230	J	0.72	+/- 0.0645	0.04	5	pCi/g	1.0						
Thorium-232	J	0.90	+/- 0.0475	0.04	5	pCi/g	1.0						
Thorium-234	U	0.60	+/- 0.738	0.70	15	pCi/g	1.0						
Uranium-235	U	0.08	+/- 0.0815	0.20	5	pCi/g	1.0						
Uranium-238	U	0.60	+/- 0.738	0.70	15	pCi/g	1.0						

M = Method	Method Description
M 1	GL-OA-E-020
M 2	HASL 300

C = Container	Lab. Container ID	Reference ID
C 1	9606239-07.01	

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Contact: Ms. Lori Davenport
Project Description: Cecil Field/IX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : IX00537 8FS

C = Container	Lab. Container ID	Reference ID

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte between DL (Detect Limit) and RL (Report Limit)
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicate that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - 1-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
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Contact: Ms. Lori Davenport
Project Description: Cecil Field/IX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : JX00537 SFS

GEL Laboratory Certifications RPI Laboratory Certifications

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Client: Bechtel
PO Box 350
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Contact: Ms. Lori Davenport
Project Description: Cecil Field/JX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : JX00838 SPS
Lab ID : 9606239-08
Matrix : Soil
Date Collected : 06/12/96
Date Received : 06/13/96
Priority : Urgent
Collector : Client

Parameter	Qualifier	Result		DL	RL	Units	DF	Analyst	Date	Time	Batch	M	C
Radiological													
Evaporative Loss @ 105 C		14.5		1.0	1	wt%	1.0	JTO	06/17/96	1300	86083	1	N
Gamma PHA - 10 items													
Cesium-137		0.16	+/- 0.0527	0.03	0.10	pCi/g	1.0	SCM	06/14/96	1906	85996	2	1
Potassium-40	J	3.8	+/- 0.658	0.30	5	pCi/g	1.0						
Radium-226		1.2	+/- 0.169	0.07	1	pCi/g	1.0						
Radium-228	J	0.98	+/- 0.19	0.20	1	pCi/g	1.0						
Thorium-228	J	1.1	+/- 0.139	0.05	5	pCi/g	1.0						
Thorium-230	J	1.2	+/- 0.169	0.07	5	pCi/g	1.0						
Thorium-232	J	1.1	+/- 0.139	0.05	5	pCi/g	1.0						
Thorium-234	J	1.5	+/- 1.23	1.1	15	pCi/g	1.0						
Uranium-235	U	0.20	+/- 0.118	0.30	5	pCi/g	1.0						
Uranium-238	J	1.5	+/- 1.23	1.1	15	pCi/g	1.0						

M = Method	Method-Description
M 1	GL-OA-E-020
M 2	HASL 300

C = Container	Lab. Container ID	Reference ID
C 1	9606239-08.01	

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CERTIFICATE OF ANALYSIS

Client: Bechtel
PO Box 350
Oak Ridge, Tennessee 37831-0350
Contact: Ms. Lori Davenport
Project Description: Cecil Field/JX

Sample ID : JX00538 SPS

C = Container	Lab. Container ID	Reference ID

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte between DL (Detect Limit) and RL (Report Limit)
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicate that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
ME - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
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Client:	Bechtel PO Box 350 Oak Ridge, Tennessee 37831-0350
Contact:	Ms. Lori Davenport
Project Description:	Cecil Field/IX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : IX00538 SF3

GEL Laboratory Certifications EPI Laboratory Certifications

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CERTIFICATE OF ANALYSIS

Client: Bechtel
PO Box 350
Oak Ridge, Tennessee 37831-0350
Contact: Ms. Lori Davenport
Project Description: Cecil Field/TX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : DX00539 5FS
Lab ID : 9606239-09
Matrix : Soil
Date Collected : 06/12/96
Date Received : 06/13/96
Priority : Urgent
Collector : Client

Parameter	Qualifier	Result		DL	RL	Units	DF	Analyst	Date	Time	Batch	M	C
Radiological													
Evaporative Loss @ 105 C		17.8		1.0	1	wt%	1.0	JTO	06/17/96	1300	86083	1	N
Gamma PHA - 10 liters													
Cesium-137		0.32	+/- 0.0393	0.04	0.10	pCi/g	1.0	SCM	06/14/96	1916	85996	2	1
Potassium-40	J	3.7	+/- 0.518	0.30	5	pCi/g	1.0						
Radium-226	J	0.72	+/- 0.0887	0.05	1	pCi/g	1.0						
Radium-228		1.1	+/- 0.149	0.09	1	pCi/g	1.0						
Thorium-228	J	1.0	+/- 0.0644	0.05	5	pCi/g	1.0						
Thorium-230	J	0.72	+/- 0.0887	0.05	5	pCi/g	1.0						
Thorium-232	J	1.0	+/- 0.0643	0.05	5	pCi/g	1.0						
Thorium-234	U	0.40	+/- 1.17	1.0	15	pCi/g	1.0						
Uranium-235	U	0.08	+/- 0.0911	0.20	5	pCi/g	1.0						
Uranium-238	U	0.40	+/- 1.17	1.0	15	pCi/g	1.0						

M = Method	Method Description
M 1	GL-OA-E-020
M 2	HASL 300

C = Container	Lab. Container ID	Reference ID
C 1	9606239-09.01	

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PO Box 350
Oak Ridge, Tennessee 37831-0350

Contact: Ms. Lori Davenport

Project Description: Cecil Field/IX

cc: BECH00394

Report Date: June 17, 1996

	Sample ID	: JX00539 SFS
C = Container	Lab. Container ID	Reference ID

Notes:
The qualifiers in this report are defined as follows:
J indicates presence of analyte between DL (Detect Limit) and RL (Report Limit)
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicate that a quality control analyte recovery is outside of specified acceptance criteria.

Data reported in mass/mass units is reported as 'dry weight'.

GEL Laboratory Certifications		EPI Laboratory Certifications	
AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
MD - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790			

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Project Description:	Cecil Field/JX

oc: BECH00394 Report Date: June 17, 1996

Sample ID : JX00539 SFS

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Client: Bechtel
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Contact: Ms. Lori Davenport
Project Description: Cecil Field/IX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : IX00540 SFS
Lab ID : 9606239-10
Matrix : Soil
Date Collected : 06/12/96
Date Received : 06/13/96
Priority : Urgent
Collector : Client

Parameter	Qualifier	Result		DL	RL	Units	DF	Analyst	Date	Time	Batch	M	C
Radiological													
Evaporative Loss @ 105 C		10.1		1.0	1	wt%	1.0	JTO	06/17/96	1300	86083	1	N
Gamma PHA - 10 liters													
Cesium-137	J	0.07	+/- 0.027	0.04	0.10	pCi/g	1.0	SCM	06/14/96	1913	85996	2	1
Potassium-40	J	3.4	+/- 0.539	0.40	5	pCi/g	1.0						
Radium-226	J	0.93	+/- 0.0932	0.06	1	pCi/g	1.0						
Radium-228	J	0.91	+/- 0.139	0.20	1	pCi/g	1.0						
Thorium-228	J	0.82	+/- 0.0638	0.05	5	pCi/g	1.0						
Thorium-230	J	0.93	+/- 0.0932	0.06	5	pCi/g	1.0						
Thorium-232	J	0.81	+/- 0.0636	0.05	5	pCi/g	1.0						
Thorium-234	J	1.1	+/- 1.07	1.1	15	pCi/g	1.0						
Uranium-235	U	0.20	+/- 0.108	0.20	5	pCi/g	1.0						
Uranium-238	J	1.1	+/- 1.07	1.1	15	pCi/g	1.0						

M = Method	Method Description
M 1	GL-OA-E-020
M 2	HASL 300

C = Container	Lab. Container ID	Reference ID
C 1	9606239-10.01	

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Contact:	Ms. Lori Davenport
Project Description:	Cecil Field/JX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : JX00540 SFS

C = Container	Lab. Container ID	Reference ID

Notes:
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J indicates presence of analyte between DL (Detect Limit) and RL (Report Limit)
U indicates that the analyte was not detected at a concentration greater than the detection limit.
* indicate that a quality control analyte recovery is outside of specified acceptance criteria.

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AL - 41040	AZ - AZ0514	AL - 41050	AZ - AZ0514
CA - 2089	CT - PH-0169	CA - I-1023/2056	CT - PH-0175
DE - SC012	FL - E87156/87294	FL - E87472/87458	MS - 29417
MB - SC012	MS - 10120	NY - 11502	RI - 138
NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
VA - 00151	WA - C223	PA - 68-485	WV - 235
WI - 999887790			

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Contact: Ms. Lori Davenport
Project Description: Cecil Field/IX

oc: BECH00394 Report Date: June 17, 1996

Sample ID : IX00540 SFS

GEL Laboratory Certifications EPI Laboratory Certifications

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CERTIFICATE OF ANALYSIS

Client: Bechtel
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Contact: Ms. Lori Davenport

Project Description: Cecil Field/IX

cc: BBCH00394

Report Date: June 17, 1996

Sample ID	: JX00541 DIW
Lab ID	: 9606239-11
Matrix	: GroundH2O
Date Collected	: 06/12/96
Date Received	: 06/13/96
Priority	: Urgent
Collector	: Client

Parameter	Qualifier	Result		DL	RL	Units	DF	Analyst	Date	Time	Batch	M	C
Radiological													
Gamma PHA - 10 items								SCM	06/14/96	1209	85947	1	1
Cesium-137	U	1.4	+/- 2.84	5.6	10	pCi/L	1.0						
Potassium-40	U	38.1	+/- 40.7	83.4	50	pCi/L	1.0						
Radium-226	U	0.90	+/- 9.7	13.0	15	pCi/L	1.0						
Radium-228	U	7.4	+/- 12.1	23.4	15	pCi/L	1.0						
Thorium-228	U	6.7	+/- 7.33	8.1	15	pCi/L	1.0						
Thorium-230	U	0.90	+/- 9.7	13.0	15	pCi/L	1.0						
Thorium-232	U	6.7	+/- 7.32	9.4	15	pCi/L	1.0						
Thorium-234	U	36.3	+/- 129	217.0	250	pCi/L	1.0						
Uranium-235	U	1.4	+/- 18.3	32.3	50	pCi/L	1.0						
Uranium-238	U	36.3	+/- 129	217.0	500	pCi/L	1.0						

M = Method	Method-Description
M 1	HASL 300

C = Container	Lab. Container ID	Reference ID
C 1	9606239-11.01	30709036

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Project Description: Cecil Field/IX

cc: BECH00394 Report Date: June 17, 1996

	Sample ID	: IX00541 DIW
C = Container	Lab. Container ID	Reference ID

Notes:
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NC - 233	NY - 11501	SC - 10582	TN - 02934
RI - 135	SC - 10120	UT - E-227	VA - 00111
TN - 02934	UT - E-251	WA - C225	NJ - 79002
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Client:	Bechtel PO Box 550 Oak Ridge, Tennessee 37831-0350
Contact:	Ms. Lori Davenport
Project Description:	Cecil Field/IX

cc: BECH00394 Report Date: June 17, 1996

Sample ID : IX00541 DIW

GEL Laboratory Certifications EPI Laboratory Certifications

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