



64427

**TECHNICAL MEMORANDUM II
RESULTS OF THE FIELD PROGRAM
TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS**

VOLUME 2 OF 2

May 1993

Prepared for

Tutu Environmental Investigation Committee
San Juan, Puerto Rico

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APPENDIX A
SAMPLE CORE LOGS

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SAMPLE/CORE LOG

Boring/Well B-1 Project/No. TUTU SITE/PR013.01 Page 1 of 2

Site Location ST. THOMAS Drilling Started 7/30/92 Drilling Completed 7/30/92

Total Depth Drilled 10.3 feet Hole Diameter 6 inches Type of Sample/
Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2' 3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 201 feet ☐ Surveyed ☒ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HOLLOW STEM AUGER

Drilling Contractor SOIL TECH Driller J. RIVERA Helper J. DIAZ
J. MILLET

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth
(feet below land surface)
From To
Core Recovery
(feet)
Time/Hydraulic
Pressure or
Blows per 6
inches

Sample/Core Description

0.0	2.0	1.1	4-3- 4-4	SILTY CLAY; little Rock fragments, small to medium; trace Sand, fine to coarse; trace Gravel, fine; soft, brown to light brown, reddish brown, dry. HNU = 52 ppm. GC sample: 0-2'.
2.0	4.0	1.3	4-3- 4-5	Same as above. GC sample: 2-4'. HNU = 32 ppm.
4.0	6.0	1.5	6-11- 9-6	Same as above. HNU = 392 ppm. GC sample: 4-6'.
6.0	8.0	1.5	6-5- 6-5	Same as above. GC sample: 6-8'. Soil sample collected for BNA, metals, and TPH analysis. HNU = 62 ppm.

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Boring/Well B-1

Prepared By R. PONCIANO

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SAMPLE/CORE LOG

SAMPLE/CORE LOG

SAMPLE/CORE LOG

Boring/Well B-4 Project/No. TUTU SITE/PRO13.01 Page 1 of 2

Site Location ST. THOMAS Drilling Started 6/9/92 Drilling Completed 6/9/92

Total Depth Drilled 188.0 feet Hole Diameter 6 inches Type of Sample/ Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2'/3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 167.61 feet ☐ Surveyed ☒ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HOLLOW STEM AUGER

Drilling Contractor SOIL TECH Driller O. GARCIA Helper M. MORALES

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth
(feet below land surface)
From To

Core
Recovery
(feet)

Time/Hydraulic
Pressure or
Blows per 6
inches

Sample/Core Description

0	0.5	0		FILL.
0.5	2	0.3	23-31-32	Spoon was redriven.
				CLAY; some Silt; trace Sand, medium; trace Rock
				fragments, fine to medium; very hard, brown, dry.
				GC sample: 0.5-2.0'.
				HNu = 0 ppm. CGI = 0% LEL.
2	3.5	1.3	7-15-17	Clay; some Silt; trace Sand, medium to coarse; trace
				Rock fragments; brown to reddish brown, dry to moist,
				hard.
				HNu = 0.1-0.4 ppm.
				GC sample: 2-4'.
4	4	0.9	4-21-21-17	Same as above, but little Sand, medium to coarse and
				moist.
				GC sample: 4-6'.
				HNu = 0.1 ppm. CGI = 0% LEL.

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SAMPLE/CORE LOG (Cont.d)

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Boring/Well B-4

Prepared By R. PONCIANO

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 Inches
From	To		

6	8	1.4	32-50- 34-40	CLAY; some Silt; trace Sand, medium to fine; trace rock fragments, fine to large, brown to gray, moist, hard.
				GC sample: 6-8'.
				HNu = 0.1 - 0.3 ppm. CGI = 0% LEL.
8	10	1.5	12-23- 29-21	CLAY; little Silt; trace Sand; fine to medium; light brown to greenish gray, moist, hard; trace gravel, fine.
				Top of bedrock is approximately at 8.3' bls.
				HNu = 0.1 ppm.
				Soil samples collected for VOC, BNA, metals and TPH analysis.
10	10.8	0.8	34-50/ 0.25'	ROCK; fragments, small to large; little Sand, fine to medium, little Silt; trace Clay; trace Sand, coarse; light gray, saturated, very hard. Top of weathered bedrock inferred at 10.8' bls.
				GC sample: 10-12'
				HNu = 0.1 ppm.
				No water in borehole. It was raining before sample 10-12' was examined.
				Total depth = 10.8 ft bls.

SAMPLE/CORE LOG

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Boring/Well B-6

Prepared By R. PONCIANO

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SAMPLE/CORE LOG

Boring/Well B-7 Project/No. TUTU SITE/PR013.01 Page 1 of 1

Site Location ST.THOMAS Drilling Started 7/31/92 Drilling Completed 7/31/92

Total Depth Drilled 4.0 feet Hole Diameter 6 inches Type of Sample/ Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2' 3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 184 feet ☐ Surveyed ☒ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HOLLOW STEM AUGER

Drilling Contractor SOIL TECH Driller J. RIVERA Helper J. DIAZ
J. MILLET

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
From	To			
0	2.0	1.5	3-24- 48-78	FILL: SILT; little Rock fragments, small; trace Clay; trace Sand, medium to fine; trace Sand, coarse; trace roots; stiff, light-brown, dry.
				GC sample: 0-2'.
				HNu = 0 ppm.
2.0	4.0	1.4	23-45- 17-25	FILL: SILT; little Rock fragments, small; trace Clay; trace Sand, medium to fine; trace Sand, coarse; trace roots; stiff, light-brown, dry.
				GC sample: 2-4'.
				HNu = 0 ppm.
				Soil samples collected for VOC, BNA, metals and TPH analysis.
				Auger refusal at 3.0 ft bls.
				Total depth = 4.0 ft bls.

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SAMPLE/CORE LOG

Boring/Well B-8 Project/No. TUTU SITE/PR013.01 Page 1 of 1

Site Location ST. THOMAS Drilling Started 8/12/92 Drilling Completed 8/12/92

Total Depth Drilled 3.6 feet Hole Diameter 6 inches Type of Sample/ Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2' 3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 191 feet ☐ Surveyed ☒ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HOLLOW STEM AUGER

Drilling Contractor SOIL TECH Driller J. RIVERA Helper J. DIAZ

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth
(feet below land surface)
From To

Core
Recovery
(feet)

Time/Hydraulic
Pressure or
Blows per 6
inches

Sample/Core Description

0	0.8			CONCRETE.
0.8	2.8	1.3	5-10- 16-16	FILL: SILTY CLAY; trace Sand, medium to coarse; trace
				Gravel, fine; trace organic material, roots; trace Rock
				fragments, small; brown to reddish brown, hard, dry.
				Soil samples collected for VOC, BNA, metals and
				TPH analysis.
				Soil sample collected for matrix spike and matrix
				spike duplicate.
2.8	3.6	0.8	50-50/ 0.3'	SILTY CLAY; trace Sand, medium to coarse; trace Gravel,
				fine; trace Rock fragments, small; very hard, reddish
				brown, dry.
				HNu = 0.1 ppm.
				GC sample 2-4'.
				Split spoon and augers were refused at approx.
				3.6 ft below land surface.
				Total depth = 3.6 ft bls.

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SAMPLE/CORE LOG

Boring/Well B-9 Project/No. TUTU SITE/PRO13.01 Page 1 of 1

Site Location ST. THOMAS Drilling Started 7/29/92 Drilling Completed 7/29/92

Total Depth Drilled 5.1 feet Hole Diameter 6 inches Type of Sample/ Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2' / 3' Sampling Interval CONTINUOUS feet

Land-Surface Elev. 165 feet Surveyed ☒ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HOLLOW STEM AUGER

Drilling Contractor SOIL TECH Driller J. RIVERA Helper J. DIAZ
J. MILLET

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth
(feet below land surface)
From To
Core Recovery
(feet)
Time/Hydraulic
Pressure or
Blows per 6
inches

Sample/Core Description

0	0.2			ASPHALT.
0.2	2	1.4	10-15- 9-10	FILL: CLAY; some Silt; little Rock fragments, small to medium; trace Sand, fine to medium; trace Sand, coarse; trace Gravel, fine, dark gray to reddish brown, stiff, dry.
				HNu = 0 ppm.
				GC sample: 0-2'.
2	4	0.5	19-12- 8-9	Same as above.
				GC sample: 2-4'.
				HNu = 0 ppm.
				Soil sample collected for VOC analysis.
4	5.1	1.2	5-8- 50/0.1'	Same as above.
				HNu = 0 ppm.
				Soil samples collected for BNA, metals and TPH analysis.
				GC sample: 4-5.1
				Top of bedrock inferred at 5.1 ft bls.
				Total depth = 5.1 ft bls.

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SAMPLE/CORE LOG

Boring/Well B-10 Project/No. TUTU SITE/PR013.01 Page 1 of 2

Site Location	ST. THOMAS	Drilling Started	8/10/92	Drilling Completed	8/10/92

Total Depth Drilled 7.9 feet Hole Diameter 6 inches Type of Sample/
Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2' 3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 141.8 feet ☐ Surveyed ☒ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HOLLOW STEM AUGER

Drilling Contractor SOIL TECH Driller J. RIVERA Helper J. DIAZ
J. MILLET

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core (feet below land surface)	Depth To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	2	1.3	17-16- 10-8	FILL: SILTY CLAY; little Rock fragments, small medium; little Sand, fine to medium; trace Sand, coarse to very coarse; trace Gravel, fine; soft, brown, dry. GC Sample: 0-2'. HNu = 0.1 ppm.
2	4	1.2	7-16- 20-16	FILL: CLAY; little Rock fragments, small to medium; trace Sand, coarse; trace Gravel, fine; brown to dark brown, hard, dry. GC Sample: 2-4'. HNu = 0.1 ppm.
4	6	1.3	8-12- 12-12	Same as above. HNu = 0.1 ppm. GC Sample: 4-6'.





Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface)	From	To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
0	0.6	0.0			CONCRETE.
0.6	2	1.3	8-10- 10-15		SILTY CLAY; little Rock fragments, small; trace Sand, fine to medium; trace organic roots; stiff, brown, dry.
					HNu = 5.0 ppm.
					GC Sample: 0.2'.
					Soil samples collected for VOC, BNA, metals and TPH analysis.
2	3.5	0.7	20-19-50 50/0.0'		Same as above.
					HNu = 1.0 ppm.
					GC Sample: 2-4'.
					Split-spoon and augers refused at 3.5' bls.
					Top of bedrock approximately at 3.5' bls.
					Total depth = 3.5 ft bls.

SAMPLE/CORE LOG

Boring/Well B-13 Project/No. TUTU SITE/PRO13.01 Page 1 of 1

Site Location ST. THOMAS Drilling Started 8/10/92 Drilling Completed 8/10/92

Total Depth Drilled 6.4 feet Hole Diameter 6 inches Type of Sample/
Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2' / 3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 139.8 feet ☐ Surveyed ☒ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HOLLOW STEM AUGER

Drilling Contractor SOIL TECH Driller J. RIVERA Helper J. DIAZ
J. MILLET

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
From	To			
0	2.0	1.1	10-12- 21-14	Fill: CLAYEY SILT; little Gravel, fine to medium; little Sand, fine to medium; trace Rock fragments, small to medium; trace organic materials, roots; medium stiff, brown, dry. GC sample: 0-2'. HNu = 0.2 ppm.
2.0	4.0	1.3	10-25- 17-12	First 0.55' is same as above, the rest is highly altered bedrock; gray; very weak. HNu = 0.2 ppm. GC sample: 2-4'.
4.0	6.0	1.4	9-11- 11-19	SILTY CLAY; little Sand, medium to coarse; brown, stiff, dry. HNu = 0.3 ppm. Soil samples collected for VOC, BNA, metals and TPH analysis.
6.0	6.4	0.2	50/0.4'	Same as above. GC sample: 6-8'. HNu = 0.1 ppm. Top of bedrock inferred at 6.4 ft bls. Total depth = 6.4 ft bls.

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SAMPLE/CORE LOG

SAMPLE/CORE LOG

Boring/Well B-15 Project/No. TUTU SITE/PRO13.01 Page 1 of 1

Site Location	ST. THOMAS	Drilling Started	8/14/92	Drilling Completed	8/14/92

Total Depth Drilled 2.2 feet Hole Diameter 3 inches Type of Sample/
Coring Device SPLIT-SPOON

Length and Diameter
of Coring Device 2' / 3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 205.0 feet ☐ Surveyed ☒ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HOLLOW STEM AUGER

Drilling Contractor SOIL TECH Driller J. RIVERA Helper J. DIAZ
J. MILLET

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
From	To			
0	2	1.3	6-4-4-5	CLAYEY SILT; some Sand, fine to medium; trace Rock fragments, small; trace organic materials, roots; soft, reddish brown, moist. Soil sample collected for VOC, BNA, metals and TPH analysis. HNu = 0.2 ppm. GC sample: 0-2'.
2	2.2	0.2	50/0.17'	Same as above. Trace weathered (highly) bedrock. Split-spoon sample refused at approximately 2.2' bls. Top of bedrock inferred at 2.2' bls. Total depth = 2.2 ft bls. HNu = 0.2 ppm. GC sample: 2-4'.

SAMPLE/CORE LOG

Boring/Well B-16 Project/No. TUTU SITE/PRO13.01 Page 1 of 1

Site Location ST. THOMAS Drilling Started 8/14/92 Drilling Completed 8/14/92

Total Depth Drilled 3.7 feet Hole Diameter 3 inches Type of Sample/ Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2' / 3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 204.8 feet ☐ Surveyed ☒ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HOLLOW STEM AUGER

Drilling Contractor SOIL TECH Driller J. RIVERA Helper J. DIAZ
J. MILLET

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth
(feet below land surface)
From To

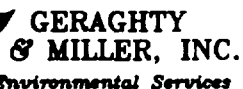
Core
Recovery
(feet)

Time/Hydraulic
Pressure or
Blows per 6
inches

Sample/Core Description

0	2	1.2	10-10- 10-10	CLAYEY SILT; some Sand, fine to medium; trace Rock fragments, small; trace organic materials, roots; soft, reddish brown to light brown, moist.
				Soil sample collected for VOC, BNA, metals and TPH analysis. Sample collected for matrix spike and matrix spike duplicate
				HNu = 0.2 ppm.
				GC sample: 0-2'.
2	3.7	12-14-45- 50/0.29'		The first 0.7' is same as above. The rest is highly altered bedrock, very weak, grayish green.
				Split-spoon refused at approximately 3.7' bls.
				Top of bedrock inferred at 3.7' bls.
				Total depth = 3.7 ft bls.
				HNu = 0.2 ppm.
				GC sample: 2-4'.

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SAMPLE/CORE LOG

Boring/Well B-13A Project/No. TUTU SITE/PR013.01 Page 1 of 1

Site Location	ST. THOMAS	Drilling Started	8/12/92	Drilling Completed	8/12/92

Total Depth Drilled 2.0 feet Hole Diameter 3 inches Type of Sample/
Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2' / 3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 139.4 feet ☐ Surveyed ☒ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HOLLOW STEM AUGER

Drilling Contractor SOIL TECH Driller J. RIVERA Helper J. DIAZ
J. MILLET

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Core Recovery (feet)

Time/Hydraulic Pressure or Blows per 6 inches

Sample/Core Description

[illegible]

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SAMPLE/CORE LOG

Boring/Well MW-2 Project/No. TUTU SITE/PRO13.01 Page 1 of 1

Site Location ST. THOMAS Drilling Started 8/13/92 Drilling Completed 8/25/92

Total Depth Drilled 28.0 feet Hole Diameter 6 inches Type of Sample/ Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2' 3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 178 feet ☒ Surveyed ☐ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HSA

Drilling Contractor SOIL TECH Driller J. RIVERA Helper J. DIAZ

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth
(feet below land surface)
From To

Core Recovery
(feet)

Time/Hydraulic
Pressure or
Blows per 6
inches

Sample/Core Description

0	0.40			ASPHALT.
0.40	2.40	1.5	10-19- 28-15	CLAYEY SILT (.8'); little Rock
				fragments, small; trace Sand, fine to medium;
				trace roots; hard, brown to tan, dry.
				SILTY CLAY; (1.2') little Rock fragments, small;
				trace Sand, fine to medium; hard, gray, dry.
				HNu = 0.6 ppm.
				GC sample: 0-2'.
				Soil samples collected for VOC, BNA, metals and TPH
				analysis.
2.4	3.10	0.5	40-50/ 0.1'	SILTY CLAY; little Rock fragments, small;
				trace Gravel, fine to medium; trace Sand,
				fine to medium; gray, very hard, dry.
				GC sample: 2-4'.
				HNu = 0.4 ppm.
				Split-spoon and auger were refused approximately
				3.1' below top of pavement. Continued drilling with
				downhole hammer to 28.0 ft. Set well

SAMPLE/CORE LOG

Boring/Well MW-1D Project/No. TUTU SITE/PRO13.01 Page 1 of 1

Site Location ST. THOMAS Drilling Started 6/5/92 Drilling Completed 7/8/92

Total Depth Drilled 90.0 feet Hole Diameter 6 inches Type of Sample/
Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2'3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 195.14 feet ☒ Surveyed ☐ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HSA

Drilling Contractor SOIL TECH Driller O. GARCIA Helper J. NIEVES
M. MORALES

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth
(feet below land surface)
From To

Core
Recovery
(feet)

Time/Hydraulic
Pressure or
Blows per 6
inches

Sample/Core Description

0	0.3			ASPHALT.
0.3	1.0			FILL: Gravel, medium to fine; some Silty Clay; trace Sand,
				medium to coarse; brown, dry to moist.
				HNu = 0 ppm.
				CGI = 0% LEL.
1.0	2.5	1.5	44-26- 50/0.5'	CLAY; some Silt; little Sand, medium to coarse; little Rock
				fragments, medium to large, angular; little Gravel, fine to
				medium; trace pieces of wood; light brown to brown,
				very hard, dry.
				HNu = 0 ppm.
				CGI = 0 % LEL. GC Sample: 1-2.5'.
				Soil samples collected for VOC, metals, BNA, and TPH
				analysis.
2.5	2.8	0.2	50/0.2'	CLAY; some Silt; trace Sand, medium to coarse; trace
				Gravel, fine: brown, dry to moist.
				Bedrock encountered at 2.8' bls.
				HNu = 0 ppm.
				CGI = 0 % LEL. Continued drilling by diamond coring bit
				to 89.0 ft and downhole hammer to an "L"

SAMPLE/CORE LOG

Boring/Well MW-4 Project/No. TUTU SITE/PRO13.01 Page 1 of 2

Site Location ST. THOMAS Drilling Started 6/16/92 Drilling Completed 6/17/92

Total Depth Drilled 28.0 feet Hole Diameter 6 inches Type of Sample/ Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2' 3" Sampling Interval 2.0 feet

Land-Surface Elev. 175.69 feet ☒ Surveyed ☐ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HSA

Drilling Contractor SOIL TECH Driller O. GARCIA Helper J. NIEVES
M. MORALES

Prepared By W.I. MORALES Hammer Weight 140 LBS. Hammer Drop 30 inches

Sample/Core Depth
(feet below land surface)

From To

Core Recovery
(feet)

Time/Hydraulic
Pressure or
Blows per 6
inches

Sample/Core Description

0.0	0.7			CONCRETE
0.7	2.7	1.0	24-22- 22-14	SILTY CLAY; trace Sand; trace Gravel, fine to coarse; reddish brown to dark greenish gray, moist; hard. HNU = 0 ppm.
2.7	4.7	1.5	10-15 12-16	SILTY CLAY; trace Sand, fine to coarse; trace Gravel, subangular to rounded, 1-2 inch pieces; brown to dark brown and gray, moist; very stiff. HNU = 4 ppm.
				Soil samples collected for VOC, BNA, metals and TPH analysis.
4.7	6.7	1.2	15-19- 30-50	SILTY CLAY; trace Sand, fine to coarse; trace Gravel, subangular; some organic content; dark gray, moist; hard. HNU = 3 ppm.
6.7	7.1	0.7	50/0.4'	SILTY CLAY; trace Sand, fine to coarse; trace Gravel, angular to rounded; some organic content; reddish brown to dark gray; hard. HNU = 0 ppm.

SAMPLE/CORE LOG (Cont.d)

Page 2 of 4

Boring/Well MW-4D

Prepared By W. MORALES

Sample/Core Depth (feet below land surface)	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 Inches
From	To	

6.7	8.7	1.3	7-11-16 -16	SILTY CLAY; little Sand, medium to fine; little Gravel,
				angular, dark gray, reddish fragments 2 inch pieces;
				moist; brown and dark gray; plastic to hard.
				HNu = 0 ppm.
8.7	10.7	1.75	9-34-38 -36	SILTY CLAY; some Sand, coarse to fine; some Gravel,
				angular to semi-rounded, brown and dark gray;
				weathered Rock fragments at 9.5' bls, crystalline, gray in
				a sandy silty clay matrix; hard. HNu = 0 ppm.
				Soil samples collected for VOC, BNA, metals, and TPH
				analysis.
10.7	11.7	0.1	50-60	ROCK; weathered, angular 2-4 inch fragments, blue-
				green porphyritic Rock fragments, with white feldspars,
				dry; some Sandy Clay, brown, moist.
				HNu = 0 ppm. Top of bedrock inferred at 10.7 ft bls.
12.7	13.15	0.9	60/0.45'	Same as above; HNu = 0 ppm.

SAMPLE/CORE LOG (Cont'd)

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Boring/Well MW-4D

Prepared By W. MORALES

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 Inches	
From	To			
13.7	14	0.9'	50/0.3'	ROCK; weathered in a Clayey matrix; angular fragments, coarse to fine grains (like Sand and Gravel); dark gray; moist. HNu = 0 ppm.
14.7	14.9	0.2'	50/0.16'	ROCK fragments; weathered, gray to dark gray; range from silty to Gravel sized fragments; moist; slightly wet. HNu = 0 ppm.
15.7	16.1	0.4	50/0.4'	ROCK; weathered in a Silty Clay matrix; angular fragments (0.5-2.0"); gray, brown, white, red mottled; black stains; crumbled; moist in Silty areas between weathered fragments. HNu = 0 ppm.
16.7	16.86	0	50/0.16'	No recovery: Wet split spoon sample of retrieval. Working Zone: HNu = 0 ppm. CGI = 0 % LEL. Wet cuttings on augers, gray green, Silty Clay.

TUT 002 1363

SAMPLE/CORE LOG

Boring/Well MW-5 Project/No. TUTU SITE/PR013.01 Page 1 of 1

Site Location ST. THOMAS Drilling Started 8/11/92 Drilling Completed 8/25/92

Total Depth Drilled 40.8 feet Hole Diameter 6 inches Type of Sample/
Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2' 3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 187.24 feet ☒ Surveyed ☐ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HSA

Drilling Contractor SOIL TECH Driller J. RIVERA Helper J. DIAZ
J. MILLETT

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
From	To			
0	2	1.1	13-19- 18-21	FILL: SILT; little Sand, Fine to medium; little Gravel, fine to medium; trace of Rock fragments, small; trace pieces of wood; trace Clay; brown medium stiff, dry. HNu = 0.1 ppm. GC sample: 0-2'. Soil samples collected for BNA, metals, and TPH analysis.
2	4	1.4	25-30- 24-39	Same as above HNu = 2.0 ppm. GC Sample: 2-4'. Soil sample collected for VOC analysis.
4	4.8	0.8	35-50/ 0.25'	ROCK; highly altered; grayish green, very weak. HNu = 0.1 ppm. GC Sample: 4-6'. Top of bedrock approximately at 4.8' bls. Continued drilling with downhole hammer to 40.8 ft. Well installed at 39.0 ft.

TUT 002 1365

SAMPLE/CORE LOG

Boring/Well MW-6 Project/No. TUTU SITE/PR013.01 Page 1 of 1

Site Location	ST. THOMAS	Drilling Started	7/21/92	Drilling Completed	7/21/92

Total Depth Drilled 65.0 feet Hole Diameter 6 inches Type of Sample/
Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2' / 3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. _____ feet ☐ Surveyed ☐ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HSA

Drilling Contractor SOIL TECH Driller J. RIVERA Helper J. DIAZ
J. MILLET

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core (feet below land From	Depth surface) To	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches

Sample/Core Description

[illegible]

SAMPLE/CORE LOG

Boring/Well MW-6D Project/No. TUTU SITE/PR013.01 Page 1 of 1

Site Location ST. THOMAS Drilling Started 8/6/92 Drilling Completed 8/10/92

Total Depth Drilled 65.0 feet Hole Diameter 6 inches Type of Sample/ Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2' 3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 171.26 feet ☒ Surveyed ☐ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HSA

Drilling Contractor SOIL TECH Driller O. GARCIA Helper M. MORALES
J. NIEVES

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth
(feet below land surface)
From To

Core
Recovery
(feet)

Time/Hydraulic
Pressure or
Blows per 6
inches

Sample/Core Description

0	0.35	1		ASPHALT
0.35	2.0	1.4	12-40- 33-28	SILTY CLAY (0.6') little Rock fragments, small to medium; trace Sand, medium; trace Gravel, fine to medium; very hard, brown, dry. Remaining materials are Silt; little Sand, fine to medium; trace Clay; orange to tan, hard, dry.
				HNu = 0 ppm.
				GC sample: 0-2'. Soil samples collected for VOC, BNA, metals and TPH analysis.
2	4	1.0	10-9- 12-15	Same as above, upper description.
				GC sample: 2-4'.
				HNu = 0 ppm.
4	4.9	0.3	13-50, 0.42'	ROCK; fragments, medium to large; some Silt; little Sand, fine to medium; trace Clay; trace Sand, coarse to very coarse; brown, dry; hard.
				Continued drilling with downhole hammer to 65.0 ft.

SAMPLE/CORE LOG

Boring/Well MW-7 Project/No. TUTU SITE/PR013.01 Page 1 of 2

Site Location ST. THOMAS Drilling Started 7/16/92 Drilling Completed 7/29/92

Total Depth Drilled 39.6 feet Hole Diameter 6 inches Type of Sample/
Coring Device SPLIT-SPOON
Length and Diameter of Coring Device 2'3" (CONTINUOUS)
Sampling Interval feet

Land-Surface Elev. 171.26 feet ☒ Surveyed ☐ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HSA

Drilling Contractor SOIL TECH Driller J. RIVERA Helper J. DIAZ
J. MILLET

Prepared By W. MORALES Hammer Weight 140 LBS Hammer Drop 30 inches

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches
From	To		

Sample/Core Description

0	2	1.3'	22-23- 38-37	FILL; SILTY CLAY; little Rock fragments, small to medium; trace Sand, medium; trace Sand, coarse to very coarse; trace Organic roots; hard, brown, dry. GC sample: 0-2'. HNU = 0 ppm.
2	4	1.1	21-24- 24-38	Same as above but without the rock fragments. GC sample: 2 - 4'. HNU = 0 ppm.
2	5.3	1.2	17-35- 50/0.29'	Rock, highly weathered; Sand, fine to medium; some Silt; trace Sand, coarse to very coarse; trace Gravel, fine trace Clay; hard, gray, dry. GC sample: 4 - 6'. HNU = 0 ppm.
6	6.4	0.4	50/0.38'	ROCK, highly altered; weak, grayish green. GC sample: 6 - 8'. HNU = 0 ppm. Top of weathered bedrock inferred at 6.0 ft bls.

SAMPLE/CORE LOG (Cont.d)

Page 2 of 2

Boring/Well MW-7

Prepared By R. PONCIANO

Sample/Core Depth (feet below land surface)	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches
From	To	

Sample/Core Depth (feet below land surface)	Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	
From	To		
8	9.0	0.9	27-42/ 0.46'
			Same as above.
			GC sample: 8-10'.
			HNu = 0 ppm.
10	10.2	0.1	50/0.13'
			Same as above.
			GC sample: 10-12'.
			HNu = 0 ppm.
12	12.6	1.2	78-128/ 0.11'
			Same as above.
			GC sample: 12-14'.
			HNu = 0 ppm.
14	15	1.9	42-154/ 0.5'
			ROCK; highly weathered. Same as above.
			GC sample: 14-16'.
			Soil samples collected for VOC, BNA, metals and TPH
			analysis.
			HNu = 0 ppm.
			Competent bedrock approximately at 15 ft bls.
			Continued drilling with downhole hammer to 39.6 ft.
			Well installed at 35.4 ft.

SAMPLE/CORE LOG

Boring/Well MW-8 Project/No. TUTU SITE/PRO13.01 Page 1 of 2

Site Location ST. THOMAS Drilling Started 7/20/92 Drilling Completed 7/23/92

Total Depth Drilled 26.0 feet Hole Diameter 6 inches Type of Sample/ Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2'3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 167.61 feet ☒ Surveyed ☐ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HSA

Drilling Contractor SOIL TECH Driller J. RIVERA Helper J. DIAZ
J. MILLET

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches
From	To		

Sample/Core Description

0	0.35			ASPHALT.
0.35	2	1.4	12-10- 12-16	FILL: SILTY CLAY; trace Sand, very fine to fine; trace Rock fragments, small to medium; trace Sand, coarse to very coarse; stiff, brown, dry.
				GC sample: 0-2'.
				HNu = 0 ppm.
2	4	1.8	10-8- 11-10	Same as above (the first 1.3'); the rest is Silt; little Clay; trace Sand, very fine; little Rock fragments; stiff, brown to reddish brown, dry.
				GC sample: 2-4'.
				Soil samples collected for VOC, BNA, metals, and TPH analysis.
4	5.9	1.1	27-50/ 0.42'	ROCK; weathered; Silt; little Clay; trace Sand, very fine to fine; trace Rock fragments, very hard, brown, dry.
				GC sample: 4-6'.
				HNu = 0 ppm.

TUT 002 1370

SAMPLE/CORE LOG

SAMPLE/CORE LOG

Boring/Well MW-11D Project/No. TUTU SITE/PRO13.01 Page 1 of 2

Site Location ST. THOMAS Drilling Started 6/26/92 Drilling Completed 7/20/92

Total Depth Drilled 74.3 feet Hole Diameter 6 inches Type of Sample/ Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2' / 3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 153.11 feet ☒ Surveyed ☐ Estimated Datum 153.22 FT ABOVE MSL

Drilling Fluid Used NONE Drilling Method HSA

Drilling Contractor SOIL TECH Driller J. RIVERA Helper J. DIAZ
J. MILLET

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth (feet below land surface)		Core Recovery (feet)	Time/Hydraulic Pressure or Blows per 6 inches	Sample/Core Description
From	To			
0	2	0.7	11-14- 9-11	FILL: CLAY; some Silt; trace Sand, fine to medium; trace Sand, coarse; trace organic materials, roots; light brown, dry, stiff. HNU = 0 ppm. GC sample: 0-2'.
2	4	1.1	14-4- 14-13	CLAY; little Silt; trace Sand, fine; trace organic materials; brown to reddish brown, moist, stiff. HNU = 0 ppm. GC sample: 2-4'.
4	5.88	1.4	21-29-31 50/0.38'	SILT; little Sand, fine; trace Clay; trace Sand, coarse to very coarse; brown, dry, hard. GC sample: 4-6'.

0	2	0.7	11-14- 9-11	FILL: CLAY; some Silt; trace Sand, fine to medium; trace Sand, coarse; trace organic materials, roots; light brown, dry, stiff. HNU = 0 ppm. GC sample: 0-2'.
2	4	1.1	14-4- 14-13	CLAY; little Silt; trace Sand, fine; trace organic materials; brown to reddish brown, moist, stiff. HNU = 0 ppm. GC sample: 2-4'.
4	5.88	1.4	21-29-31 50/0.38'	SILT; little Sand, fine; trace Clay; trace Sand, coarse to very coarse; brown, dry, hard. GC sample: 4-6'.

TUT 002 13/5

Page 2 of 2

Prepared By R. PONCIANO

[illegible]

TUT 002 1376

SAMPLE/CORE LOG

Boring/Well MW-12D Project/No. TUTU SITE/PRO13.01 Page 1 of 1

Site Location ST. THOMAS Drilling Started 7/6/92 Drilling Completed 7/23/92

Total Depth Drilled 75.0 feet Hole Diameter 6 inches Type of Sample/
Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2' 3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 161.58 feet ☒ Surveyed ☐ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HSA

Drilling Contractor SOIL TECH Driller J. RIVERA Helper J. DIAZ
J. MILLET

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth
(feet below land surface)
From To

Core
Recovery
(feet)

Time/Hydraulic
Pressure or
Blows per 6
inches

Sample/Core Description

0	2		19-15- 35-25	FILL: SILT; some Clay; trace Sand, very fine to very coarse; trace roots; trace Gravel, medium; trace Rock fragments; hard; brown, dry. HNU = 0 ppm. GC Sample: 0-2'.
2	4	0.7	17-7- 13-21	CLAY; some Silt; trace Sand, very fine to very coarse; trace roots; trace Rock fragments, medium to large; very stiff. GC sample: 2-4'. HNU = 0 ppm.
4	5.9	1.4	18-27-44- 50/0.38'	SILT; some Clay; trace Sand, very fine to coarse; trace rock fragments, medium; brown to yellowish, stiff. GC sample: 4 - 6' Soil samples collected for VOC, BNA, metals and TPH analysis. Top of bedrock at 5.9 ft bls. Continued drilling by diamond coring from 5.9 to 75.0 ft and downhole hammer from 30 to 88.0 ft. HNU = 0 ppm.

SAMPLE/CORE LOG

Boring/Well MW-13D Project/No. TUTU SITE/PR013.01 Page 1 of 1

Site Location ST. THOMAS Drilling Started 6/19/92 Drilling Completed 7/15/92

Total Depth Drilled 120.3 feet Hole Diameter 6 inches Type of Sample/ Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2' 3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 236.67 feet ☒ Surveyed ☐ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used NONE Drilling Method HSA

Drilling Contractor SOIL TECH Driller J. RIVERA J. MILLET Helper J. DIAZ

Prepared By R. PONCIANO Hammer Weight 140 Hammer Drop 30 inches

Sample/Core Depth
(feet below land surface)
From To

Core Recovery
(feet)

Time/Hydraulic
Pressure or
Blows per 6
inches

Sample/Core Description

0	0.83	0.7	14-50/ 0.25'	CLAY; some Silt; little Sand, very fine; trace Gravel, small to medium; trace organic materials (roots); very hard, light brown, dry.
				HNu = 1-3 ppm.
				CGI = 0% LEL.
				GC sample: 0-2'
2	4	0.6	23-31- 26-40	CLAY; some Silt; little Sand, very fine to medium; little Gravel, fine; trace Sand, very coarse to coarse; trace Rock fragments, large to medium; light-brown, hard, dry.
				HNu = 0 ppm.
				GC Sample: 2-4'
4	5.0	0.7	25-50/ 0.46'	Same as above.
				HNu = 0 ppm.
				Soil samples collected for VOC, BNA, metals and TPH analysis.
				GC sample: 4-5'.
				Continued drilling by diamond coring using a downhole hammer from land

TUT 002 1378

SAMPLE/CORE LOG

Boring/Well MW-14 Project/No. TUTU SITE/PRO13.01 Page 1 of 1

Site Location ST. THOMAS Drilling Started 7/1/92 Drilling Completed 7/2/92

Total Depth Drilled 48.0 feet Hole Diameter 8 inches Type of Sample/
Coring Device SPLIT-SPOON

Length and Diameter of Coring Device 2'3" Sampling Interval CONTINUOUS feet

Land-Surface Elev. 196.04 feet ☒ Surveyed ☐ Estimated Datum MEAN SEA LEVEL

Drilling Fluid Used AIR/WATER (Small amount or water to minimize dust) Drilling Method DOWNHOLE HAMMER BIT

Drilling Contractor SOIL TECH Driller O.GARCIA Helper M. MORALES
J. NIEVES

Prepared By W. I. MORALES Hammer Weight 140 Hammer Drop 36 inches

Sample/Core Depth
(feet below land surface)

From To

Core Recovery
(feet)

Time/Hydraulic
Pressure or
Blows per 6
inches

Sample/Core Description

0	0.1			ASPHALT
0.1	2	1.1	60-35 35-78	SILTY CLAY; some Sand; trace Gravel, brown to gray,
				intermixed with weathered Rock fragments, greenish gray,
				angular; hard. Soil samples collected for VOC, BNA,
				metals and TPH analysis.
				HNu = 0 ppm.
2	3	0.5	90-100	Same as above, less Clay, more weathered Rock
				fragments, very angular; Saprolite
				HNu = 0 ppm.
				Two split-spoon samples collected at MW-14. Proceeded to
				ream hole down to 48.0 ft. Water found at approximately
				45.0-46.0 ft bls. Monitoring Well installed at 45.2 ft.
				Water level on 7/2/92 after completion: 28.24 ft.
				Approximately 30 gallons of water were used during
				downhole hammer procedure to minimize dust.

TUT 002 1379

APPENDIX B
GEOLOGIC LOGS

TUT 002 1380

**Geologic Log of MW-1
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
ASPHALT	0 - 0.1
CLAY; some Silt; little Sand, fine to coarse, trace weathered rock fragments; angular, hard, dry, brown, greenish-gray.	0.1 - 1.8
Top of bedrock inferred at 1.8 feet below land surface.	

(See also Geologic Log of MW-1D)

**Geologic Log of MW-1D
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
ASPHALT	0 - 0.3
Fill consisting of GRAVEL medium to fine; some Clay; trace silt; trace Sand, medium to coarse; dry to moist; brown.	0.3 - 2.5
CLAY; some SILT; little to trace Sand, medium to coarse; little rock fragments, medium to large, angular; little to trace gravel, fine to medium; trace pieces of wood; very hard, dry to moist, light brown to brown.	2.5 - 2.8
VOLCANIC BRECCIA (coarse grained); greenish-gray; strong to moderately strong; fine, medium, large grained, rectangular and irregular shape, moderately sorted; plagioclase feldspar, pyroxenes, and chlorite minerals, dull to vitreous; calcite veins, iron stains; fresh to slightly altered.	2.8 - 15.0
VOLCANIC BRECCIA (finer grained); mottled gray and white; some pebble sized, angular clasts; contact metamorphism; plagioclase feldspar, hornblende, pyroxene, magnetite.	15.0 - 21.2
VOLCANIC BRECCIA - Debris Flow; dark, grayish-green; competent, jointed interval; porphyritic, fine to coarse; large (8 cm) slump clasts; large plagioclase and pyroxene crystals.	21.2-89.0
Fracture zones observed from 2.34 to 15.09 feet bls, 19.34 to 21.2 feet bls, 34.5 to 35.5 feet bls, and 54.0 to 55.0 feet bls.	

bls below land surface

**Geologic Log of MW-2
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
ASPHALT	0 - 0.4
SILT; some Clay, little rock fragments, small; trace Sand, fine to medium; trace roots; hard, dry; brown to tan	0.4 - 1.2
CLAY; some Silt; little rock fragments, small; trace Gravel, fine to medium; hard to very hard; dry, gray.	1.2 - 3.1
Top of bedrock inferred at 3.4 feet below land surface.	

**Geologic Log of MW-3
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
CONCRETE	0 - 0.4
Fill, CLAY; some Silt; trace Sand, fine to medium; trace rock fragments, small to medium; hard, dry; brown, reddish brown.	0.4 - 2.0
No recovery.	2.0 - 2.4
Top of bedrock inferred at 2.4 feet below land surface.	

**Geologic Log of MW-4
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
CONCRETE	0 - 0.7
CLAY; some Silt; some organic content (4.7 - 6.7 feet); trace Sand, fine to coarse; trace Gravel; subangular, very stiff to hard; reddish brown, dark greenish-gary, brown, dark brown, gray, and dark gray.	0.7 - 7.1
No recovery.	8.7 - 9.8
Top of bedrock inferred at 8.7 feet below land surface.	
(See also Geologic Log for MW-4D)	

**Geologic Log of MW-4D
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
CONCRETE PAVEMENT	0 - 0.7
CLAY; some Silt, little Sand, fine to coarse; little Gravel; stiff to hard; moist; reddish brown to brown, bluish-gray, dark gray; medium plasticity.	0.7 - 9.5
Weathered rock fragments and CLAY; some Silt; some to little Sand.	9.5 - 10.7
Top of weathered bedrock inferred at 10.7 feet.	
Weathered rock fragments and CLAY - some Silt; angular, small to large; hard; moist to wet at 14.7 and 18.7 feet, gray, blue, green, brown, white, red, black stains; crumbled.	10.7 - 22.8
Top of competent bedrock inferred at 22.8 feet below land surface.	
VOLCANIC ANDESITE TUFF; dark green; highly fractured to 26.5 feet bls; gray; moderately strong to strong; very fine grained; pyroxene, plagioclase feldspars, some quartz, chlorite, and orthoclase minerals; calcite veins; iron stains; contact metamorphism and hydrothermal alteration 26.5 to 28.2 feet bls.	22.8 - 28.2
VOLCANIC BRECCIA; gray; fine to medium grained; plagioclase, pyroxene, magnetite; pyroxene crystals (2 cm); fining upward sequences.	28.2 - 33.0
Weathered VOLCANIC BRECCIA; SILT and CLAY; light brown, very fine grained to pebble sized fragments; semi-angular.	33.0 - 35.0
No recovery	35.0 - 37.1

**Geologic Log of MW-4D
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
VOLCANIC ANDESITE TUFF; dark green, gray; strong; aphanitic, very fine grained; pyroxene, plagioclase feldspars, epidote, some quartz, magnetite, chlorite, and orthoclase minerals; calcite veins; black minerals 60% rock matrix; white plagioclase amygdules 35% of rock matrix, slightly altered.	37.1 - 58.3
DIORITE; dark gray; very dense; strong; very fine to coarse grained; pyroxene, plagioclase feldspar, quartz, chlorite, and orthoclase minerals; pyroxene minerals ranged from 35 to 60% of rock matrix; plagioclase minerals ranged from 35 to 40% of rock matrix, slightly altered.	58.3 - 64.0
Weathered VOLCANIC ANDESITE TUFF; altered to SILT and CLAY; very fine to medium grained; friable, vertical foliations; calcite, kaolinite, chlorite; white-rust color.	64.0 - 66.5
VOLCANIC ANDESITE TUFF; dark green; fine grained; aphanitic; pyroxene, plagioclase, epidote; calcite filled vertical fractures.	66.5 - 68.0
Fracture zones observed from 9.0 to 25.5 feet bls, 30.0 to 38.2 feet bls, and 65.0 to 66.5 feet bls.	
Highly weathered fracture plane at 40.9, 55.0, and 64.0 feet bls.	

bls below land surface

**Geologic Log of MW-5
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval</u> (feet below land surface)
Fill, SILT; little Sand, fine to medium; little Gravel, fine to medium; trace rock fragments, small; trace clay; trace pieces of wood; hard; dry; brown.	0 - 4.0
Highly weathered bedrock; very weak; grayish-green.	4.0 - 4.8
Top of bedrock inferred at 4.8 feet below land surface.	

**Geologic Log of MW-6D
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
ASPHALT	0 - 0.3
CLAY; some SILT; trace Sand, fine to very coarse; little rock fragments, small to medium; hard; dry; brown to gray.	0.3 - 2.0
No recovery.	2.0 - 4.0
VOLCANIC BRECCIA; grayish-green to dark green; moderately strong; porphyritic, medium to coarse grained; rectangular to massive phenocrysts (2 mm to 6 cm), moderately sorted; plagioclase feldspar, pyroxene minerals, dull, glassy, vitreous; white minerals ranged from 10 - 15% of rock matrix; slightly to highly altered and stained; Clay - little Silt; trace Sand, fine to coarse; light gray; soft; wet; magnesium and iron oxide.	4.0 - 32.0
VOLCANIC ANDESITE TUFF; grayish-green; moderately strong to weak; fine to medium grained, rectangular and irregular shape, moderately sorted; plagioclase feldspar, pyroxenes, epidote and chlorite minerals; dull, glassy; calcite veins; iron staining; moderately to highly altered.	32.0 - 45.0
VOLCANIC BRECCIA - Debris Flow, with slump casts; competent, jointed interval; medium to coarse grained, plagioclase, epidote, chlorite, pyroxene; rounded slump blocks (6 cm) of dark gray, coarse grained Tuff in a mottled dark gray-green matrix.	45.0 - 53.0
VOLCANIC BRECCIA; grayish-green; competent, jointed interval; strong to moderately strong; coarse grained, rectangular, cubic and irregular shape; plagioclase, chlorite, and epidote minerals, dull, glassy; calcite veins; fresh to slightly altered.	53.0 - 60.0

**Geologic Log of MW-6D
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
VOLCANIC BRECCIA - Debris Flow, with slump casts; greenish-gray; moderately strong; fine grained, rectangular to irregular shaped slump casts (8 cm), dark gray, pyroxene rich, coarse Tuff; matrix is fine grained; well sorted; plagioclase, dull, glassy, slightly altered.	60.0 - 65.0
Fracture zones observed from 9.6 to 32.0 feet bls, 35.0 to 35.5 feet bls, 37.0 to 40.0 feet bls, and 43 to 60 feet bls.	

Note: This log is a combination of the geology observed at MW-6 (abandoned) and MW-6D.

bls below land surface

PR01301/052193.log/lcb

TUT 002 1390

**Geologic Log of MW-7
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
Fill, CLAY; some Silt; little rock fragments, small to medium; trace Sand, medium to very coarse; trace roots; hard; dry; brown.	0 - 4.0
Highly weathered Rock; SAND, fine to medium; some Silt; trace Sand, coarse to very coarse; trace Gravel, fine; trace Clay; hard, dry, gray.	4.0 - 6.0
Highly weathered bedrock; weak, grayish-green.	6.0 - 15.0

**Geologic Log of MW-8
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
Fill, CLAY; some Silt; trace Sand, very fine to very coarse; trace rock fragments, small to medium; very stiff; dry; brown.	0 - 0.35
Moderately weathered rock; SILT; little to trace Sand, very fine to fine; little trace rock fragments; very stiff to hard; dry; brown to reddish-brown.	3.3 - 8.3
Top of bedrock inferred at 8.3 feet below land surface.	

**Geologic Log of MW-9
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
Fill, consisting of CLAY; some Silt; little rock fragments, small to large; trace Sand, fine to very coarse; hard; dry; brown to reddish-brown.	0 - 5.0
Top of bedrock inferred at 5.0 feet below land surface.	
VOLCANIC BRECCIA; light greenish-gray; moderately strong; porphyritic, fine to large grained, rectangular to irregular shape, moderately sorted; plagioclase, epidote, and chlorite minerals, some chert; dull, vitreous; calcite veins; plagioclase minerals range from 10 to 25 % of rock matrix; slightly altered; Clay; observed at 10 feet, little Silt, trace Sand, medium to coarse.	5.0 - 15.0
VOLCANIC ANDESITE TUFF, and Silt and Clay; homogenous, aphanitic, very fine grained; plagioclase, pyroxene, chlorite, some quartz; calcite veins; slightly to highly altered; bluish-green to grayish-green.	15.0 - 28.0
VOLCANIC BRECCIA; grayish-green; moderately strong; porphyritic, fine to coarse grained; moderately to poorly sorted; plagioclase, calcite, hornblende, magnetite, chlorite, and pyroxene minerals; calcite veins; slightly altered.	28.0 - 35.0

**Geologic Log of MW-10
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
Fill, CLAY; some Silt; little Sand; medium, little rock fragments, small to medium; trace Gravel, fine to medium; hard; dry; gray to brown.	0 - 2.9
Top of bedrock inferred at 2.9 feet.	
See also Geologic Log of MW-10D.	

**Geologic Log of MW-10D
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
ASPHALT	0 - 0.5
CLAY; some Silt; trace Sand, fine; trace Gravel, fine to medium; little rock fragments, small to medium; hard; dry; gray to brown.	0.5 - 1.7
VOLCANIC BRECCIA, greenish-gray; moderately strong; medium to large grained, rectangular to irregular shape, moderately sorted; plagioclase minerals, dull; manganese oxidation, iron stains; calcite stains; moderately to slightly altered.	2.3 - 5.0
VOLCANIC ANDESITE TUFF; greenish-gray; moderately strong, fine grained, plagioclase, hornblende, less pyroxene.	5.0 - 6.0
VOLCANIC BRECCIA; greenish-gray, moderately strong, medium to coarse grained, plagioclase, pyroxene, heterogeneous, zoned rectangular clasts, alteration to iron oxides.	6.0 - 8.2
VOLCANIC ANDESITE TUFF; grayish-blue, moderately strong and competent, fine grained, plagioclase, pyroxene, calcite.	8.2 - 12.0
VOLCANIC ANDESITE TUFF; grayish-blue, highly fractured and crushed, fine grained, pyroxene, plagioclase, calcite.	12.0 - 19.0
VOLCANIC BRECCIA; mottled olive-green, moderately strong and competent, fine grained; plagioclase, calcite, pyroxene, epidote, hornblende, alteration to magnesium and iron oxides.	19.0 - 21.0
VOLCANIC ANDESITE TUFF; light gray, highly fractured and crushed; very fine grained, homogeneous, plagioclase, calcite, pyroxene, epidote, hornblende.	21.0 - 22.0

**Geologic Log of MW-10D
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
VOLCANIC BRECCIA; greenish-gray; weak, highly fractured to crushed at 22.0 to 27.5; medium to coarse grained, rectangular to irregular shape, moderately sorted; plagioclase, pyroxenes, and some quartz minerals, dull, glassy; manganese oxidation, iron stains, calcite veins; moderately to slightly altered.	22.0 - 32.0
VOLCANIC BRECCIA - Debris Flow; mottled greenish-gray; strong, moderate jointing; medium to large grained; rectangular, irregular shape, large clasts; poorly sorted; plagioclase, quartz, pyroxenes, epidote and chlorite minerals; calcite veins; fresh to slightly altered	32.0 - 75.0
Fracture zone observed from 6.0 to 8.2 feet bls, 12.0 to 19.0 feet bls, 21.0 to 27.5 feet bls, and 53.4 to 55.0 feet bls.	

bls below land surface

**Geologic Log of MW-11D
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
Fill consisting of CLAY; some to little Silt, trace Sand, fine to coarse; trace Organic material; very stiff; dry to moist; light brown, brown to reddish-brown.	0 - 4.0
SILT; little SAND, fine; trace clay; trace Sand, coarse to very coarse; hard; dry; brown.	4.0 - 10.2
VOLCANIC ANDESITE TUFF; bluish-green; strong to moderately strong; fine grained, rectangular, cubic and irregular shape, well sorted; plagioclase feldspar, epidote, quartz, and pyroxene minerals, dull, glassy, bright to silky; calcite veins, iron stains; white minerals ranged from 10 to 25% of rock matrix; fresh, slightly to highly altered.	10.2 - 52.0
VOLCANIC ANDESITE TUFF; contact metamorphism, zoned (heated) clasts (1 cm); bluish-green, strong to moderately strong; fine grained; well sorted; plagioclase feldspar, epidote, quartz, and pyroxene minerals, glassy, silky dull; calcite veins, iron stains; fresh to slightly altered; white minerals ranged from 10 to 25% of rock matrix (plagioclase content increases with depth).	52.0 - 75.0
Fracture zone observed from 12.0 to 25.0 feet bls, 30.0 to 32.0 feet bls, 36.0 to 37.0 feet bls, at 38.0 feet bls, 42.0 to 45.0 feet bls, and 50 to 52.0 feet bls.	

bls below land surface

**Geologic Log of MW-12D
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
Fill consisting of SILT; some Clay; trace Sand, very fine to very coarse; trace Gravel, medium, trace rock fragments; trace Organic material; hard; dry; brown.	0 - 2.0
CLAY, some SILT; trace Sand, very fine to very coarse; trace rock fragments, medium to large, trace organics; very stiff.	2.0 - 4.0
No recovery.	5.9 - 10.0
Highly weathered and altered VOLCANIC BRECCIA, SILT and CLAY; crushed; little to trace rock fragments, small to medium; trace Sand, very fine to coarse (5 cm clasts); stiff to very stiff, dry; brown to yellow, light brown.	10.0 - 15.0
Top of weathered bedrock inferred at 15.0 feet below land surface.	
VOLCANIC BRECCIA; orange to light brown, light gray to reddish-gray; coarse grained, competent; pyroxene and plagioclase phenocrysts, calcite veins, iron stains; moderately to highly altered.	15.0 - 29.0
VOLCANIC BRECCIA - Debris Flow; dark greenish-black; coarse grained matrix with fine grained angular slump clasts, plagioclase, pyroxene, epidote.	29.0 - 31.0
VOLCANIC ANDESITE TUFF; bluish-green and gray; strong to weak to moderately strong; fine to very fine grained, aphanitic, angular fragments; plagioclase feldspar, pyroxenes, quartz and pyrite minerals, dull, vitreous, metallic; calcite veins, iron stains; plagioclase minerals range from 5 to 10% of rock matrix; slightly to moderately altered.	31.0 - 50.2

**Geologic Log of MW-12D
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
VOLCANIC BRECCIA - Debris Flow; dark grayish-black, moderately fractured, coarse grained matrix and clasts, pyroxene and hornblende clasts and plagioclase, pyroxene, and hornblende matrix.	50.2 - 65.0
No recovery.	65.0 - 75.0
Fracture zones observed from 10.0 to 15.0 feet bls, 18.5 to 19.0 feet bls, 20.0 to 21.0 feet bls, 37.0 to 40.0 feet bls, 45.0 to 46.0 feet bls, 48.5 to 49.5 feet bls, 51.0 to 53.0 feet bls, and 59.7 to 63.0 feet bls.	

bls below land surface

**Geologic Log of MW-13D
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
CLAY; some Silt; little Sand, very fine; trace Gravel, small to medium; trace Organic material; very hard; dry; light brown.	0 - 2.0
CLAY, some Silt; little Sand, very fine to medium; little Gravel, fine; trace Sand, very coarse to coarse; trace rock fragments, large to medium; hard; dry; light brown.	2.0 - 5.0
VOLCANIC ANDESITE TUFF; dark green with white mottling in some areas; moderately strong to very weak at 20.0 feet bls; highly fractured and crushed, fine, medium grained, irregular shape, moderately sorted; plagioclase feldspar, quartz and epidote minerals, dull; calcite veins; slightly to moderately altered at 5.3 feet bls, highly altered with iron stains at 20.0 feet bls; plagioclase minerals range from 10 to 35% of rock matrix.	5.0 - 20.0
VOLCANIC BRECCIA; fine to coarse grained, highly altered and fractured (20.0 to 30 feet bls), vertical foliations, friable, alteration to Clay minerals (calcite, chlorite, kaolinite), mottled grayish-green.	20.0 - 45.0
VOLCANIC BRECCIA - Debris Flow; coarse grained with 6 cm slump clasts, clasts are very fine grained Tuff, epidote, chlorite, pyroxene, plagioclase, and calcite, FeO ₂ staining, dark green and mottled.	45.0 - 55.0
VOLCANIC BRECCIA; dusky yellow green to grayish-green; moderately strong to weak; epiclastic, fine, medium, large grained, occasional clast of 1 to 3 cm (40 to 55 feet bls), rectangular, cubic, and irregular shape, moderately to well sorted; plagioclase feldspar, epidote, chlorite, and pyroxene minerals, glassy, dull; calcite veins, iron stains; slightly to highly altered (55 to 85 feet bls); plagioclase minerals range from 10 to 35% of rock matrix (40 to 55 feet bls).	55.0 - 88.0

**Geologic Log of MW-13D
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
VOLCANIC BRECCIA; finer grained, competent, primary minerals are pyroxene and hornblende, secondary minerals are epidote, plagioclase, and chlorite, vertical foliations, grayish-blue green.	88.0 - 92.0
VOLCANIC BRECCIA - DEBRIS FLOW; fine and coarse grained slump blocks (7 to 15 cm), rounded, plagioclase, pyroxene, some pyrite, calcite veins oriented 45°, grayish-green to blue green.	92.0 - 110.0
VOLCANIC ANDESITE TUFF; fine to very fine grained; competent and relatively unweathered, plagioclase, epidote, and pyroxene, calcite inclusions, dark greenish-blue.	110.0 - 120.0
Fracture zones observed from 5.0 to 36.0 feet bls, 56.0 to 60.0 feet bls, 63.0 to 65.0 feet bls, and 70.0 to 75.0 feet bls.	

bls below land surface

PR01301/052193.log/lcb

TUT 002 1401

**Geologic Log of MW-14
Tutu Service Station Investigation
St. Thomas, U.S. Virgin Islands**

<u>Description</u>	<u>Sampled Interval (feet below land surface)</u>
ASPHALT	0 - 0.1
CLAY; some Silt; some Sand; trace Gravel to some weathered rock fragments, angular; very hard; greenish-gray, brown gray.	0.1 - 3.0
Top of bedrock inferred at 3.0 feet below land surface.	

APPENDIX C

**SOIL SAMPLING PROCEDURES PROVIDED BY
CDM FEDERAL PROGRAMS CORPORATION**

TUT 002 1403

SURFACE SOIL SAMPLING

SOP 1-3

Revision: 0

Date: June 30, 1992

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4.0 REQUIRED EQUIPMENT

- Site-specific plans
- Field logbook
- Indelible black ink pens and markers
- Labels and appropriate forms/documentation for sample shipment
- Appropriate sample containers
- Insulated cooler and waterproof sealing tape
- Ice bags or "blue ice"
- Latex or appropriate gloves
- Plastic zip-top bags
- Personal protective clothing and gear
- Stainless steel and/or Teflon-lined spatulas and pans, trays, or bowls
- Stainless steel and/or Teflon-lined trowels or spoons (or equipment as specified in the site-specific plans)
- Plastic sheeting

5.0 PROCEDURES

5.1 Preparation

The following steps must be followed when preparing for sample collection:

1. Don the appropriate personal protective clothing as dictated by the site-specific health and safety plan.
2. The collection points shall be stated, located on a site map, and referenced in the field logbook.
3. Processes for verifying depth of sampling must be specified in the site-specific plans.
4. Place clean plastic sheeting on a flat, level surface near the sampling area, if possible, and place equipment to be used on the plastic; place the insulated cooler(s) on separate plastic sheeting. Cover all equipment and supplies with clean plastic sheeting when not in use.
5. A clean, decontaminated trowel or spoon will be used for each sample collected.

SURFACE SOIL SAMPLING

SOP 1-3

Revision: 0

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5.2 Collection

The following general steps must be followed when collecting surface soil samples:

1. Surface soil samples are normally collected from the least-contaminated to the most-contaminated areas. Stay outside of a specific sampling location until all samples are collected at that location.
2. Document the sampling events, recording the information in the designated field logbook. Document any and all deviations from SOPs in the field logbook and include rationale for changes. ~~See FPC-SOP #1.~~
3. Carefully remove stones, vegetation, snow, etc. from the sampling location surface.
4. Carefully remove the top 1 to 2 cm of exposed soil, sediment, or sludge before sample collection.
5. Collect sample portions or aliquots for volatile analyses first and any other samples that would be degraded by aeration.

5.2.1 Method for Collecting Samples for Volatile Organic Compound (VOC) Analysis

The requirements for collecting grab samples of surface soil for VOCs or other samples degraded by aeration are as follows:

1. VOC samples shall be collected with the least disturbance possible.
2. VOC samples shall be collected as grab samples; however, the method of collection will vary from site to site, based on data quality objectives and the degree of known or suspected contamination.
3. Label the sample containers with the appropriate information. Secure the label, covering it with a piece of clear tape.
4. Use a clean stainless steel or Teflon-lined trowel or spoon (or tube) to collect sufficient material in one grab, over the required sampling interval, to fill the sample containers.

SURFACE SOIL SAMPLING

SOP 1-3

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5. With the aid of a clean stainless steel spatula, quickly fill the sample containers directly from the sampling device, removing stones, twigs, grass, etc., from the sample. Fill the containers as full and compact as possible to minimize head space.
6. Immediately secure the Teflon-lined caps on the sample container.
7. Wipe the containers clean with a clean Kimwipe or paper towel.
8. Place the containers in individual zip-top plastic bag(s) and seal the bag(s).
9. Pack all samples according to ~~FPC-SOP-2-5~~ ^{Work Plan}. Include properly completed Traffic Reports and/or chain-of-custody forms, and affix signed and dated custody seals to the three unhinged sides of the cooler lid.
10. Decontaminate sampling equipment according to ~~FPC-SOP-4-5~~ ^{Work Plan}.

5.2.2 Method for Collecting Samples for Nonvolatile Organic or Inorganic Compound Analysis

The requirements for collecting samples of surface soil for non-volatile organic or inorganic analyses are as follows:

1. Label each sample container with the appropriate information. Secure the label by covering it with a piece of clear tape.
2. Use a decontaminated stainless steel or Teflon-lined trowel or spoon to obtain sufficient sample from the required interval and subsampling points, if necessary, to fill the specified sample containers.
3. Empty the contents of each fill of the sampling device directly into a clean stainless steel or Teflon-lined tray or bowl.
4. ~~Composite~~ ^{Homogenize} sample according to ~~FPC-SOP-2-3~~ ^{attached method described in the EPA Region II CERCLA QA manual, page 57, under "Homogenization."}
5. Use the spoon, spatula, or trowel to distribute the uniform mixture into the labeled sample containers. Fill organic sample containers first, then inorganics.
6. Secure the appropriate cap on each container immediately after filling it.
7. Wipe the sample containers clean with a clean Kimwipe or paper towel.

SURFACE SOIL SAMPLING

SOP 1-3

Revision: 0

Date: June 30, 1992

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-
8. Place sample containers in individual zip-top plastic bags and seal the bags.
 9. Pack all samples according to ^{Work Plan} ~~FPC-SOP-2-5~~. Include properly completed Traffic Report and/or chain-of-custody forms, and affix custody seals to the three unhinged sides of the cooler lid.
 10. Decontaminate sampling equipment according to ^{Work Plan} ~~FPC-SOP-4-5~~.

6.0 RESTRICTIONS/LIMITATIONS

Grab sampling for VOC analysis or for analysis of any other compound(s) that may be degraded by aeration is necessary to minimize sample disturbance and, hence, analyte loss. The representativeness of this sample, however, is difficult to determine because the collected sample represents a single point, is not homogenized, and has been disturbed.

7.0 REFERENCES

U.S. Department of Energy, Hazardous Waste Remedial Actions Program, *Quality Control Requirements For Field Methods*, DOE/HWP-69/R1, July 1990.

U.S. Department of Energy, Hazardous Waste Remedial Actions Program, *Standard Operating Procedures For Site Characterizations*, DOE/HWP-100, July 1990.

U.S. Environmental Protection Agency, *A Compendium of Superfund Field Operations Methods*, EPA/540/P-87/001, OSWER Directive 9355.0-14, December 1987.

IX. METHODS OF SAMPLE PREPARATION

A. Homogenization

The homogenization of a sample is the process of mixing individual grab samples in order to minimize any bias of sample representativeness introduced by the natural stratification of constituents within the sample.

To homogenize a sample of a soil/sediment matrix, first rocks, twigs, leaves and other debris should be removed if they are not considered part of the sample. The soil/sediment should be removed from the sampling device and placed in a stainless steel pan, then thoroughly mixed using a stainless steel spoon. The sediment in the pan should be scraped from the sides, corners and bottom of the pan, rolled to the middle of the pan, and initially mixed. The sample should then be quartered and moved to the four corners of the pan. Each quarter of the sample should be mixed individually, and then rolled to the center of the container and the entire sample mixed again.

Homogenization of an aqueous sample is only necessary if stratification of constituents is of concern, for example when sampling a lagoon or containerized liquid. Then homogenization would be performed by mixing in a stainless steel bowl.

B. Compositing

Compositing of samples is performed when samplers desire to obtain an average concentration of contaminants over a certain number of sampling points. Anytime compositing is performed, the concentration of contaminant in individual grab samples is diluted proportionately to the number of samples taken. Not only is the contaminant diluted, the detection limits for each individual sample are raised proportionally to the number of samples added to the composite. For instance, if a sampler wishes to composite two discreet samples into one, and the method detection limit for a target compound is 330 ppb, the detection limit for the target compound does not change for the composite, however, the detection limit for the compound in the individual samples which make up the composite is two times the normal detection limit or $2 \times 330 = 660$ ppb. This is important to keep in mind because it is possible that if a contaminant were present in only one of the two composited samples, and if it were at a level between 330 and 660 ppb, that contaminant would not be quantified or possibly even identified due to the effective dilution of the contaminant concentration in the composite. This concept should be taken into account when determining the data quality objectives of a composite sampling event, to ensure that useful data is collected. It is advisable that if a positive identification is made in the course of analyzing a composite sample, that the discreet samples then be analyzed individually to determine the true distribution of contaminant throughout each component of the composite.

APPENDIX D

RECORD OF BEDROCK CORING PARAMETERS

TUT 002 1409

RECORD OF BEDROCK CORING PARAMETERS

BORING/WELL: MW-1D

PAGE 1 OF 1

SITE: Tutu Service Station Investigation

LOCATION: St. Thomas, U.S. Virgin Islands

LENGTH AND DIAMETER
OF CORING DEVICE: 5'3"

DATE OF CORING: 6/11/92

CORE LOGGED BY: R. Ponciano

DRILLER: J. Rivera

[illegible]

BLS	Below land surface.
MIN.	Minutes.
PSI	Pounds per square inch.
-	Not available.

RQD equals rock quality designation.

ROD equals sum of core pieces >4 inches in length divided by penetration.

Percent recovery equals penetration divided by recovery

PRO13.01.T1 Created by NR 4/93/BDRCMW1D.WK3

TUT 002 1410

RECORD OF BEDROCK CORING PARAMETERS

BORING/WELL: MW-4D

PAGE 1 OF 1

SITE: Tutu Service Station Investigation

LOCATION: St. Thomas, U.S. Virgin Islands

LENGTH AND DIAMETER
OF CORING DEVICE: 5'3"

DATE OF CORING: 6/5/92

CORE LOGGED BY: R. Ponciano

DRILLER: J. Rivera

[illegible]

BLS	Below land surface.
MIN.	Minutes.
PSI	Pounds per square inch.
-	Not Available.

RQD equals rock quality designation

RQD equals sum of core pieces >4 inches in length divided by penetration.

Percent recovery equals penetration divided by recovery.

PRO13.01.T1/Created by NR.4/93/BDRCMW4D.WK3

TUT 002 1411

GERAGHTY & MILLER, INC.

RECORD OF BEDROCK CORING PARAMETERS

BORING/WELL: MW-6D

PAGE 1 OF 1

SITE: Tutu Service Station Investigation

LOCATION: St. Thomas, U.S. Virgin Islands

LENGTH AND DIAMETER
OF CORING DEVICE: 5'3"

DATE OF CORING: 7/22/92

CORE LOGGED BY: R. Ponciano

DRILLER: J. Rivera

[illegible]

BLS	Below land surface.
MIN.	Minutes.
PSI	Pounds per square inch.
-	Not Available.

RQD equals rock quality designation

RQD equals sum of core pieces >4 inches in length divided by penetration.

Percent recovery equals penetration divided by recovery

PRO13.01.T1 Created by NR.4/93/BDRCMTW6D.WK3

TUT 002 1412

GERAGHTY & MILLER, INC.

RECORD OF BEDROCK CORING PARAMETERS

BORING/WELL: MW-9

PAGE 1 OF 1

SITE: Tutu Service Station Investigation

LOCATION: St. Thomas, U.S. Virgin Islands

LENGTH AND DIAMETER
OF CORING DEVICE: 5'3"

DATE OF CORING: 7/28/92

CORE LOGGED BY: R. Ponciano

DRILLER: J. Rivera

[illegible]

BLS	Below land surface.
MIN.	Minutes.
PSI	Pounds per square inch.
-	Not Available.

RQD equals rock quality designation.

RQD equals sum of core pieces >4 inches in length divided by penetration.

Percent recovery equals penetration divided by Recovery

PRO13.01.T1/ Created by NR.4/93/BDR CMW9.WK3

TUT 002 1413

RECORD OF BEDROCK CORING PARAMETERS

BORING/WELL: MW-10D

PAGE 1 OF 1

SITE: Tutu Service Station Investigation

LOCATION: St. Thomas, U.S. Virgin Islands

LENGTH AND DIAMETER

OF CORING DEVICE: 5'3"

DATE OF CORING: 7/28/92

DRILLER: J. Rivera

CORE LOGGED BY: R. Pocciano

RUN NUMBER	DEPTH OF RUN (FEET BLS)	PENETRATION (FEET)	RUN DURATION (MIN.)	PENETRATION RATE (FEET/MIN.)	DOWNPRESSURE (PSI)	RECOVERY (FEET)	PERCENT RECOVERY	RQD
1	2.25-4.65	2.40	31	0.08	150	2.40	100	92
1A	4.65-5.0	0.35	1	0.35	150	0.30	86	0
2	5.0-8.2	3.20	38	0.08	150	2.3	72	44
2A	8.2-10.0	1.80	13	0.14	150	1.5	83	69
3	10.0-13.0	3.0	17	0.18	150	3.0	100	65
3A	13.0-15.0	2.0	17	0.12	150	1.4	70	0
4	15.0-19.0	4.0	28	0.14	150	2.3	58	23
5	19.0-22.0	3.0	22	0.14	150	3.0	100	53
6	22.0-25.0	3.0	17	0.11	150	0.8	27	0
7	25.0-27.0	2.0	27	0.07	150	1.2	60	0
7A	27.0-27.3	0.3	4	0.08	150	0.2	67	0
7B	27.0-28.3	1.3	4	0.32	150	1.3	100	50
7C	28.3-30.0	1.7	9	0.18	150	1.65	97	27
8	30.0-33.5	3.5	24	0.14	100	3.5	100	54
8A	33.5-35.0	1.5	7	0.21	100	1.5	100	37
9	35.0-40.0	5.0	30	0.16	100	4.8	96	89
10	40.0-44.8	4.8	18	0.27	250	4.6	96	74
11	44.8-49.4	4.8	17	0.28	200	4.8	100	70
12	49.4-51.4	2.0	21	0.10	200	1.68	84	67
12A	51.4-55.0	3.6	14	0.26	200	3.6	100	65
13	55.0-59.8	4.8	22	0.22	200	4.8	100	96
14	59.8-64.7	4.9	14	0.35	300	4.9	100	85
14A	64.7-65.5	0.8	3	0.27	300	0.8	100	100
15	65.5-70.0	4.5	12	0.38	300	4.5	100	90
16	70.0-75.0	5.0	11	0.45	300	4.6	92	72

BLS Below land surface.

MIN. Minutes.

PSI Pounds per square inch.

- Not Available.

RQD equals rock quality designation

RQD equals sum of core pieces > 4 inches in length divided by penetration.

Percent recovery equals penetration divided by recovery

PRO13.01.T1 Created by NR.4/93/BDRCMW10.WK3

TUT 002 1414

RECORD OF BEDROCK CORING PARAMETERS

BORING/WELL: MW-11D

PAGE 1 OF 1

SITE: Tutu Service Station Investigation

LOCATION: St. Thomas, U.S. Virgin Islands

LENGTH AND DIAMETER
OF CORING DEVICE: 5'3"

DATE OF CORING: 06/29/92

CORE LOGGED BY: R. Pociano

DRILLER: J. Rivera

[illegible]

BLS	Below land surface.
MIN.	Minutes.
PSI	Pounds per square inch.
-	Not Available.

RQD equals rock quality designation.

RQD equals sum of core pieces >4 inches in length divided by penetration.

Percent recovery equals penetration divided by recovery.

PRO13.01.T1/Created by NR.4/93/BDRMW11D.WK3

TUT 002 1415

GERAGHTY & MILLER, INC.

RECORD OF BEDROCK CORING PARAMETERS

BORING/WELL: MW-12D

PAGE 1 OF 2

SITE: Tutu Service Station Investigation

LOCATION: St. Thomas, U.S. Virgin Islands

LENGTH AND DIAMETER

OF CORING DEVICE: 5/8"

DATE OF CORING: 7/7/92

DRILLER: J. Rivera

CORE LOGGED BY: R. Ponciano

RUN NUMBER	DEPTH OF RUN (FEET BLS)	PENETRATION (FEET)	RUN DURATION (MIN.)	PENETRATION RATE (FEET/MIN.)	DOWNPRESSURE (PSI)	RECOVERY (FEET)	PERCENT RECOVERY	RQD
1	5.9-10.0	4.10	10	0.41	200	0	0	0
2	10.0-15.0	5.10	20	0.26	150-200	2.0	39	0
3	15.0-18.5	3.5	18	0.19	100	2.2	63	0
3A	18.5-20.0	1.5	4	0.38	100	1.5	100	0
4	20.0-25.0	5.0	13	0.38	150	2.80	56	0
5	25.0-30.0	5.0	23	0.22	50-100	4.00	80	0
6	30.0-33.10	3.1	42	0.07	100	2.4	77	0
6A	33.10-35.0	1.9	-	-	100	1.90	100	0
7	35.0-37.0	2.0	16	0.13	100	1.5	75	23
7A	37.0-38.5	1.5	14	0.11	100-150	1.5	100	0
7B	38.5-40.0	1.5	9	0.15	100	1.5	100	0
8	40.0-41.5	1.5	9	0.17	150	1.3	87	0
8A	41.5-45.0	3.5	18	0.19	100	3.2	91	0
9	45.0-49.5	4.5	34	0.13	100	3.0	67	11
10	49.5-50.2	0.7	20	0.35	200	0.6	86	0
10A	50.2-53.0	2.8	25	0.11	150	2.0	71	0
10B	53.0-55.0	2.0	11	0.18	100-150	2.0	100	28
11	55.0-59.7	4.70	39	0.12	150-300	4.2	89	56
12	59.7-61.20	1.50	16	0.09	100	1.0	67	0
13	61.20-61.95	0.75	13	0.06	50-100	0.5	67	0
14	61.95-62.13	0.18	17	0.01	150	0.10	56	0
14A	62.13-62.68	0.55	10	0.06	100	0.40	73	0
14B	62.68-64.66	1.92	12	0.16	100	1.2	63	0
14C	64.66-65.0	0.40	3	0.13	100	0.15	38	0
15	65.0-65.4	0.40	7	0.06	100	0.20	50	0
15A	65.4-66.0	0.60	4	0.15	100	0	0	0
15B	66.0-70.0	4.0	59	0.07	100	0	0	0

BLS Below land surface.
 MIN. Minutes.
 PSI Pounds per square inch.
 - Not Available.

RQD equals rock quality designation.

RQD equals sum of core pieces > 4 inches in length divided by penetration.

Percent recovery equals penetration divided by recovery.

PRO13.01.T1 Created by NR.4/93/BDRMW12D.WK3

TUT 002 1416

RECORD OF BEDROCK CORING PARAMETERS

BORING/WELL: MW-12D

PAGE 2 OF 2

SITE: Tutu Service Station Investigation

LOCATION: St. Thomas, U.S. Virgin Islands
DRILLER: J. Rivera

CORE LOGGED BY: R. Ponciano

[illegible]

BLS	Below land surface.
MIN.	Minutes.
PSI	Pounds per square inch.
-	Not Available.

RQD equals rock quality designation.

RQD equals sum of core pieces >4 inches in length divided by penetration.

Percent recovery equals penetration divided by recovery.

PRO13.01.T1/Created by NR.4/93/BDRMW12D.WK3

TUT 002 1417

RECORD OF BEDROCK CORING PARAMETERS

BORING/WELL: MW-13D

PAGE 1 OF 1

SITE: Tutu Service Station Investigation

LOCATION: St. Thomas, U.S. Virgin Islands

LENGTH AND DIAMETER
OF CORING DEVICE: 5'3"

DATE OF CORING: 6/19/92

CORE LOGGED BY: R. Ponciano

DRILLER: J. Rivera

RUN NUMBER	DEPTH OF RUN (FEET BLS)	PENETRATION (FEET)	RUN DURATION (MIN.)	PENETRATION RATE (FEET/MIN.)	DOWNPRESSURE (PSI)	RECOVERY (FEET)	PERCENT RECOVERY	RQD
1	5.3-7.4	2.1	-	-	200	0.6	29	0
1A	7.4-10.0	2.6	6	0.43	300	1.0	38	0
2	10.0-15.0	5.0	12	0.42	300	0.6	12	0
3	15.0-20.0	5.0	19	0.26	200	0.15	3	0
4	20.0-25.0	5.0	25	0.20	200	0.9	18	0
5	25.0-30.0	5.0	21	0.24	200	1.3	26	0
6	30.0-35.0	5.0	12	0.42	200	2.2	44	12
7	35.0-40.0	5.0	22	0.23	200	4.0	80	52
8	40.0-45.0	5.0	13	0.38	200	4.10	82	81
9	45.0-50.0	5.0	8	0.63	200	4.75	95	97
10	50.0-55.0	5.0	12	0.42	200	3.80	76	63
11	55.0-60.0	5.0	13	0.38	200	3.80	76	47
12	60.0-65.0	5.0	16	0.31	200	4.30	86	74
13	65.0-70.0	5.0	21	0.24	200	4.00	80	41
14	70.0-75.0	5.0	9	0.56	200	4.50	90	61
15	75.0-80.0	5.0	13	0.38	200	4.70	94	83
16	80.0-85.0	5.0	16	0.31	-	4.80	96	50
17	85.0-90.0	5.0	17	0.29	50-200	4.80	96	83
18	90.0-95.0	5.0	14	0.36	200	4.80	96	90
19	95.0-100.0	5.0	11	0.45	200	4.90	98	80
20	100.0-105.0	5.0	15	0.33	50-200	5.10	102	73
21	105.0-110.0	5.0	27	0.19	50-200	4.0	80	72
22	110.0-115.0	5.0	13	0.38	50-200	4.90	98	89
23	115.0-120.0	5.0	10	0.50	50-200	4.90	98	88

BLS Below land surface.
MIN. Minutes.
PSI Pounds per square inch.
- Not Available.

RQD equals rock quality designation

RQD equals sum of core pieces > 4 inches in length divided by penetration.

Percent recovery equals penetration divided by recovery.

PRO13.01.T1 Created by NR.4/93/BDRMW13D.WK3

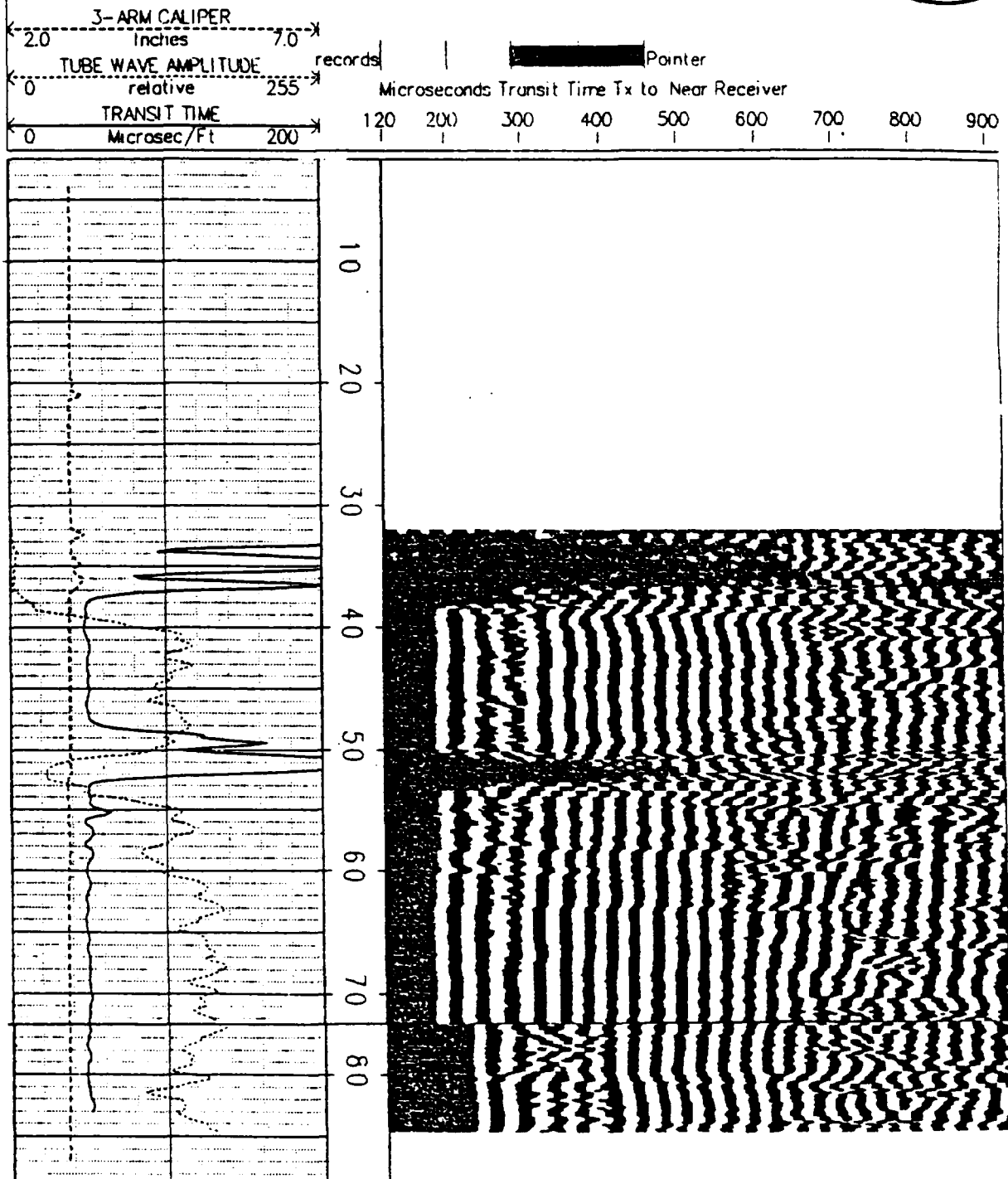
TUT 002 1418

APPENDIX E
GEOPHYSICAL LOGS

TUT 002 1419

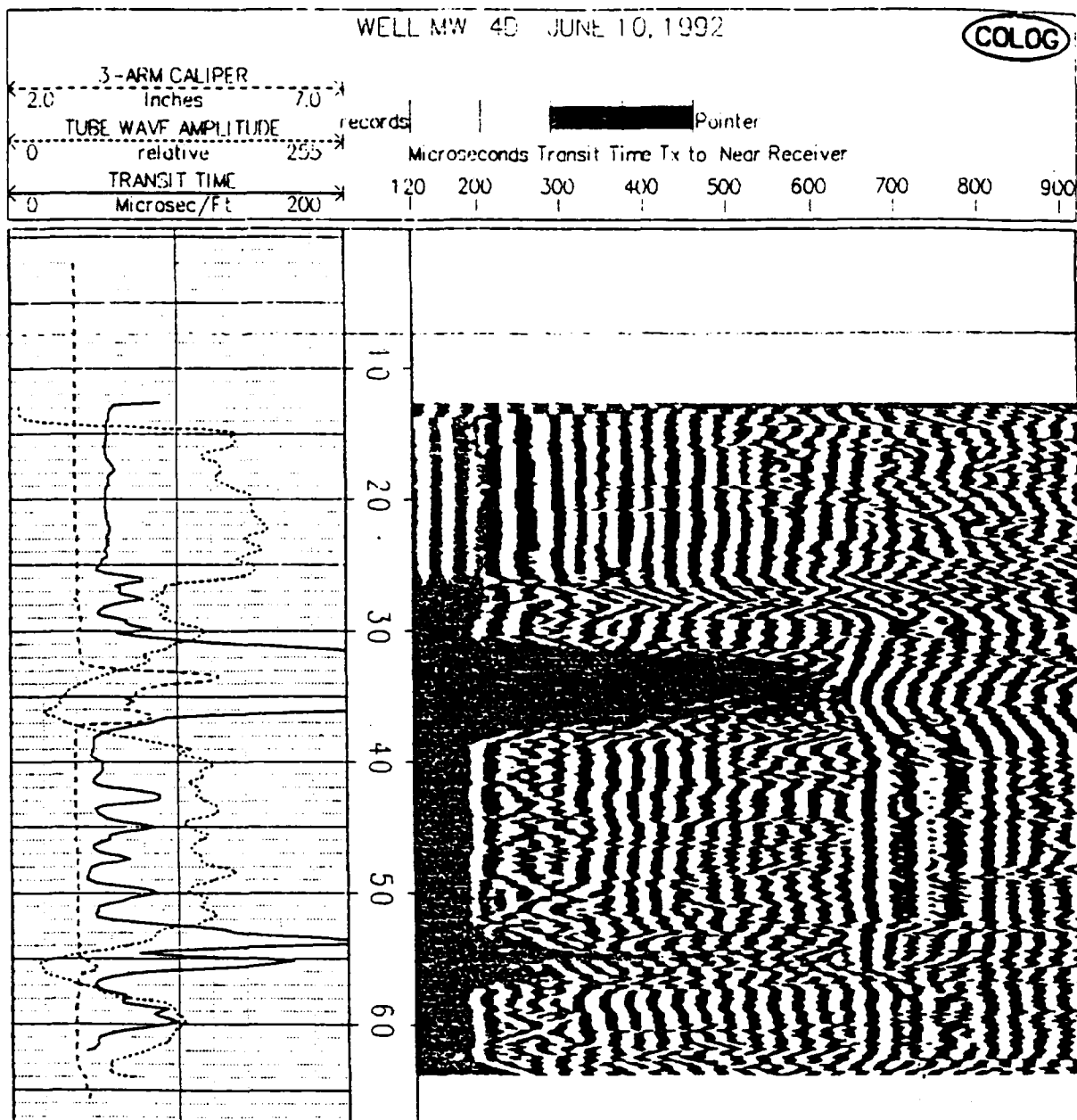
WELL MW-10 JUNE 18, 1992

COLOG

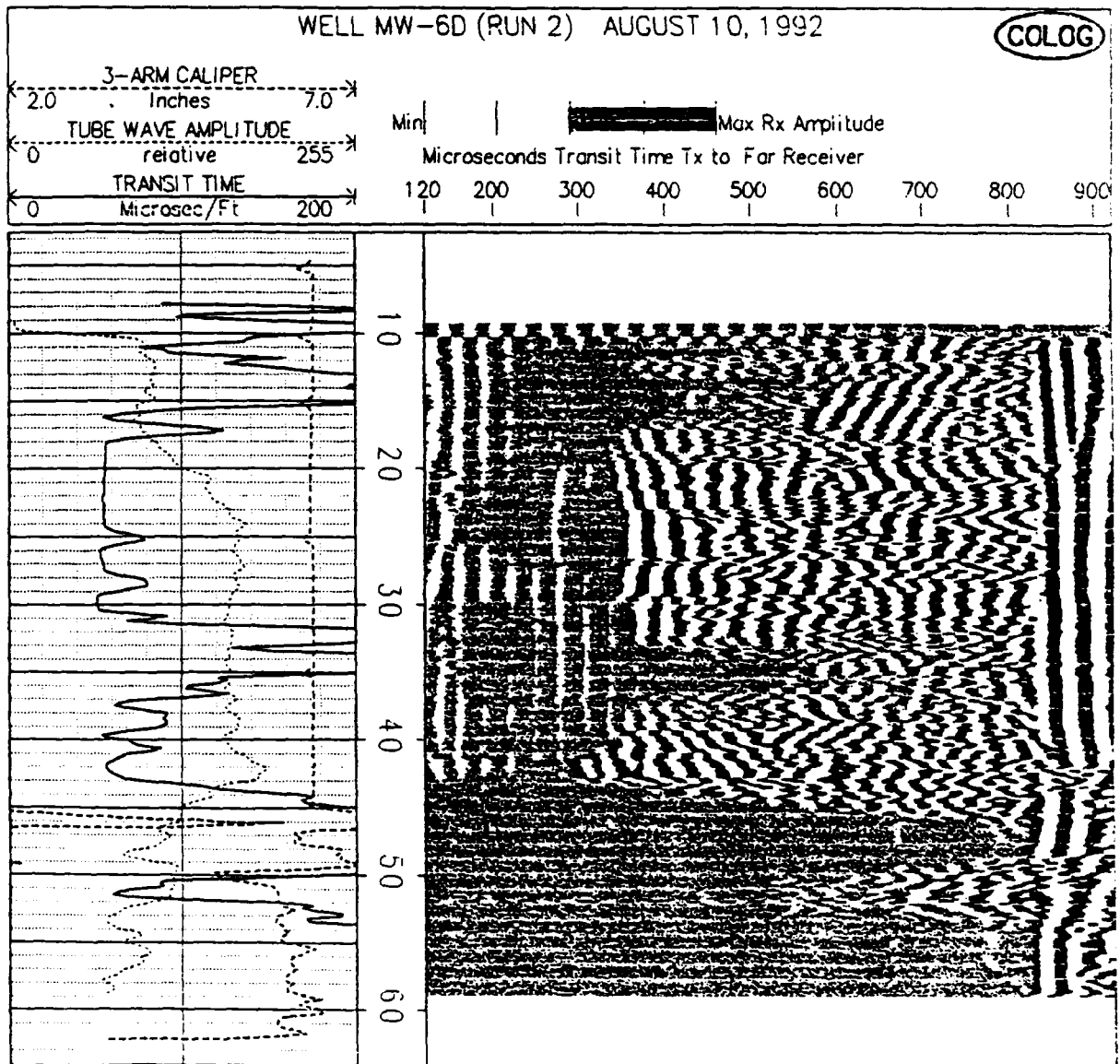


TUT 002 1420

GERAGHTY & MILLER, INC.



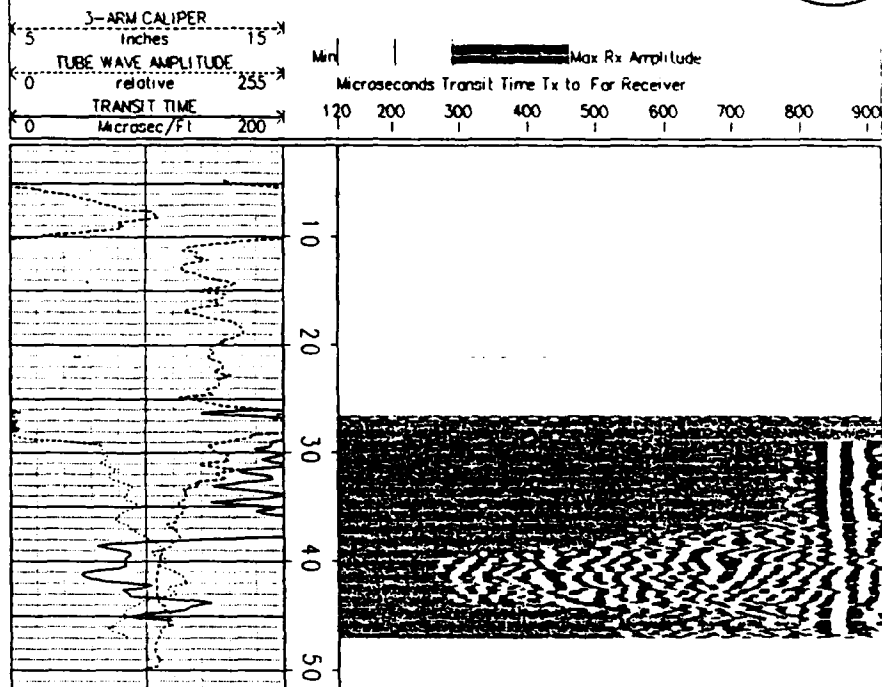
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TUT 002 1422

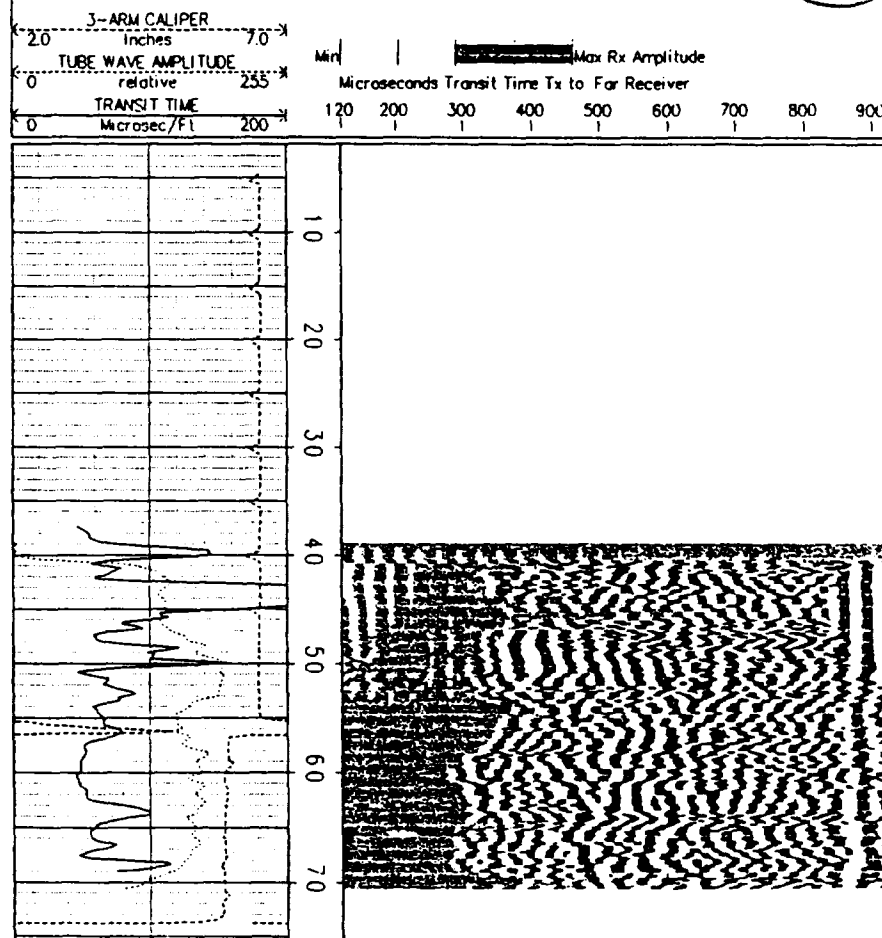
WELL MW-100 (RUN 1) AUGUST 18, 1992

COLOG



WELL MW-100 (RUN 2) AUGUST 19, 1992

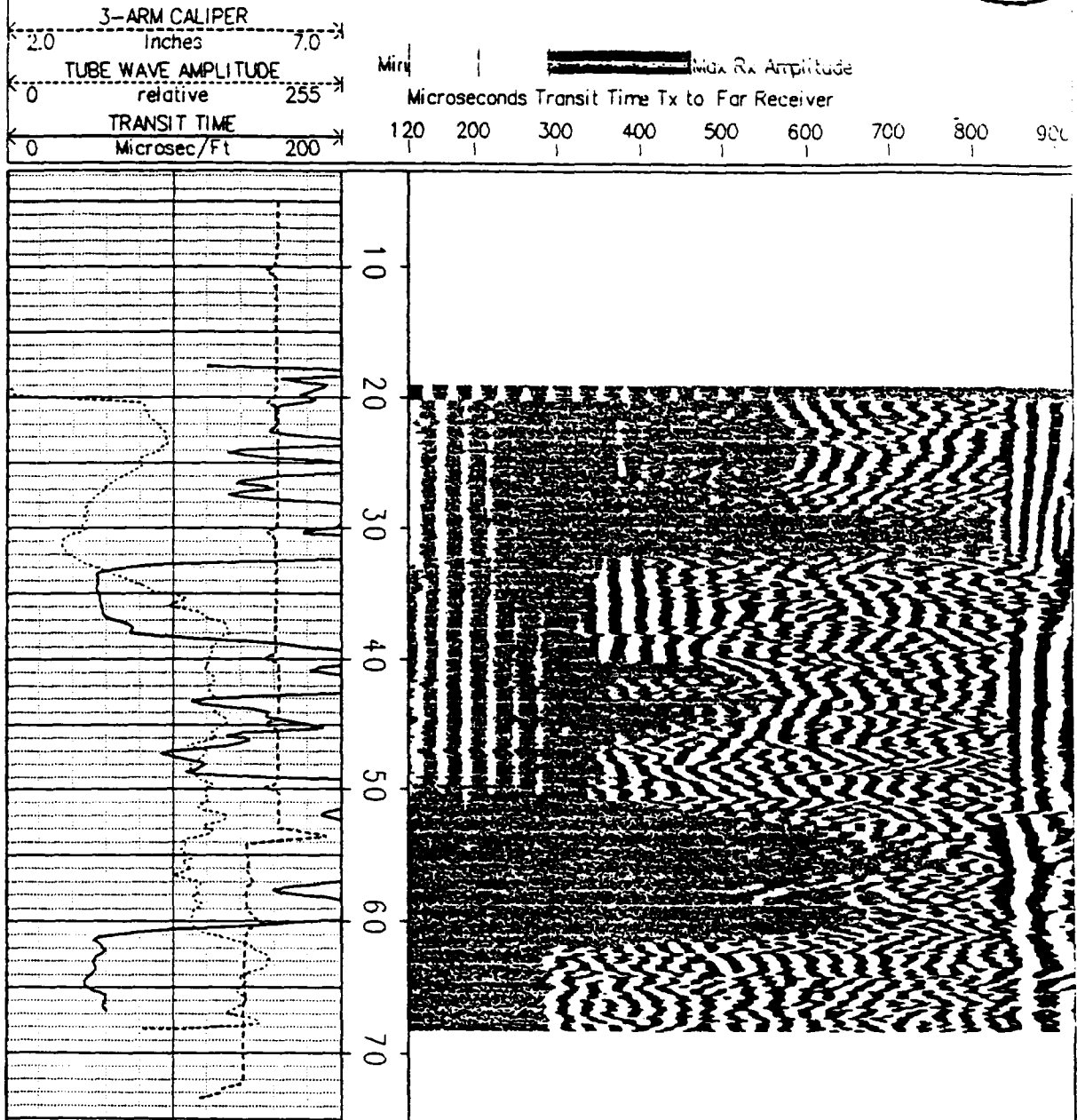
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TUT 002 1423

WELL MW-11D (RUN 2) JULY 20, 1992

COLOG



TOT 002 1424

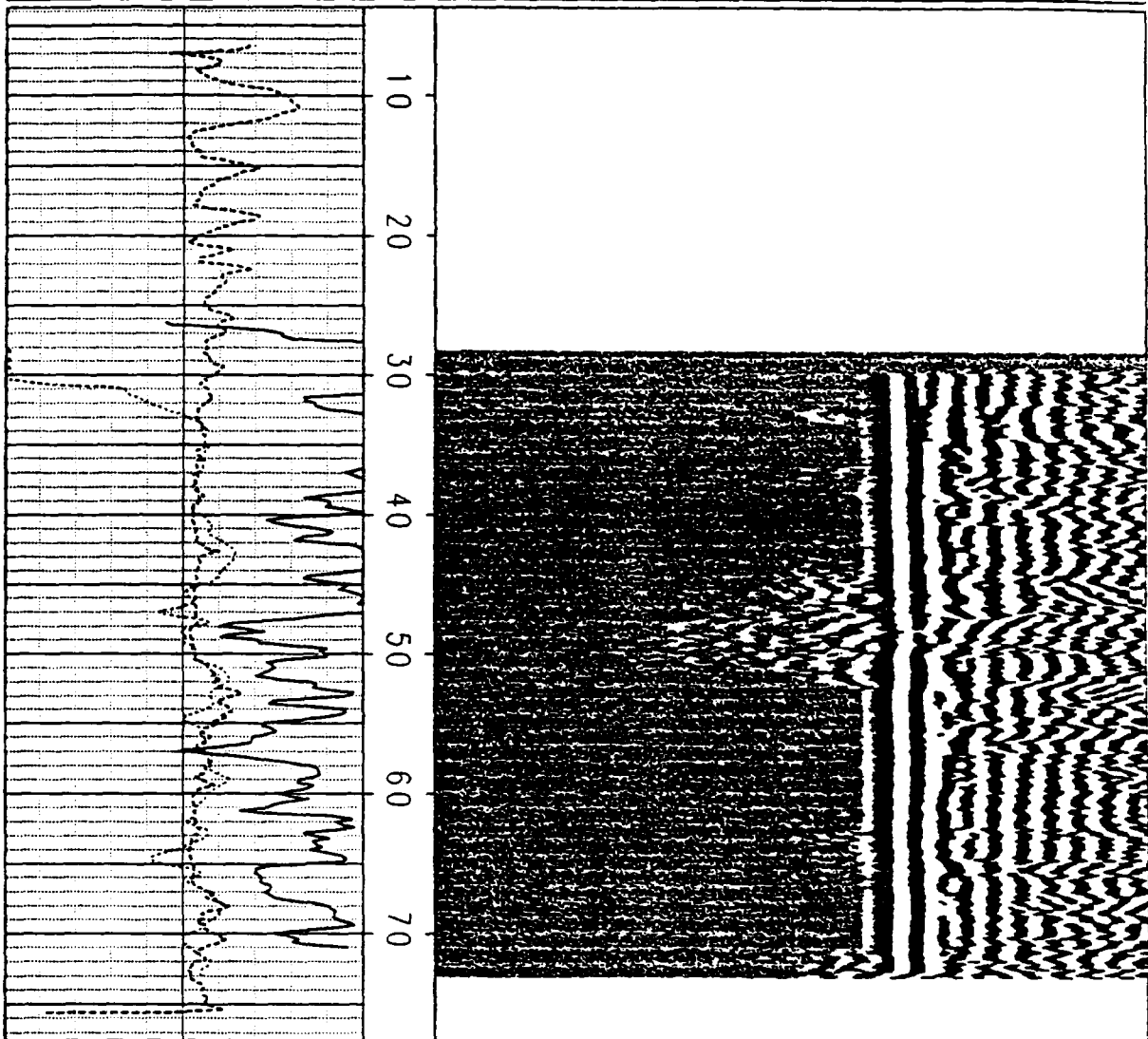
WELL MW-12D JULY 22, 1992

COLOG

3-ARM CALIPER
Inches
5 15
TUBE WAVE AMPLITUDE
relative
0 255
TRANSIT TIME
Microsec/Ft
0 200

Min | | Max Rx Amplitude
Microseconds Transit Time Tx to Near Receiver

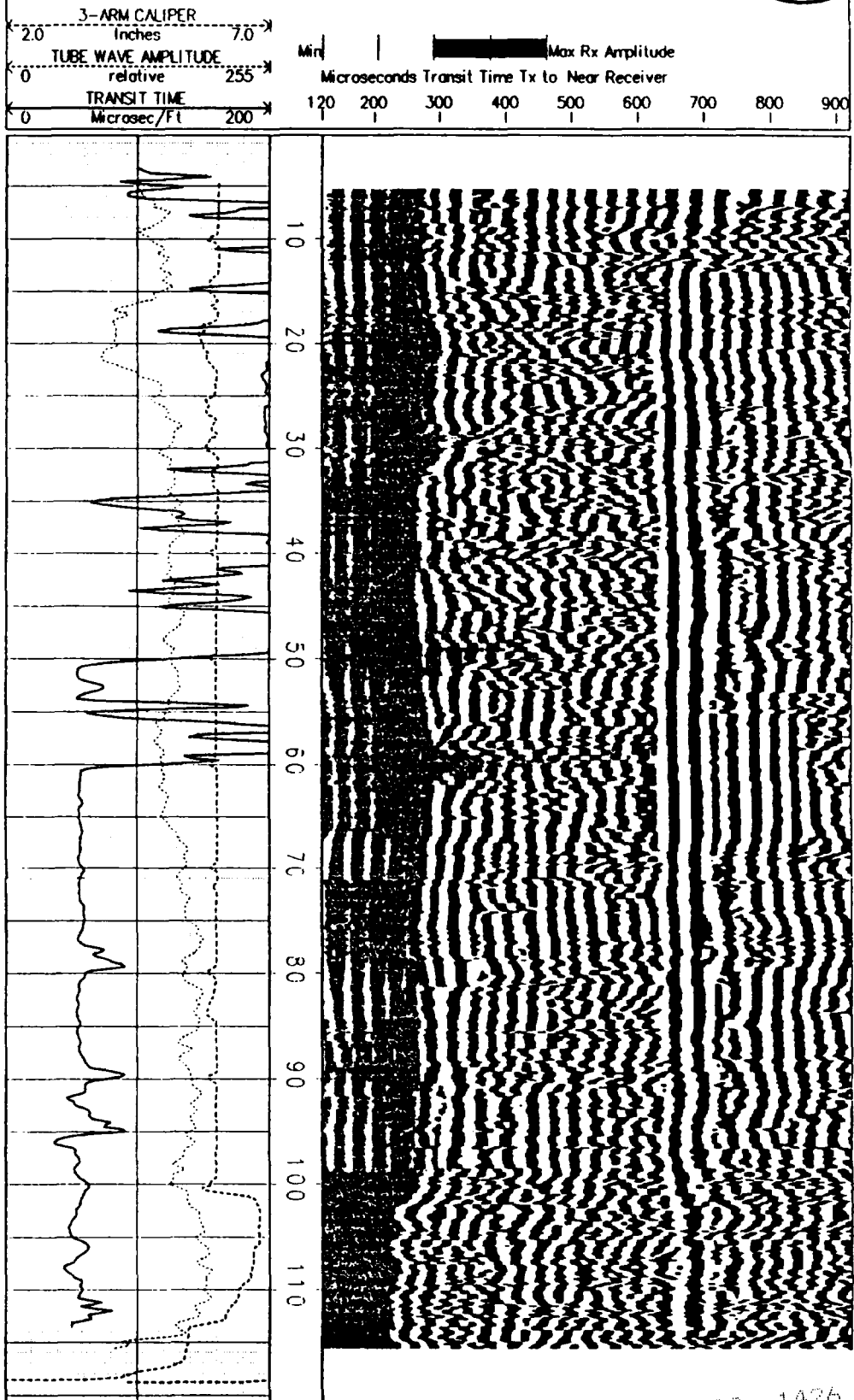
120 200 300 400 500 600 700 800 900



TUT 002 1425

WELL MW-13D JULY 15, 1992

COLOG

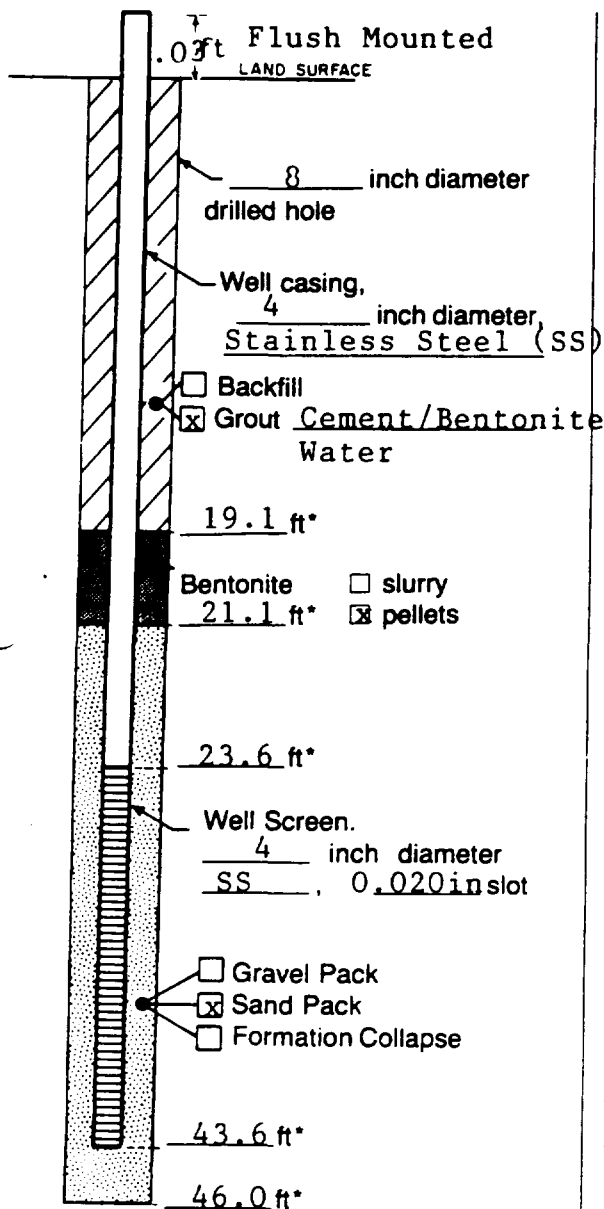


TUT 002 1426

APPENDIX F
WELL CONSTRUCTION LOGS

TUT 002 1427

WELL CONSTRUCTION LOG



Project TEIC/PRO1301 Well MW-1

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. _____

Land-Surface Elevation 195.05 feet msl

and Datum 195.08 feet ☒ Surveyed

☐ Estimated

Installation Date(s) June 30, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid Water

Development Technique(s) and Date(s)

Submersible pump; 8/29/92

Fluid Loss During Drilling NA gallons

Water Removed During Development 60 (approximately) gallons

Static Depth to Water 29.5 before develop. feet below M.P.

Pumping Depth to Water 40.0 feet below M.P.

Pumping Duration 0.42 hours

Yield NA gpm Date 8/29/92

Specific Capacity NA gpm/ft

Well Purpose Monitoring

Remarks 6-inch hollow stem auger from land surface to 1.7 feet.

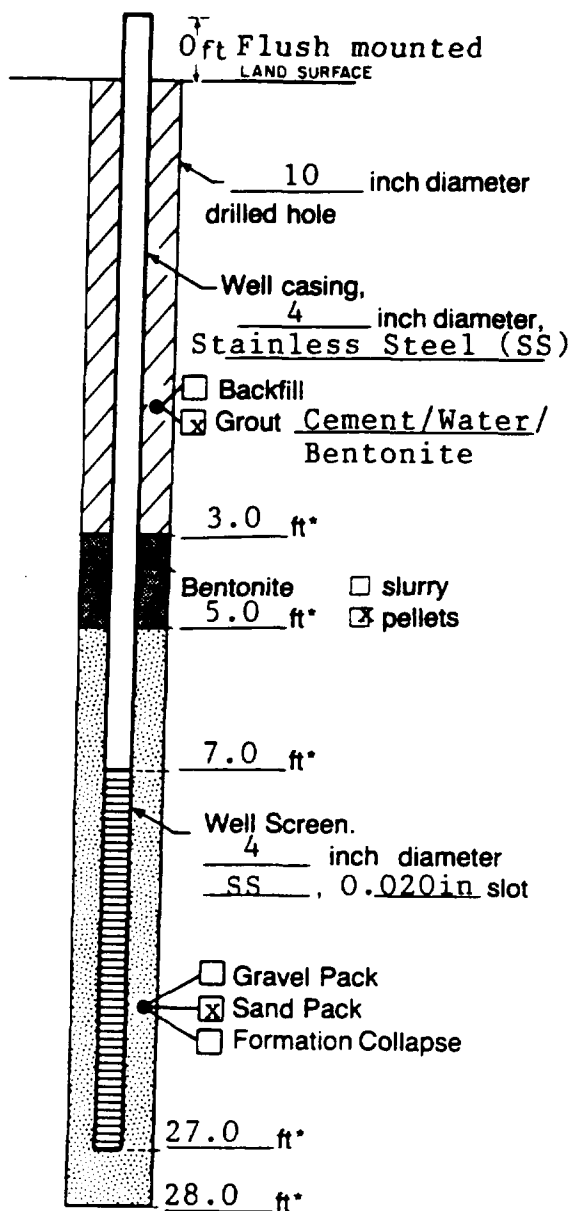
7.5-inch air hammer from land surface to 46.0 feet.

Borehole cave in up to 43.6 feet.

Top of bedrock at 1.8 feet.

Prepared by Wanda I. Morales

WELL CONSTRUCTION LOG



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project TEIC/PRO1301 Well MW-2

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. _____

Land-Surface Elevation 178.31 feet msl

and Datum 178.15 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) August 25, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid _____

Development Technique(s) and Date(s)

Centrifugal pump. Flushed well with water
to facilitate development; 9/2/92

Fluid Loss During Drilling NA gallons

Water Removed During Development 72 (approximately) gallons

Static Depth to Water 13.6 before develop. feet below M.P.

Pumping Depth to Water 26.0 feet below M.P.

Pumping Duration 0.41 hours

Yield NA gpm Date 9/2/92

Specific Capacity NA gpm/ft

Well Purpose Monitoring well

Remarks 6-inch hollow stem auger from land
surface to 2.0 feet.

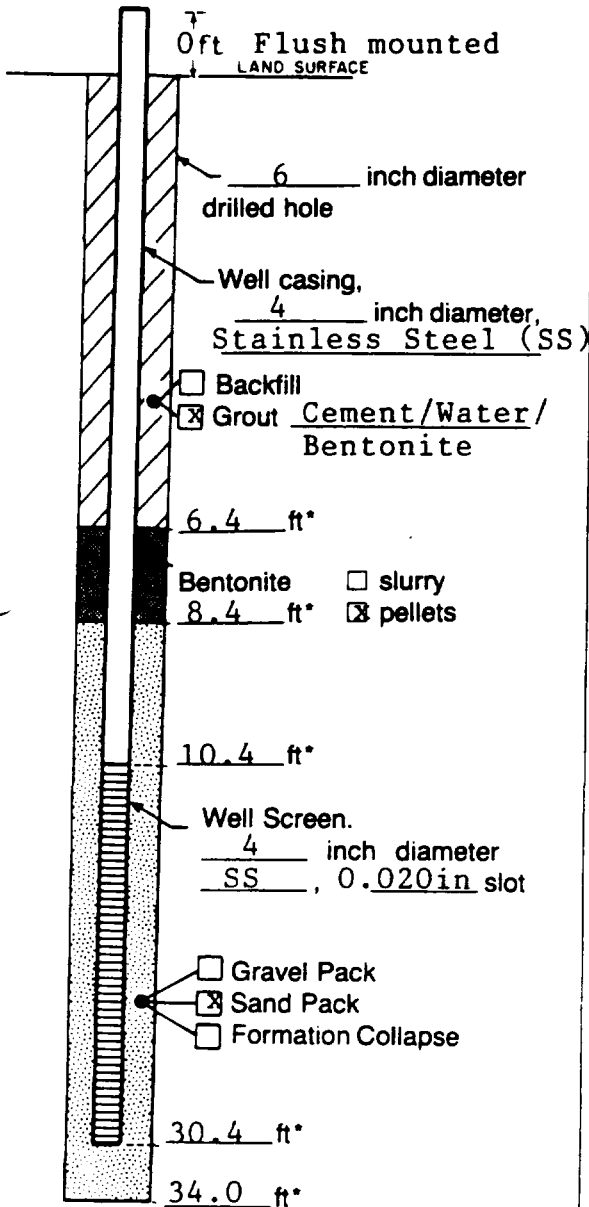
10-inch air hammer from land surface to
29.0 feet.

Borehole cave in up to 28.0 feet.

Top of bedrock at 3.1 feet.

Prepared by Wanda I. Morales

WELL CONSTRUCTION LOG



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project TEIC/PR01301 Well MW-3

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. _____

Land-Surface Elevation 181.85 feet msl

and Datum 181.84 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) June 9 & 11, 1992

Drilling Method Hollow Stem Auger/Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid _____

Development Technique(s) and Date(s)

Submersible pump, August 25, 1992

Fluid Loss During Drilling NA gallons

Water Removed During Development 130 gallons

Static Depth to Water 17.35ft before develop feet below M.P.

Pumping Depth to Water 28.40 feet below M.P.

Pumping Duration 0.5 hours

Yield 4.3 gpm Date 8/25/92

Specific Capacity 0.4 gpm/ft

Well Purpose Monitoring Well

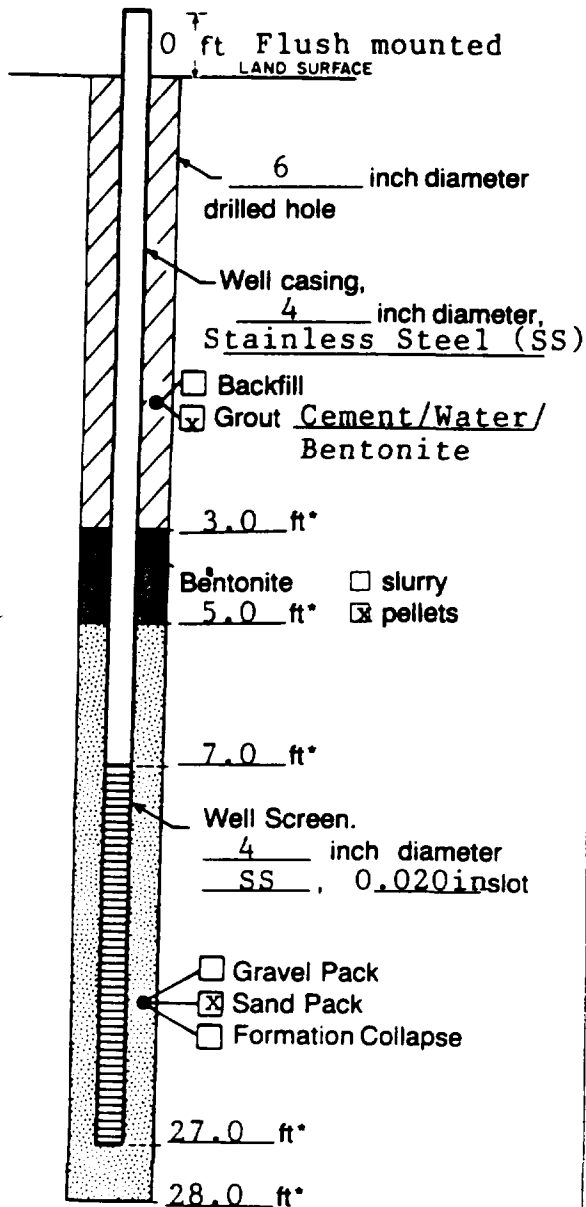
Remarks 6-inch hollow stem auger from land
surface to 2.4 feet (Bedrock).

5.5-inch air hammer from 2.4 to 34.0 feet.

Borehole cave in up to 33.3 feet.

Prepared by Rubén Ponciano

WELL CONSTRUCTION LOG



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project TEIC/PR01301 Well MW-4

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. _____

Land-Surface Elevation 175.69 feet msl

and Datum 175.66 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) June 17, 1992

Drilling Method Hollow Stem Auger/Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid _____

Development Technique(s) and Date(s)

Submersible pump; 8/24/92

Fluid Loss During Drilling NA gallons

Water Removed During Development 73 gallons

Static Depth to Water 11.54 ft before development feet below M.P.

Pumping Depth to Water 25.0 feet below M.P.

Pumping Duration 0.5 hours

Yield 2.4 gpm

Date 8/24/92

Specific Capacity 0.2 gpm/ft

Well Purpose Monitoring Well

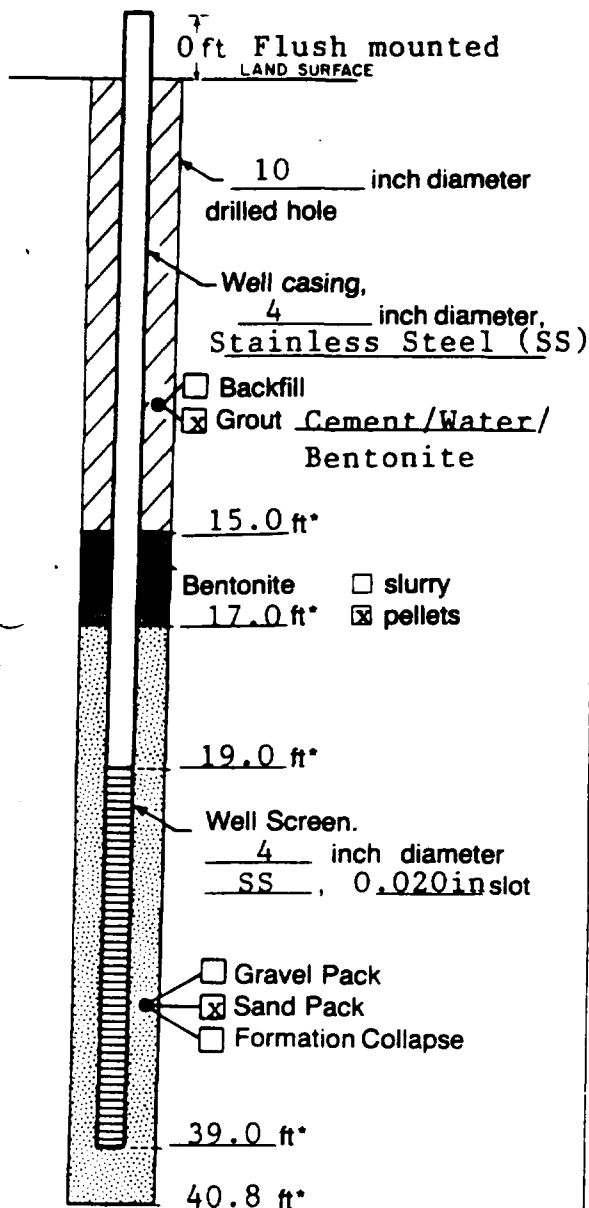
Remarks 6-inch hollow stem auger from land
surface to 9.8 feet.

7.5-inch air hammer from 9.8 to

28.0 feet. Top of bedrock at 8.7 feet.

Prepared by Wanda I. Morales

WELL CONSTRUCTION LOG



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project TEIC/PRO1301 Well MW-5

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. _____

Land-Surface Elevation 187.24 feet msl

and Datum 187.09 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) August 25, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid _____

Development Technique(s) and Date(s)

Centrifugal pump. Flushed well with water
to facilitate development; 9/2/92.

Fluid Loss During Drilling NA gallons

Water Removed During Development 66 gallons

Static Depth to Water 22.8 ft before develop feet below M.P.

Pumping Depth to Water 37.5 feet below M.P.

Pumping Duration 0.43 hours

Yield NA gpm

Date 9/2/92

Specific Capacity NA gpm/ft

Well Purpose Monitoring well

Remarks 6-inch hollow stem auger from land
surface to 4.0 feet.

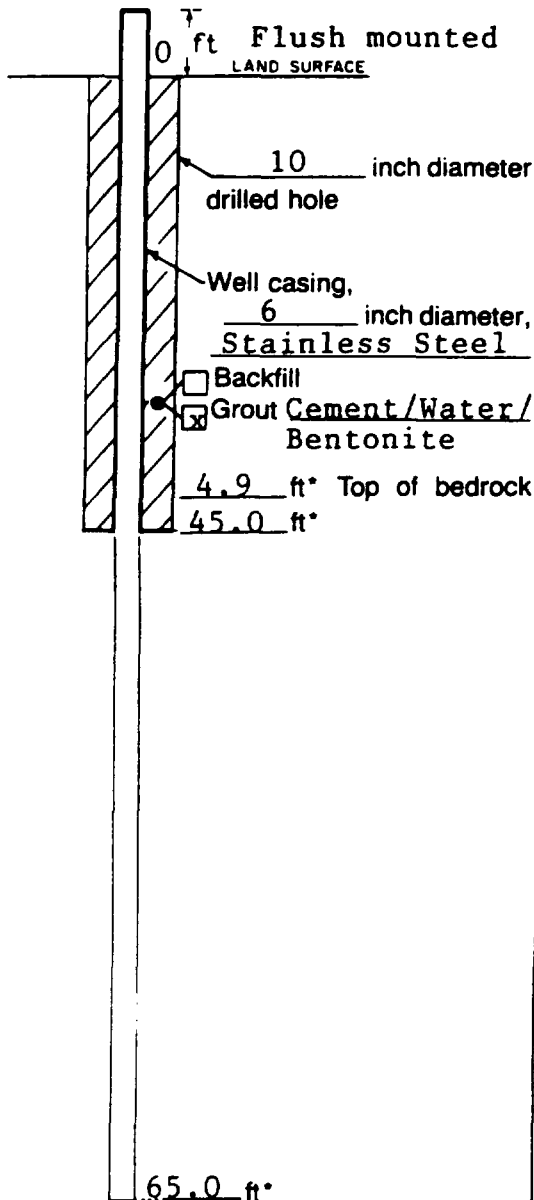
10-inch air hammer from land surface to

45.0 feet. Top of bedrock at 4.8 feet.

Grout seal from 44.8 up to 40.8 feet.

Prepared by Wanda I. Morales

WELL CONSTRUCTION LOG (BEDROCK)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

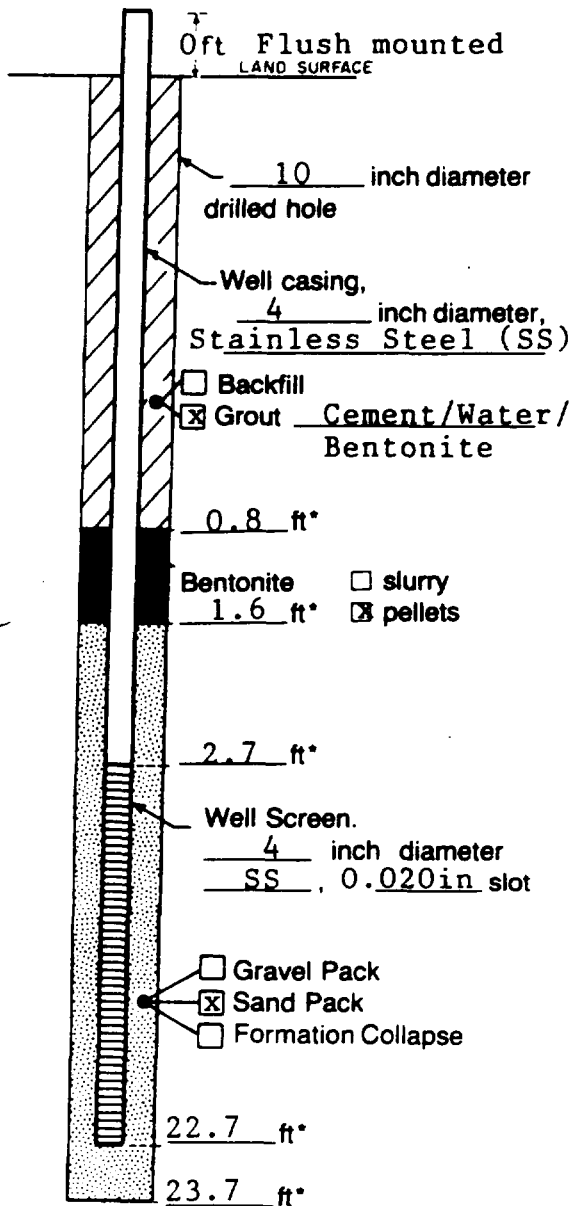
*Depth Below Land Surface

Project TEIC/PR01301 Well MW-6D
Town/City Anna's Retreat/Tutu
County St. Thomas State USVI
Permit No. _____
Land-Surface Elevation 171.26 feet msl
and Datum 171.01 feet msl ☒ Surveyed
☐ Estimated
Installation Date(s) August 6 & 10, 1992
Drilling Method Hollow Stem Auger & Air Hammer
Drilling Contractor Soil Tech
Drilling Fluid Water when diamond coring was performed.
Development Technique(s) and Date(s)
Centrifugal pump; September 2, 1992
Fluid Loss During Drilling NA gallons
Water Removed During Development 240 gallons
Static Depth to Water 20.2 ft before develop feet below M.P.
Pumping Depth to Water 74.0 feet below M.P.
Pumping Duration 0.33 hours
Yield 12 gpm Date 9/2/92
Specific Capacity 0.22 gpm/ft
Well Purpose Monitoring well
Fracture Zones _____

Remarks 6-inch hollow stem auger from land surface to 4.9 feet. Depth to bedrock 4.9 feet
10-inch air hammer from land surface to 45.0 feet.
5.5-inch air hammer from 45.0 to 65.0 feet.

Prepared by Wanda I. Morales

WELL CONSTRUCTION LOG



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project TEIC/PR01301 Well MW-6R

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. _____

Land-Surface Elevation 171.44 feet msl

and Datum 171.17 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) September 2, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid _____

Development Technique(s) and Date(s)

Submersible pump; 9/9/92

Fluid Loss During Drilling NA gallons

Water Removed During Development 486 gallons

Static Depth to Water 8.2ft before develop feet below M.P.

Pumping Depth to Water 20.6 feet below M.P.

Pumping Duration 0.9 hours

Yield 9 gpm Date 9/9/92

Specific Capacity 0.72 gpm/ft

Well Purpose Monitoring Well

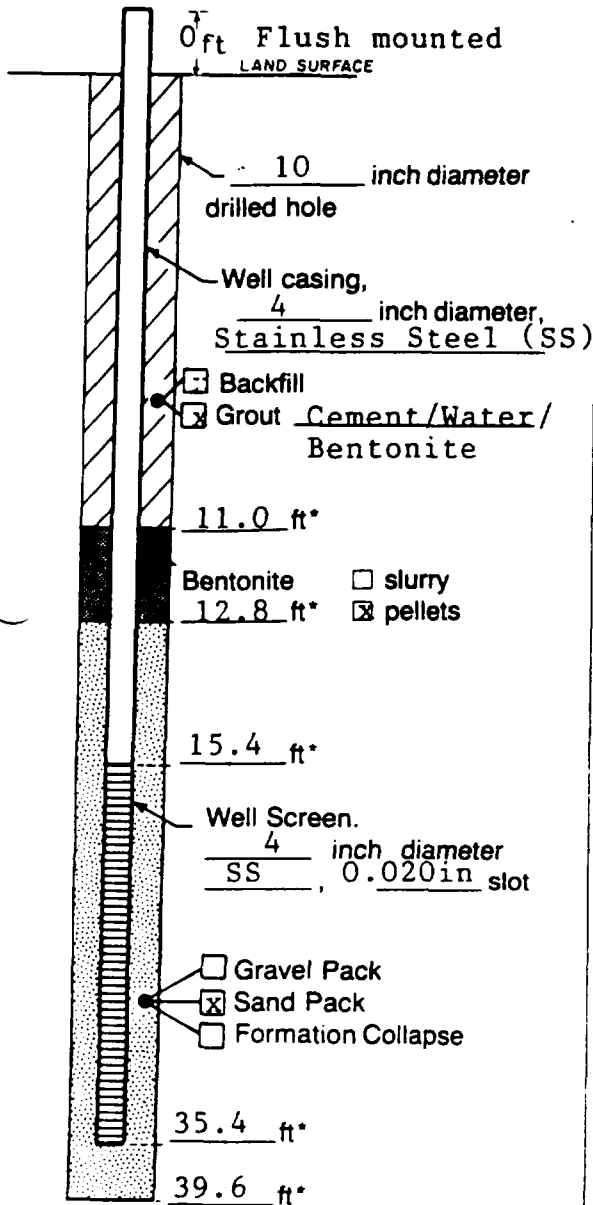
Remarks 10-inch air hammer from land surface to 26.0 feet.

Borehole cave in up to 23.7 feet.

Bedrock at approximately 4.92 feet bls (see MW-6D).

Prepared by Derrick Stepanof/Rubén Ponciano

WELL CONSTRUCTION LOG



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project TEIC/PRO1301 Well MW-7

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. _____

Land-Surface Elevation 180.3 feet msl

and Datum 180.13 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) July 29, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid _____

Development Technique(s) and Date(s)

Centrifugal pump. Flushed well with water to facilitate development; 9/2/92.

Fluid Loss During Drilling NA gallons

Water Removed During Development 84 gallons

Static Depth to Water 17.14 ft before develop feet below M.P.

Pumping Depth to Water 34.0 feet below M.P.

Pumping Duration _____ hours

Yield NA gpm Date 9/2/92

Specific Capacity NA gpm/ft

Well Purpose Monitoring well

Remarks 6-inch hollow stem auger from land surface to 15.0 feet.

10-inch air hammer from land surface to

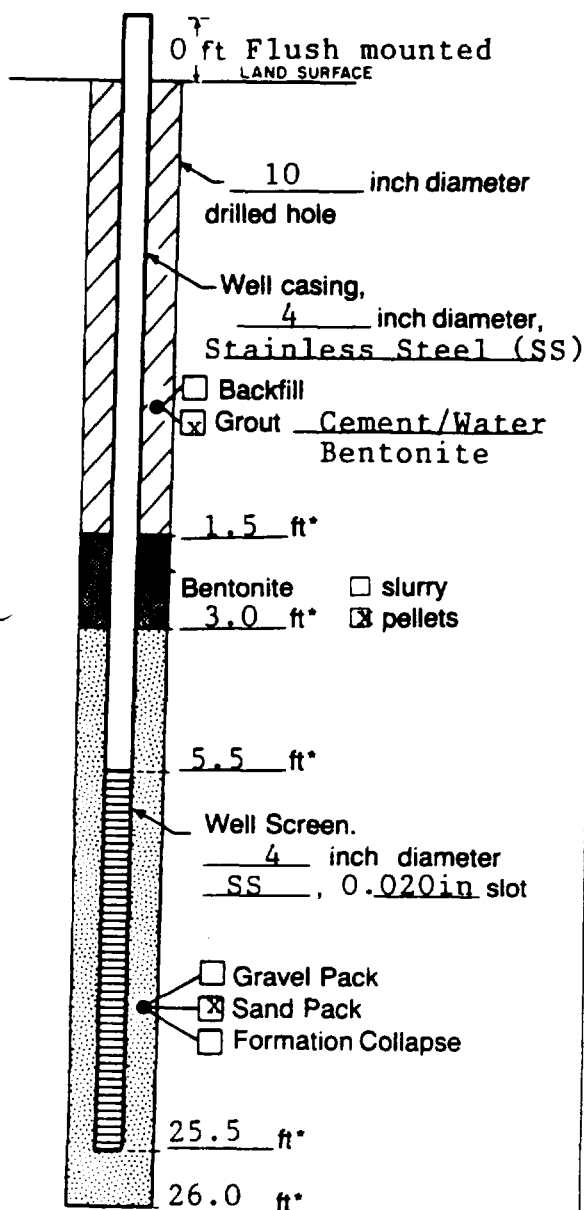
40.0 feet.

Borehole cave in up to 39.6 feet.

Competent bedrock approximatley at 15.0 feet.

Prepared by Wanda I. Morales

WELL CONSTRUCTION LOG



Project TEIC/PRO1301 Well MW-8

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. _____

Land-Surface Elevation 167.61 feet msl

and Datum 167.54 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) July 23, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid _____

Development Technique(s) and Date(s)

Centrifugal pump. Flushed well with water
to facilitate development; 8/31/92.

Fluid Loss During Drilling NA gallons

Water Removed During Development 110 gallons

Static Depth to Water 17.70ft before develop feet below M.P.

Pumping Depth to Water 25.0 feet below M.P.

Pumping Duration 0.76 hours

Yield NA gpm

Date 8/31/92

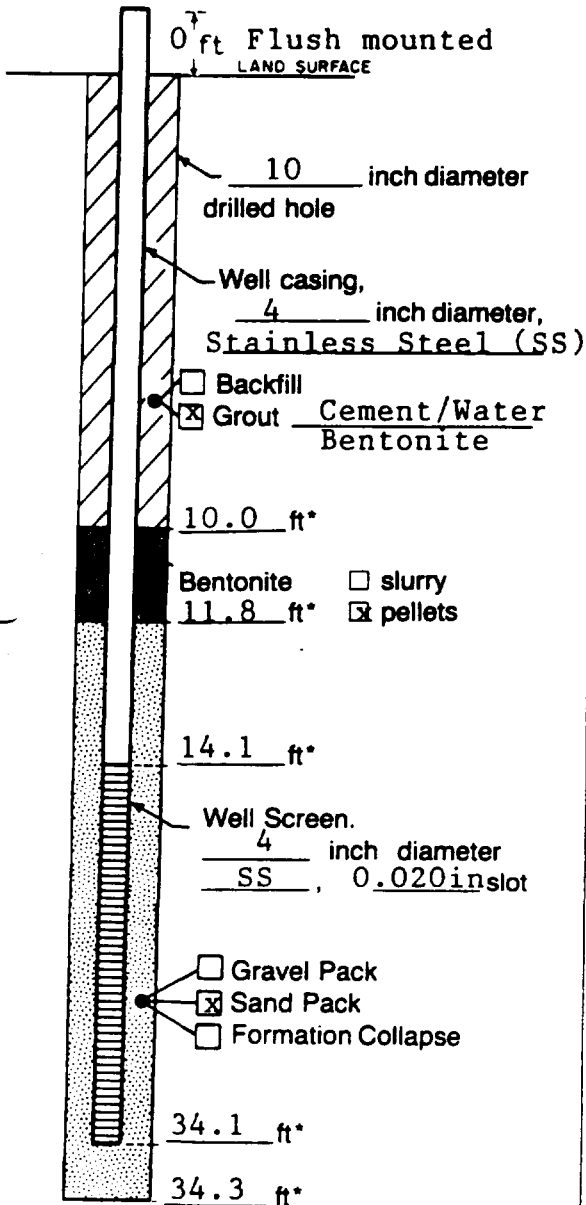
Specific Capacity NA gpm/ft

Well Purpose Monitoring well

Remarks 6-inch hollow stem auger from land
surface to 8.3 feet (bedrock).
10-inch air hammer from land surface to
27.0 feet.
Borehole cave in up to 26.0 feet.

Prepared by Wanda I. Morales

WELL CONSTRUCTION LOG



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project TEIC/PRO1301 Well MW-9

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. _____

Land-Surface Elevation 162.32 feet msl

and Datum 162.26 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) July 30, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid Water when diamond coring was performed.

Development Technique(s) and Date(s)

Centrifugal pump. Flushed well with water to facilitate development; 9/2/92.

Fluid Loss During Drilling NA gallons

Water Removed During Development 70 gallons

Static Depth to Water 13.14 ft before develop feet below M.P.

Pumping Depth to Water 33.0 feet below M.P.

Pumping Duration 0.33 hours

Yield NA gpm

Date 9/2/92

Specific Capacity NA gpm/ft

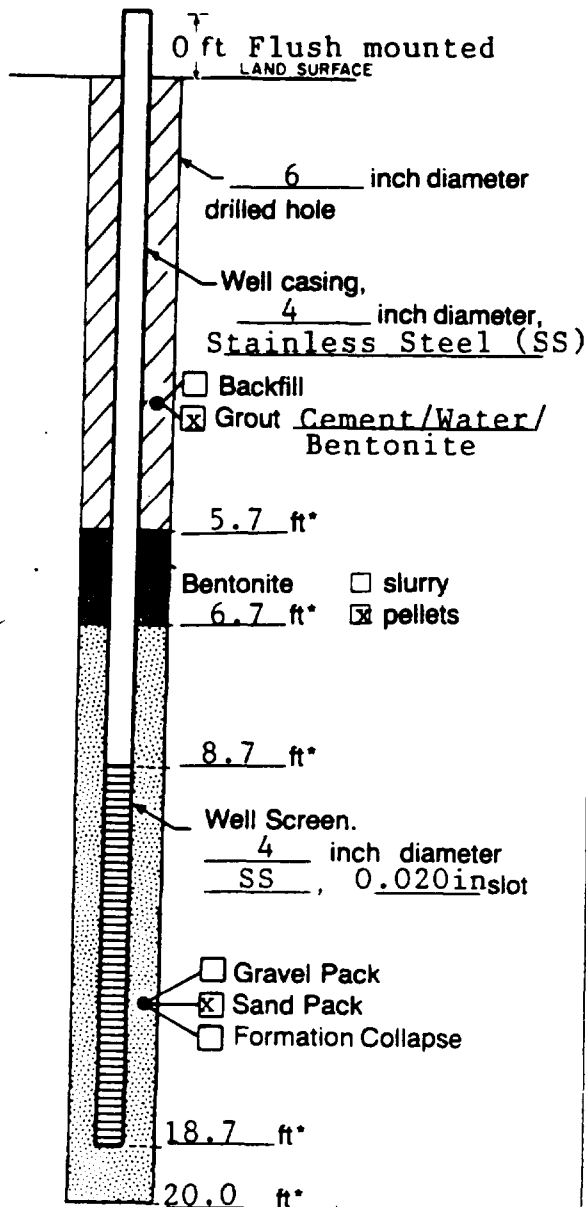
Well Purpose Monitoring well

Remarks 6-inch hollow stem auger from land surface to 5.5 feet. Bedrock at 5.0 feet.
3-inch diamond coring from 5.5 to 35.0 feet.
10-inch air hammer from 3.7 to 37.0 feet.
Borehole cave in up to 34.3 feet.

Prepared by Wanda L. Morales

TUT 002 1439

WELL CONSTRUCTION LOG



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project TEIC/PR01301 Well MW-9S

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. _____

Land-Surface Elevation 162.47 feet msl

and Datum 162.37 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) September 14, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid _____

Development Technique(s) and Date(s)

Centrifugal pump. Flushed well with water
to facilitate development; 9/15/92.

Fluid Loss During Drilling NA gallons

Water Removed During Development 20 gallons

Static Depth to Water 13.34ft before develop feet below M.P.

Pumping Depth to Water 18.0 feet below M.P.

Pumping Duration 0.20 hours

Yield NA gpm Date 9/15/92

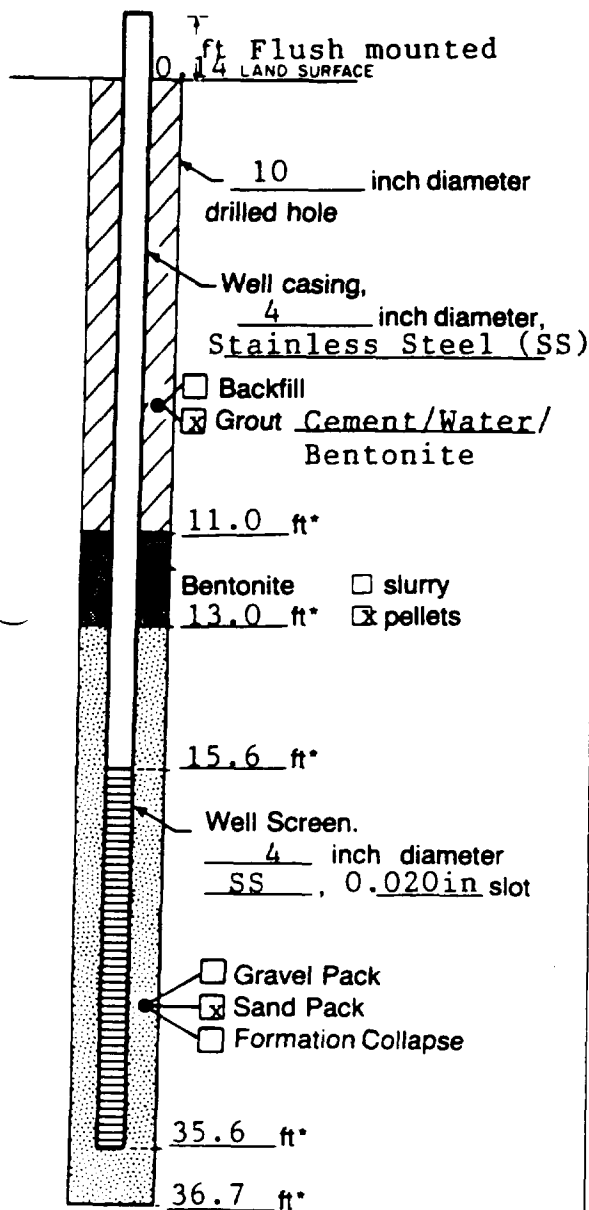
Specific Capacity NA gpm/ft

Well Purpose Monitoring well

Remarks 10-inch air hammer from land surface
to 20.0 feet.
Borehole cave in from 20.0 up to
18.7 feet. Bedrock located approximately
at 5.0 feet.

Prepared by Rubén Ponciano

WELL CONSTRUCTION LOG



Project TEIC/PR01301 Well MW-10

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. _____

Land-Surface Elevation 161.36 feet msl

and Datum 161.50 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) August 20, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid _____

Development Technique(s) and Date(s)

Centrifugal pump. Flushed well with water
to facilitate development; 9/2/92.

Fluid Loss During Drilling NA gallons

Water Removed During Development 40.0 gallons

Static Depth to Water 20.80ft before develop feet below M.P.

Pumping Depth to Water 34.0 feet below M.P.

Pumping Duration 0.3 hours

Yield NA gpm Date 9/2/92

Specific Capacity NA gpm/ft

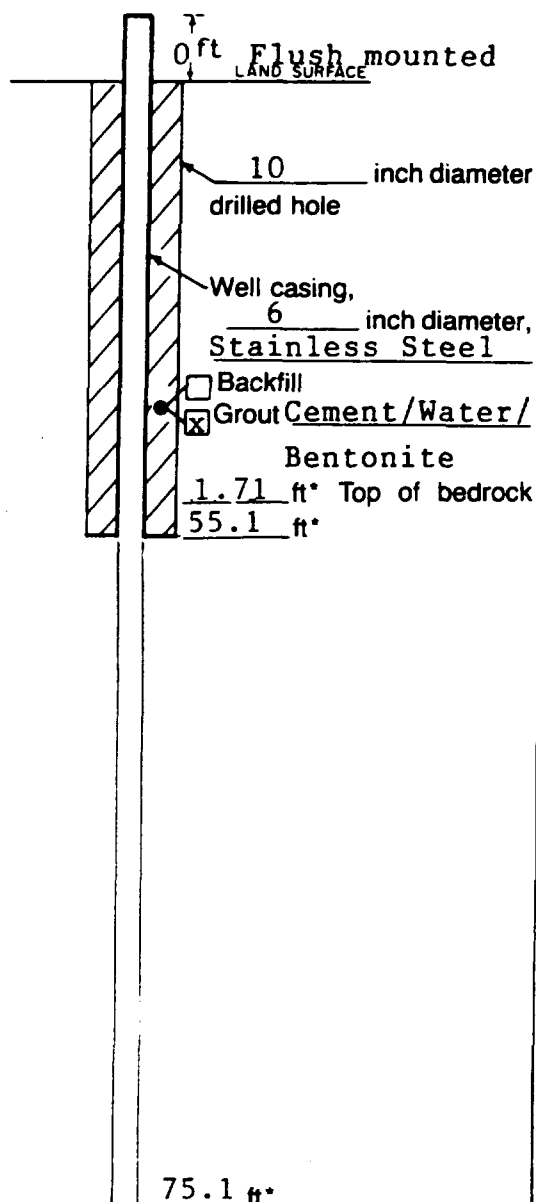
Well Purpose Monitoring well

Remarks 6-inch hollow stem auger from land
surface to 3.0 feet. (Bedrock at 2.9 feet).
10-inch air hammer from land surface to
36.7 feet.

Prepared by Wanda I. Morales

WELL CONSTRUCTION LOG

(BEDROCK)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

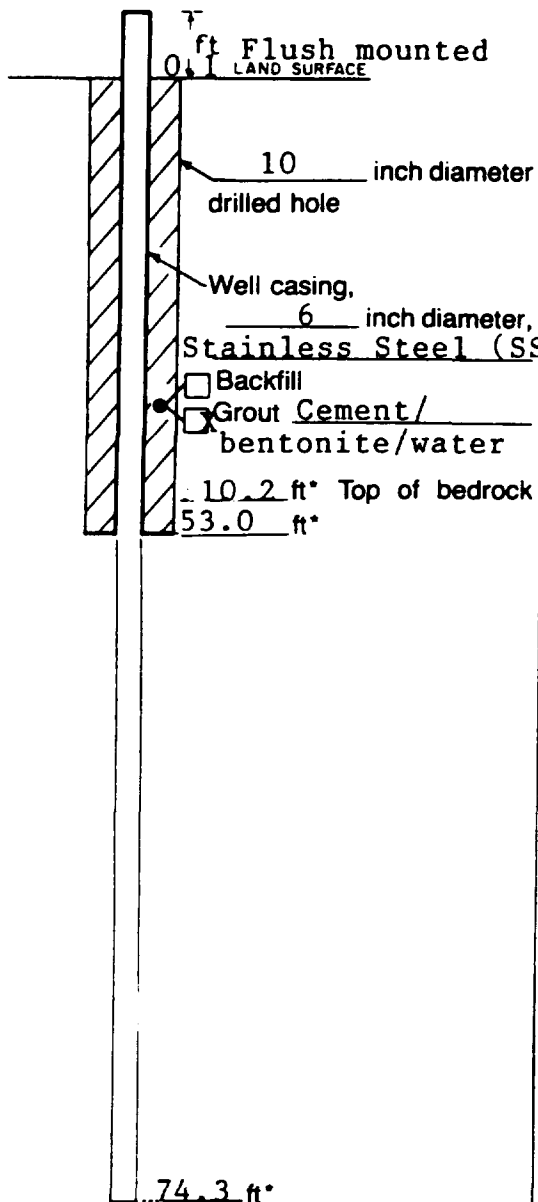
*Depth Below Land Surface

Project TEIC/PRO1301 Well MW-10D
 Town/City Anna's Retreat/Tutu
 County St. Thomas State USVI
 Permit No. _____
 Land-Surface Elevation 161.52 feet msl
 and Datum 161.38 feet msl ☒ Surveyed
☐ Estimated
 Installation Date(s) August 17, 18 & 19, 1992
 Drilling Method Hollow Stem Auger & Air Hammer
 Drilling Contractor Soil Tech
 Drilling Fluid Water when diamond coring was performed.
 Development Technique(s) and Date(s)
Centrifugal pump. Flushed well with water to facilitate development; 9/2/92.
 Fluid Loss During Drilling NA gallons
 Water Removed During Development 240 gallons
 Static Depth to Water 20.20ft before develop feet below M.P.
 Pumping Depth to Water 74.0 feet below M.P.
 Pumping Duration 0.33 hours
 Yield NA gpm Date 9/2/92
 Specific Capacity NA gpm/ft
 Well Purpose Monitoring well
 Fracture Zones _____

Remarks 6-inch hollow stem auger from land surface to 1.71 feet (Top of bedrock).
3-inch diamond coring from 1.71 to 75.0 feet.
10-inch air hammer from 2.0 to 56.0 feet.
6-inch casing installed at 55.1 feet.
5.5-inch air hammer from 55.1 to 75.1 feet.

Prepared by Wanda I. Morales

WELL CONSTRUCTION LOG (BEDROCK)



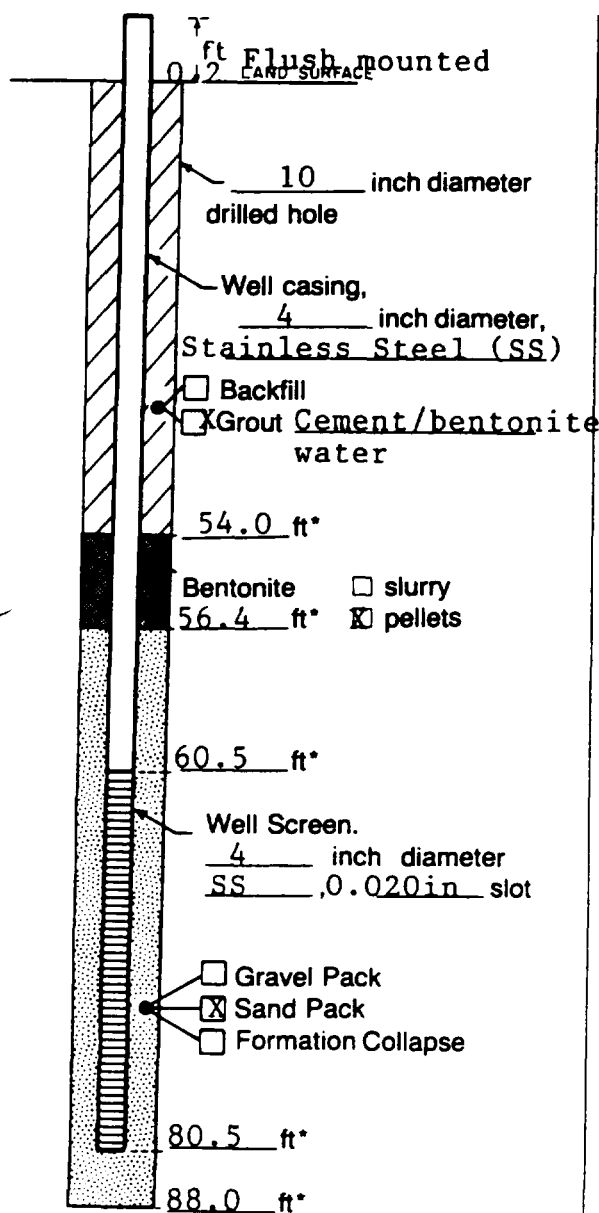
Measuring Point is Top of
Well Casing Unless Otherwise
Noted.

*Depth Below Land Surface

Project TEIC/Tutu PR01301 Well MW-11D
 Town/City Anna's Retreat /Tutu
 County St. Thomas State USVI
 Permit No. _____
 Land-Surface Elevation 153.11 feet msl
 and Datum 153.22 feet msl ☒ Surveyed
☐ Estimated
 Installation Date(s) July 16, 17, 20, 1992
 Drilling Method Hollow Stem Auger & Air Hammer
 Drilling Contractor Soil Tech
 Drilling Fluid Water when diamond coring was performed.
 Development Technique(s) and Date(s)
Centrifugal pump. Flushed well with water to
facilitate development; 9/2/92.
 Fluid Loss During Drilling NA gallons
 Water Removed During Development 84 gallons
 Static Depth to Water 17.20 before develop feet below M.P.
 Pumping Depth to Water 73.0 feet below M.P.
 Pumping Duration 0.43 hours
 Yield NA gpm Date 9/2/92
 Specific Capacity NA gpm/ft
 Well Purpose Monitoring
 Fracture Zones _____
 Remarks 6-inch hollow stem auger from land surface
to 11.0 feet. (Top of bedrock approx. 10.2 feet)
3-inch diamond coring from 10.2 to 75.0 feet.
10-inch air hammer from 5.0 to 53.5 feet.
6-inch casing installed at 53.0 feet.
5.5-inch air hammer from 53.0 to 74.3 feet.

Prepared by Wanda I. Morales

WELL CONSTRUCTION LOG



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project TEIC/Tutu PR01301 Well MW-12D
Town/City Anna's Retreat/Tutu
County St. Thomas State USVI
Permit No. _____
Land-Surface Elevation 161.58 feet msl
and Datum 161.81 feet msl ☒ Surveyed
☐ Estimated
Installation Date(s) July 23, 1992
Drilling Method Hollow Stem Auger & Air Hammer
Drilling Contractor Soil Tech
Drilling Fluid Water when diamond coring was perform

Development Technique(s) and Date(s)
Centrifugal pump. Flushed well with water to
facilitate development; 9/1/92.

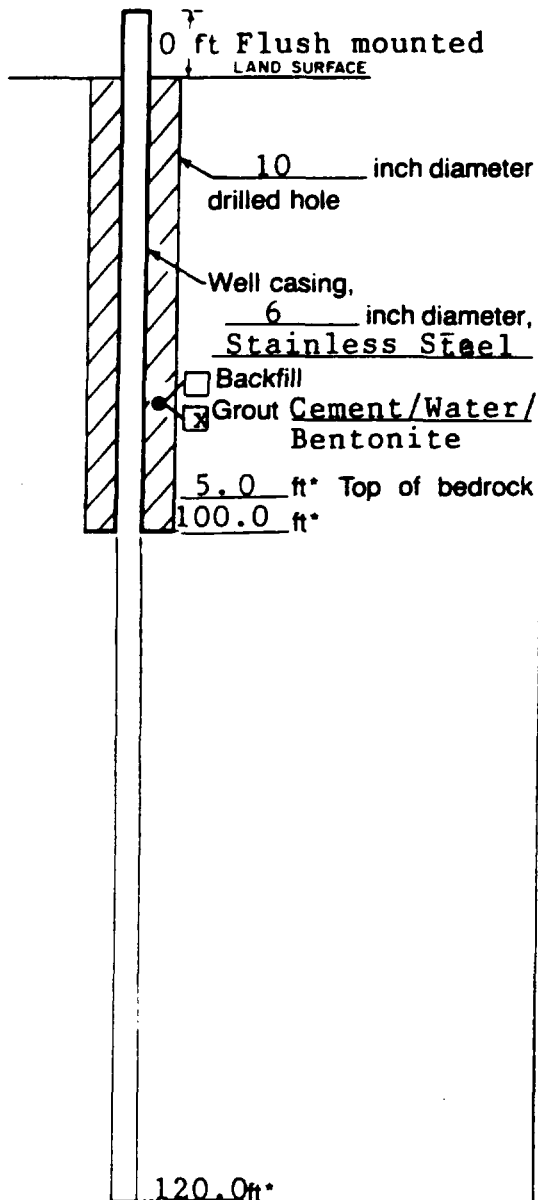
Fluid Loss During Drilling NA gallons
Water Removed During Development 76 gallons
Static Depth to Water 26.0 before develop. feet below M.P.
Pumping Depth to Water 79.0 feet below M.P.
Pumping Duration 1.1 hours
Yield NA gpm Date 9/1/92
Specific Capacity NA gpm/ft
Well Purpose Monitoring well

Remarks 6-inch hollow stem auger from land
surface to 5.9 feet (top of bedrock).
3-inch diamond coring from 5.9 to 75.0 feet.
10-inch air hammer from 3.9 to 88.0 feet.

Prepared by Wanda I. Morales

WELL CONSTRUCTION LOG

(BEDROCK)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project TEIC/PR01301 Well MW-13D
Town/City Anna's Retreat/Tutu
County St. Thomas State USVI
Permit No. _____
Land-Surface Elevation 236.67 feet msl
and Datum 236.60 feet msl ☒ Surveyed
☐ Estimated
Installation Date(s) July 9, 13, & 15, 1992
Drilling Method Hollow Stem Auger & Air Hammer
Drilling Contractor Soil Tech
Drilling Fluid Water when diamond coring was performed

Development Technique(s) and Date(s)
Submersible pump. Flushed well with water to facilitate development; 9/3/92.

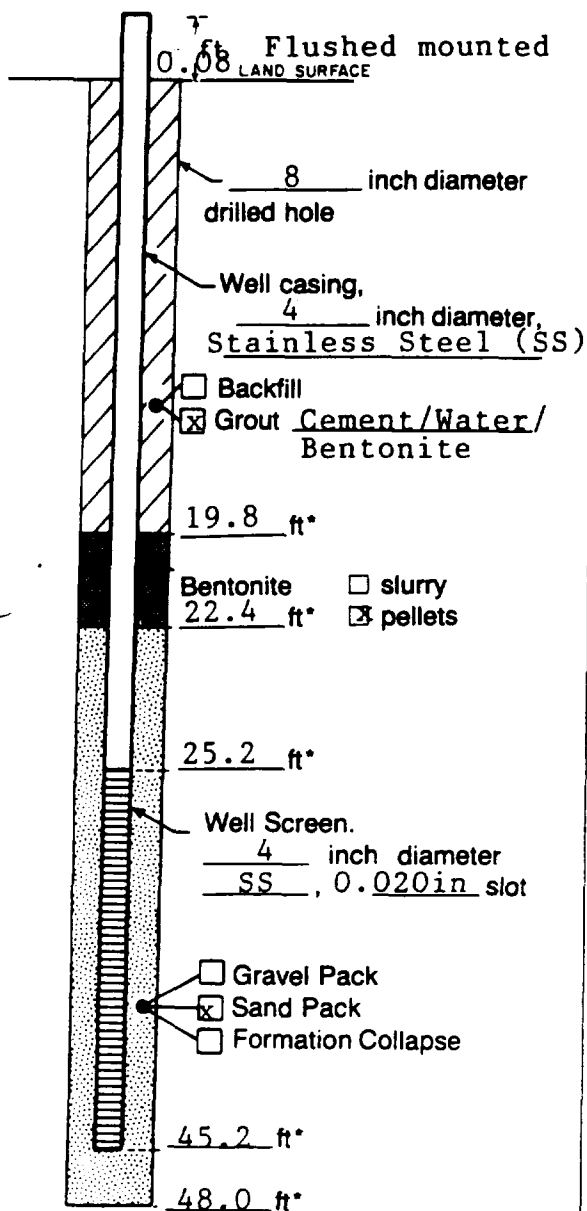
Fluid Loss During Drilling NA gallons
Water Removed During Development 150 gallons
Static Depth to Water 57.60ft before develop feet below M.P.
Pumping Depth to Water 106 feet below M.P.
Pumping Duration 0.42 hours
Yield NA gpm Date 9/3/92
Specific Capacity NA gpm/ft
Well Purpose Monitoring well
Fracture Zones _____

Remarks 6-inch hollow stem auger from land surface to 5.3 feet. (Bedrock at 5.0 feet).
3-inch diamond coring from 4.6 to 120 feet.
10-inch air hammer from land surface to 100.5 feet.
5.5-inch air hammer from 100 to 120.3 feet.

Prepared by _____

TUT 002 1445

WELL CONSTRUCTION LOG



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project TEIC/PR01301 Well MW-14

Town/City Anna's Retreat/Tutu

County St. Thomas State USVI

Permit No. _____

Land-Surface Elevation 196.04 feet msl

and Datum 196.12 feet msl ☒ Surveyed

☐ Estimated

Installation Date(s) July 2, 1992

Drilling Method Hollow Stem Auger & Air Hammer

Drilling Contractor Soil Tech

Drilling Fluid _____

Development Technique(s) and Date(s)

Centrifugal pump. Flushed well with water to facilitate development; 8/31/92.

Fluid Loss During Drilling NA gallons

Water Removed During Development 108 gallons

Static Depth to Water 28.40ft before develop feet below M.P.

Pumping Depth to Water 43.0 feet below M.P.

Pumping Duration 0.55 hours

Yield NA gpm Date 8/31/92

Specific Capacity NA gpm/ft

Well Purpose Monitoring well

Remarks 6-inch hollow stem auger from land surface to 3.0 feet. (top of bedrock).
7.5-inch air hammer from land surface to 48.0 feet.

Prepared by Wanda I. Morales

TUT 002 1446

APPENDIX G
WATER SAMPLING LOGS

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>			
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>			
Site/Well No.	<u>Esso Tap</u>	Coded/ Replicate No.	<u>None</u>	Date
Weather	<u>Partly Cloudy</u>	Time Sampling Began	<u>10:40 am</u>	Time Sampling Completed
				<u>10/07/92</u>
				<u>12:00 pm</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Faucet at Esso.</u>		
Height of MP Above Land Surface	<u>NA</u>	MP Elevation	<u>NA</u>
Total Sounded Depth of Well Below MP	<u>NA</u>	Water-Level Elevation	<u>NA</u>
Depth to Water Below MP	<u>NA</u>	Diameter of Casing	<u>NA</u>
Water Column in Well	<u>NA</u>	Gallons Pumped Prior to Sampling	<u>NA</u>
Gallons per Foot	<u>NA</u>	Sampling Pump Intake Setting (feet below land surface)	<u>NA</u>
Gallons in Well	<u>NA</u>		

Evacuation Method Not applicable; Faucet valve was opened for 10 minutes before sampling.

SAMPLING DATA/FIELD PARAMETERS

			TIME (ET from Start Pumping)		
Color	Odor	Field			
<u>Clear</u>	<u>None</u>	Parameters	<u>10:42 am</u>	<u>12:05 pm</u>	
		pH	<u>7.56</u>	<u>7.55</u>	
		Temp. (°C)	<u>29.2</u>	<u>29.3</u>	
		Spec. Cond. (umhos)	<u>664</u>	<u>626</u>	
		PID (ppm)	<u>0</u>	<u>0</u>	

Sampling Method and Material NA

Constituents Sampled	Container Description	Preservative
	From Lab __X__ or G&M ____	
VOCs	<u>5-40ml vials</u>	<u>HCL pH-1</u>
TCL BNAs	<u>2-500 ml amber glass</u>	<u>None</u>
TAL Total/Dissolved Metals	<u>1-500 ml plastic</u>	<u>HNO3</u>
TAL Cyanide	<u>1-500 ml plastic</u>	<u>NaOH</u>
TPH	<u>2-500 ml amber glass</u>	<u>HCL</u>

Remarks _____

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

WELL CASING VOLUMES				
GAL./FT.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

Tutu more data(Tapack)

TUT 002 1448

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>		
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>		
Site/Well No.	<u>MW-1*</u>	Coded/ Replicate No.	<u>None</u>
Weather	<u>Clear, 85° F</u>	Time Sampling Began	<u>8:54 am</u>
		Date Time Sampling Completed	<u>10/6/92</u> <u>10:15 am</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing.</u>		
Height of MP Above Land Surface	<u>0.04 ft</u>	MP Elevation	<u>195.08 ft</u>
Total Sounded Depth of Well Below MP	<u>43.00 ft</u>	Water-Level Elevation	<u>166.29 ft</u>
Depth to Water Below MP	<u>28.79 ft</u>	Diameter of Casing	<u>4-inch</u>
Water Column in Well	<u>14.21 ft</u>	Gallons Pumped Prior to Sampling	<u>28</u>
Gallons per Foot	<u>0.65</u>	Sampling Pump Intake Setting (feet below land surface)	<u>41.0 ft</u>
Gallons in Well	<u>9.24</u>		
Evacuation Method	<u>Submersible Pump Pump start - 8:54 am Pump off - 9:25 am</u>		

SAMPLING DATA/FIELD PARAMETERS

			TIME (ET from Start Pumping)				
Color	Odor	Field	Parameters	9:02am (10 gal.)	9:12 am (10 gal.)	9:22 am (10 gal.)	After sampling
Clear	None		pH	7.03	7.00	7.02	7.00
			Temp. (°C)	31.1	31.3	32.1	29.5
			Spec. Cond. (umhos)	1330	1335	1333	133
			PID (ppm)	0	0	0	0

Sampling Method and Material Teflon Bailor

Constituents Sampled	Container Description From Lab <u>X</u> or G&M _____	Preservative
VOCs	5-40ml vials	HCL pH-1
TCL BNAs	2-500 ml amber glass	None
TAL Total/Dissolved Metals	1-500 ml plastic	HNO3
TAL Cyanide	1-500 ml plastic	NaOH
TPH	2-500 ml amber glass	HCL

Remarks Well went dry. * Well was resampled due to lost sample containers during shipment on 10/2/92.
Ground-water sample was collected according to the procedure specified in Appendix G, Section 1.6.2. of Work Plan.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

WELL CASING VOLUMES				
GAL./FT.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

Two well depths - 18.03

TUT 002 1449

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>				
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>				
Site/Well No.	<u>MW-1D</u>	Coded/ Replicate No.	<u>None</u>	Date	<u>10/2/92</u>
Weather	<u>Clear, 88° F</u>	Time Sampling Began	<u>8:37 am</u>	Time Sampling Completed	<u>10:00 am</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing</u>				
Height of MP Below Land Surface	<u>0.003 ft</u>	MP Elevation	<u>195.14 ft</u>		
Total Sounded Depth of Well Below MP	<u>90.0 ft</u>	Water Level Elevation	<u>165.52 ft</u>		
Depth to Water Below MP	<u>29.62 ft</u>	Diameter of Casing	<u>6-inch</u>		
Water Column in Well	<u>60.38 ft</u>	Gallons Pumped Prior to Sampling	<u>120</u>		
Gallons per Foot	<u>1.47</u>	Sampling Pump Intake Setting (feet below land surface)	<u>85.0 ft</u>		
Gallons in Well	<u>88.76</u>				
Evacuation Method	<u>Submersible Pump Pump start -- 8:37 am Pump off -- 8:52 am</u>				

SAMPLING DATA/FIELD PARAMETERS

		TIME (ET from Start Pumping)			
Color	Odor	Field	Parameters	8:49 am (120 gal.)	After Sampling
<u>Clear</u>	<u>None</u>		pH	<u>10.56</u>	<u>8.06</u>
			Temp. (°C)	<u>29.5</u>	<u>29.3</u>
			Spec. Cond. (umhos)	<u>2780</u>	<u>741</u>
			PID (ppm)	<u>0</u>	<u>0</u>

Sampling Method and Material Teflon Bailer

Constituents Sampled	Container Description From Lab __X__ or G&M _____	Preservative
VOCs	<u>5-40ml vials</u>	<u>HCL pH-1</u>
TCL BNAs	<u>2-500 ml amber glass</u>	<u>None</u>
TAL Total/Dissolved Metals	<u>1-500 ml plastic</u>	<u>HNO3</u>
TAL Cyanide	<u>1-500 ml plastic</u>	<u>NaOH</u>
TPH	<u>2-500 ml amber glass</u>	<u>HCL</u>

Remarks Well went dry. Ground-water was sampled according to the procedure specified in Appendix G, Section 1.6.2 of Work Plan.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

		WELL CASING VOLUMES			
GAL./FT.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47	

Tutu made 10/2/92 (MW-1D.ad)

TUT 002 1450

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>				
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>				
Site/Well No.	<u>MW-2</u>	Coded/ Replicate No.	<u>None</u>	Date	<u>9/30/92</u>
Weather	<u>Partly cloudy, 90° F</u>	Time Sampling Began	<u>8:28 am</u>	Time Sampling Completed	<u>10:15 am</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing.</u>		
Height of MP Below Land Surface	<u>0.16 ft</u>	MP Elevation	<u>178.15 ft</u>
Total Sounded Depth of Well Below MP	<u>26.9 ft</u>	Water-Level Elevation	<u>165.51 ft</u>
Depth to Water Below MP	<u>12.64 ft</u>	Diameter of Casing	<u>4-inch</u>
Water Column in Well	<u>14.26 ft</u>	Gallons Pumped	
Gallons per Foot	<u>0.65</u>	Prior to Sampling	<u>37</u>
Gallons in Well	<u>9.27</u>	Sampling Pump Intake Setting (feet below land surface)	<u>14.0 ft</u>
Evacuation Method	<u>Centrifugal Pump</u>	Pump start - <u>8:28 am</u>	Pump off - <u>8:51 am</u>

SAMPLING DATA/FIELD PARAMETERS

			TIME (ET from Start Pumping)				
Color	Odor	Field	Parameters	8:37 am (12 gal.)	8:39 am (10.5 gal.)	8:49 am (15 gal.)	After Sampling
Clear	None		pH	6.86	6.98	6.96	6.85
			Temp. (°C)	30.1	24.8	30.0	30.7
			Spec. Cond. (umhos)	1321	1317	1314	1293
			PID (ppm)	0	0	0	0

Sampling Method and Material: Teflon Bailor

Constituents Sampled	Container Description From Lab <u>X</u> or G&M _____	Preservative
VOCs	5-40ml vials	HCL pH-1
TCL BNAs	2-500 ml amber glass	None
TAL Total/Dissolved Metals	1-500 ml plastic	HNO3
TAL Cyanide	1-500 ml plastic	NaOH
TPH	2-500 ml amber glass	HCL

Remarks: _____

Sampling Personnel: C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

GAL/FT.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

Tutu well distillate - 2.64

TUT 002 1451

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>				
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>				
Site/Well No.	<u>MW-3</u>	Coded/ Replicate No.	<u>None</u>	Date	<u>9/30/92</u>
Weather	<u>Partly cloudy, 90° F</u>	Time Sampling Began	<u>1:14 pm</u>	Time Sampling Completed	<u>2:15 pm</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing.</u>	
Height of MP Below Land Surface	<u>0.01 ft</u>	MP Elevation <u>181.84 ft</u>
Total Sounded Depth of Well Below MP	<u>30.40 ft</u>	Water - Level Elevation <u>185.52 ft</u>
Depth to Water Below MP	<u>16.32 ft</u>	Diameter of Casing <u>4 - inch</u>
Water Column in Well	<u>14.08 ft</u>	Gallons Pumped Prior to Sampling <u>30</u>
Gallons per Foot	<u>0.65</u>	Sampling Pump Intake Setting (feet below land surface) <u>20.0 ft</u>
Gallons in Well	<u>9.15</u>	

Evacuation Method Centrifugal Pump Pump start - 1:14 pm Pump off - 1:32 pm

SAMPLING DATA/FIELD PARAMETERS

		TIME (ET from Start Pumping)			
Color	Odor	Field	Parameters	1:21 pm (10 gal.)	1:26 pm (10 gal.)
Clear	Slight		pH	<u>6.79</u>	<u>6.80</u>
			Temp. (°C)	<u>30.6</u>	<u>29.8</u>
			Spec. Cond. (umhos)	<u>1233</u>	<u>1241</u>
			PID (ppm)	<u>2.6</u>	<u>2.8</u>
				<u>1:31 pm (10 gal.)</u>	<u>After Sampling</u>
				<u>6.83</u>	<u>6.74</u>
				<u>30.1</u>	<u>30.1</u>
				<u>1252</u>	<u>1495</u>
				<u>22</u>	<u>2.9</u>

Sampling Method and Material Teflon Bailor

Constituents Sampled	Container Description From Lab <u>X</u> or G&M _____	Preservative
VOCs	<u>5-40ml vials</u>	<u>HCL pH-1</u>
TCL BNAs	<u>2-500 ml amber glass</u>	<u>None</u>
TAL Total/Dissolved Metals	<u>1-500 ml plastic</u>	<u>HNO3</u>
TAL Cyanide	<u>1-500 ml plastic</u>	<u>NaOH</u>
TPH	<u>2-500 ml amber glass</u>	<u>HCL</u>

Remarks Slight product odor.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

	WELL CASING VOLUMES
GAL./FT.	1 - 1/4" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65
	1 - 1/2" = 0.09 2 - 1/2" = 0.26 3 - 1/2" = 0.50 6" = 1.47

Total well depth 30.40 ft

TUT 002 1452

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>				
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>				
Site/Well No.	<u>MW-4</u>	Coded/ Replicate No.	<u>None</u>	Date	<u>9/30/92</u>
Weather	<u>Partly cloudy, 90° F</u>	Time Sampling Began	<u>11:31 am</u>	Time Sampling Completed	<u>1:00 pm</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing.</u>		
Height of MP Below Land Surface	<u>0.03 ft</u>	MP Elevation	<u>175.66 ft</u>
Total Sounded Depth of Well Below MP	<u>27.00 ft</u>	Water Level Elevation	<u>165.04 ft</u>
Depth to Water Below MP	<u>10.62 ft</u>	Diameter of Casing	<u>4-inch</u>
Water Column in Well	<u>16.38 ft</u>	Gallons Pumped Prior to Sampling	<u>38</u>
Gallons per Foot	<u>0.65</u>	Sampling Pump Intake Setting (feet below land surface)	<u>16.0 ft</u>
Gallons in Well	<u>10.65</u>		
Evacuation Method	<u>Centrifugal Pump Pump start - 11:31 am Pump off - 11:58 am</u>		

SAMPLING DATA/FIELD PARAMETERS

			TIME (ET from Start Pumping)				
Color	Odor	Field	Parameters	11:36 am (10 gal.)	11:46 am (10 gal.)	11:56 am (18 gal.)	After Sampling
Clear	None		pH	6.94	7.01	7.03	7.09
			Temp. (°C)	33.1	32.8	32.7	31.9
			Spec. Cond. (umhos)	1371	1340	1358	1456
			PID (ppm)	2.76	1.0	2.40	0

Sampling Method and Material Teflon Bailor

Constituents Sampled	Container Description	Preservative
VOCs	5-40ml vials	HCL pH-1
TCL BNAs	2-500 ml amber glass	None
TAL Total/Dissolved Metals	1-500 ml plastic	HNO3
TAL Cyanide	1-500 ml plastic	NaOH
TPH	2-500 ml amber glass	HCL

Remarks _____

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

	WELL CASING VOLUMES			
GAL/FT.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

Tutu mark 4000/W - 4.0x3

TUT 002 1453

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>		
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>		
Site/Well No.	<u>MW-4D</u>	Coded/ Replicate No.	<u>None</u>
Weather	<u>Partly cloudy</u>	Time Sampling Began	<u>12:11 pm</u>
		Date Time Sampling Completed	<u>10/5/92</u> <u>2:00 pm</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing.</u>		
Height of MP Above Land Surface	<u>0.3 ft</u>	MP Elevation	<u>176.02 ft</u>
Total Sounded Depth of Well Below MP	<u>71.0 ft</u>	Water-Level Elevation	<u>164.92 ft</u>
Depth to Water Below MP	<u>11.10 ft</u>	Diameter of Casing	<u>6-inch</u>
Water Column in Well	<u>59.90 ft</u>	Gallons Pumped Prior to Sampling	<u>264</u>
Gallons per Foot	<u>1.47</u>	Sampling Pump Intake Setting (feet below land surface)	<u>20.0 ft</u>
Gallons in Well	<u>88.05</u>		
Evacuation Method	<u>Centrifugal Pump Pump start - 12:11 pm Pump off - 1:47 pm</u>		

SAMPLING DATA/FIELD PARAMETERS

			TIME (ET from Start Pumping)				
Color	Odor	Field	Parameters	12:41 pm (90 gal.)	1:15 pm (78 gal.)	1:47 pm (96 gal.)	After Sampling
Clear	Slight		pH	7.00	7.00	7.00	7.01
			Temp. (°C)	30.8	30.0	30.5	30.5
			Spec. Cond. (umhos)	1471	1472	1476	1473
			PID (ppm)	0	90.7	52	68

Sampling Method and Material Teflon Baller

Constituents Sampled	Container Description From Lab _X_ or G&M _____	Preservative
VOCs	5-40ml vials	HCL pH-1
TCL BNAs	2-500 ml amber glass	None
TAL Total/Dissolved Metals	1-500 ml plastic	HNO3
TAL Cyanide	1-500 ml plastic	NaOH
TPH	2-500 ml amber glass	HCL

Remarks Trace of product observed in this well. Slight petroleum odor.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

	WELL CASING VOLUMES			
GAL./FT.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

Tutu wells dtd/10/5/92 - 4D.mh3

TUT 002 1454

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>				
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>				
Site/Well No.	<u>MW-4D*</u>	Coded/ Replicate No.	<u>None</u>	Date	<u>10/7/92</u>
Weather	<u>Clear, 82° F</u>	Time Sampling Began	<u>7:55 am</u>	Time Sampling Completed	<u>9:30 am</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing.</u>	
Height of MP Above Land Surface	<u>0.24 ft</u>	MP Elevation <u>176.23 ft</u>
Total Sounded Depth of Well Below MP	<u>71.0 ft</u>	Water-Level Elevation <u>165.15 ft</u>
Depth to Water Below MP	<u>11.08 ft</u>	Diameter of Casing <u>6-inch</u>
Water Column in Well	<u>59.92 ft</u>	Gallons Pumped Prior to Sampling <u>280</u>
Gallons per Foot	<u>1.47</u>	Sampling Pump Intake Setting (feet below land surface) <u>66.0 ft</u>
Gallons in Well	<u>88.08</u>	
Evacuation Method	<u>Submersible Pump Pump start - 7:55 am Pump off - 8:30 am</u>	

SAMPLING DATA/FIELD PARAMETERS

		TIME (ET from Start Pumping)			
Color	Odor	Field	Parameters	8:06 am (88 gal.)	8:17 am (88 gal.)
Clear	Slight		pH	7.15	7.17
			Temp. (°C)	28.6	28.6
			Spec. Cond. (umhos)	1477	1474
			PID (ppm)	0	0
				8:28 am (104 gal.)	
				7.16	
				28.8	
				1474	
				0	

Sampling Method and Material Teflon Bailor

Constituents Sampled	Container Description From Lab <u>X</u> or G&M _____	Preservative
<u>VOCs</u>	<u>5-40ml vials</u>	<u>HCL pH-1</u>

Remarks * Well was resampled for VOCs due to air bubbles in original sample container.
Trace of product observed in this well.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

WELL CASING VOLUMES				
GAL./FT.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

Tutu work sheet MW-4DR.msk

TUT 002 1455

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>		
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>		
Site/Well No.	<u>MW-5</u>	Coded/ Replicate No.	<u>None</u>
Weather	<u>Clear, 85° F</u>	Time Sampling Began	<u>8:59 am</u>
		Date	<u>10/1/92</u>
		Time Sampling Completed	<u>9:25 am</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing</u>		
Height of MP Below Land Surface	<u>0.16 ft</u>	MP Elevation	<u>187.09 ft</u>
Total Sounded Depth of Well Below MP	<u>39.0 ft</u>	Water Level Elevation	<u>164.49 ft</u>
Depth to Water Below MP	<u>22.60 ft</u>	Diameter of Casing	<u>4-inch</u>
Water Column in Well	<u>16.40 ft</u>	Gallons Pumped Prior to Sampling	<u>33</u>
Gallons per Foot	<u>0.85</u>	Sampling Pump Intake Setting (feet below land surface)	<u>33.0 ft</u>
Gallons in Well	<u>10.66</u>		
Evacuation Method	<u>Centrifugal Pump Pump start - 8:59 am Pump off - 9:25 am</u>		

SAMPLING DATA/FIELD PARAMETERS

		TIME (ET from Start Pumping)
Color	Odor	Field
Clear	Strong odor	Parameters
		9:07 am (10 gal.)
		9:14 am (10.5 gal.)
		9:22 am (12 gal.)
		After Sampling
		pH
		6.80
		7.00
		7.00
		7.00
		Temp. (°C)
		29.6
		29.6
		30.02
		29.2
		Spec. Cond. (umhos)
		1294
		1284
		1262
		1149
		PID (ppm)
		9.999
		<2000
		<2000
		2000

Sampling Method and Material Teflon Bailor

Constituents Sampled	Container Description	Preservative
	From Lab_X____ or G&M_____	
VOCs	5-40ml vials	HCL pH-1
TCL BNAs	2-500 ml amber glass	None
TAL Total/Dissolved Metals	1-500 ml plastic	HNO3
TAL Cyanide	1-500 ml plastic	NaOH
TPH	2-500 ml amber glass	HCL

Remarks Trace of product observed in this well. Strong gasoline odor.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

	WELL CASING VOLUMES
GAL/FT.	1-1/4" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65
	1-1/2" = 0.09 2-1/2" = 0.26 3-1/2" = 0.50 6" = 1.47

Tutu used distillate - 10/1/92

TUT 002 1456

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>		
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>		
Site/Well No.	<u>MW - 6R</u>	Coded/ Replicate No.	<u>None</u>
Weather	<u>Partly cloudy, 90° F.</u>	Time Sampling Began	<u>11:15 am</u>
		Date	<u>9/29/92</u>
		Time Sampling Completed	<u>1:15 pm</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing.</u>		
Height of MP Below Land Surface	<u>0.3 ft</u>	MP Elevation	<u>171.17 ft</u>
Total Sounded Depth of Well Below MP	<u>22.95 ft</u>	Water - Level Elevation	<u>163.67 ft</u>
Depth to Water Below MP	<u>7.50 ft</u>	Diameter of Casing	<u>4 - inch</u>
Water Column in Well	<u>15.45 ft</u>	Gallons Pumped Prior to Sampling	<u>37</u>
Gallons per Foot	<u>0.65</u>	Sampling Pump Intake Setting (feet below land surface)	<u>11.0 ft</u>
Gallons in Well	<u>10.04</u>		
Evacuation Method	<u>Centrifugal Pump Pump start - 11:15 am Pump off - 11:28 am</u>		

SAMPLING DATA/FIELD PARAMETERS

		TIME (ET from Start Pumping)			
Color	Odor	Field	Parameters	11:18 am (9 gal.)	11:21 am (9 gal.)
Clear	None		pH	<u>6.88</u>	<u>6.83</u>
			Temp. (°C)	<u>31.2</u>	<u>30.2</u>
			Spec. Cond. (umhos)	<u>1283</u>	<u>1309</u>
			PID (ppm)	<u>94</u>	<u>0</u>
					<u>0</u>

Sampling Method and Material Teflon Bailor

Constituents Sampled	Container Description From Lab <u>X</u> or G&M _____	Preservative
VOCs	5 - 40ml vials	HCL pH - 1
TCL BNAs	2 - 500 ml amber glass	None
TAL Total/Dissolved Metals	1 - 500 ml plastic	HNO3
TAL Cyanide	1 - 500 ml plastic	NaOH
TPH	2 - 500 ml amber glass	HCL

Remarks _____

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

	WELL CASING VOLUMES	
GAL./FT.	1 - 1/4" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65	
	1 - 1/2" = 0.09 2 - 1/2" = 0.26 3 - 1/2" = 0.50 6" = 1.47	

Tutu work data MW - 6R, w33

TUT 002 1457

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>				
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>				
Site/Well No.	<u>MW-6D</u>	Coded/ Replicate No.	<u>None</u>	Date	<u>9/30/92</u>
Weather	<u>Partly cloudy, 90° F.</u>	Time Sampling Began	<u>10:12 am</u>	Time Sampling Completed	<u>11:20 am</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing.</u>	
Height of MP Below Land Surface	<u>0.25 ft</u>	MP Elevation <u>171.01 ft</u>
Total Sounded Depth of Well Below MP	<u>62.6 ft</u>	Water-Level Elevation <u>163.71 ft</u>
Depth to Water Below MP	<u>7.30 ft</u>	Diameter of Casing <u>6-inch</u>
Water Column in Well	<u>55.30 ft</u>	Gallons Pumped Prior to Sampling <u>270</u>
Gallons per Foot	<u>1.47</u>	Sampling Pump Intake Setting (feet below land surface) <u>10.0 ft</u>
Gallons in Well	<u>81.29</u>	
Evacuation Method	<u>Centrifugal Pump Pump start - 10:12 am Pump off - 11:11 am</u>	

SAMPLING DATA/FIELD PARAMETERS

		TIME (ET from Start Pumping)					
Color	Odor	Field	Parameters	10:29 am (77 gal.)	10:49 am (90 gal.)	11:09 am (103 gal.)	After Sampling
Clear	None		pH	6.50	6.70	6.78	7.74
			Temp. (°C)	29.4	29.8	29.9	31.8
			Spec. Cond. (umhos)	1450	1465	1465	1200
			PID (ppm)	0	0	0	0
Sampling Method and Material	<u>Teflon Bailor</u>						

Constituents Sampled	Container Description From Lab <u>X</u> or G&M _____	Preservative
VOCs	5-40ml vials	HCL pH-1
TCL BNAs	2-500 ml amber glass	None
TAL Total/Dissolved Metals	1-500 ml plastic	HNO3
TAL Cyanide	1-500 ml plastic	NaOH
TPH	2-500 ml amber glass	HCL

Remarks _____

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

	WELL CASING VOLUMES
GAL/FT.	1-1/4" = 0.06 2" = 0.16 3" = 0.37 4" = 0.65 1-1/2" = 0.09 2-1/2" = 0.26 3-1/2" = 0.50 6" = 1.47

Tutu was a desktop W - sD one.)

TUT 002 1458

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>			
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>			
Site/Well No.	<u>MW-7</u>	Coded/ Replicate No.	<u>None</u>	Date
Weather		Time Sampling Began	<u>11:32 am</u>	<u>10/05/92</u>
				Time Sampling Completed
				<u>12:30 pm</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing.</u>		
Height of MP Below Land Surface	<u>0.16 ft</u>	MP Elevation	<u>180.13 ft</u>
Total Sounded Depth of Well Below MP	<u>35.0 ft</u>	Water-Level Elevation	<u>163.37 ft</u>
Depth to Water Below MP	<u>16.76 ft</u>	Diameter of Casing	<u>4-inch</u>
Water Column in Well	<u>18.24 ft</u>	Gallons Pumped Prior to Sampling	<u>46</u>
Gallons per Foot	<u>0.65</u>	Sampling Pump Intake Setting (feet below land surface)	<u>20.0 ft</u>
Gallons in Well	<u>11.86</u>		
Evacuation Method	<u>Centrifugal Pump Pump start - 11:32 am Pump off - 11:50 am</u>		

SAMPLING DATA/FIELD PARAMETERS

			TIME (ET from Start Pumping)				
Color	Odor	Field	Parameters	11:38 am (10 gal.)	11:43 am (15 gal.)	11:48 am (21 gal.)	After Sampling
Clear	None		pH	7.05	7.05	7.12	7.05
			Temp. (°C)	30.3	29.5	29.5	Not measured
			Spec. Cond. (umhos)	1294	1288	1292	1289
			PID (ppm)	0	0	0	0
Sampling Method and Material	<u>Teflon Bailor</u>						

Constituents Sampled	Container Description From Lab <u>X</u> or G&M _____	Preservative
VOCs	5-40ml vials	HCL pH-1
TCL BNAs	2-500 ml amber glass	None
TAL Total/Dissolved Metals	1-500 ml plastic	HNO3
TAL Cyanide	1-500 ml plastic	NaOH
TPH	2-500 ml amber glass	HCL

Remarks _____

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

WELL CASING VOLUMES			
GAL./FT. 1 - 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
1 - 1/2" = 0.09	2 - 1/2" = 0.26	3 - 1/2" = 0.50	6" = 1.47

Tutu/PR01301 MW-7 (46)

TUT 002 1459

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>			
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>			
Site/Well No.	<u>MW-8</u>	Coded/ Replicate No.	<u>None</u>	Date
Weather	<u>Partly cloudy; 90° F.</u>	Time Sampling Began	<u>8:39 am</u>	Time Sampling Completed
				<u>9/29/92</u>
				<u>11:30 am</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing</u>		
Height of MP Below Land Surface	<u>0.08 ft</u>	MP Elevation	<u>167.54 ft</u>
Total Sounded Depth of Well Below MP	<u>25.56 ft</u>	Water-Level Elevation	<u>150.51 ft</u>
Depth to Water Below MP	<u>17.03 ft</u>	Diameter of Casing	<u>4-inch</u>
Water Column in Well	<u>8.53 ft</u>	Gallons Pumped Prior to Sampling	<u>12</u>
Gallons per Foot	<u>0.65</u>	Sampling Pump Intake Setting (feet below land surface)	<u>21.0 ft</u>
Gallons in Well	<u>5.54</u>		

Evacuation Method Centrifugal Pump Pump start - 8:39 am Pump off - 8:51 am

SAMPLING DATA/FIELD PARAMETERS

		TIME (ET from Start Pumping)
Color	Odor	Field
Clear	None	Parameters
		8:41 am
		8:48 am
		6.78
		6.88
		Temp. (°C)
		32.8
		32.2
		Spec. Cond. (umhos)
		1252
		1370
		PID (ppm)
		0
		0

Sampling Method and Material Teflon Bailor

Constituents Sampled	Container Description From Lab <u>X</u> or G&M	Preservative
VOCs	5-40ml vials	HCL pH-1
TCL BNAs	2-500 ml amber glass	None
TAL Total/Dissolved Metals	1-500 ml plastic	HNO3
TAL Cyanide	1-500 ml plastic	NaOH
TPH	2-500 ml amber glass	HCL

Remarks Well went dry. Ground-water sample was collected according to the procedure specified in Appendix G, Section 1.6.2 of Work Plan.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

	WELL CASING VOLUMES
GAL./FT.	1-V ₁ " = 0.06 2" = 0.16 3" = 0.37 4" = 0.65
	1-V ₂ " = 0.09 2-V ₂ " = 0.26 3-V ₂ " = 0.50 6" = 1.47

Tutu/PR01301 (MW-8) (4.10.92)

TUT 002 1460

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>				
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>				
Site/Well No.	<u>MW-9</u>	Coded/ Replicate No.	<u>None</u>	Date	<u>10/07/92</u>
Weather	<u>Partly cloudy; 85° F.</u>	Time Sampling Began	<u>9:05 am</u>	Time Sampling Completed	<u>10:30 am</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing.</u>	
Height of MP Below Land Surface	<u>0.06 ft</u>	MP Elevation <u>162.26 ft</u>
Total Sounded Depth of Well Below MP	<u>34.10 ft</u>	Water-Level Elevation <u>149.86 ft</u>
Depth to Water Below MP	<u>12.40 ft</u>	Diameter of Casing <u>4-inch</u>
Water Column in Well	<u>21.70 ft</u>	Gallons Pumped Prior to Sampling <u>46</u>
Gallons per Foot	<u>0.65</u>	Sampling Pump Intake Setting (feet below land surface) <u>32.0 ft</u>
Gallons in Well	<u>14.11</u>	
Evacuation Method	<u>Submersible Pump Pump start - 9:05 am Pump off - 9:38 am</u>	

SAMPLING DATA/FIELD PARAMETERS

			TIME (ET from Start Pumping)				
Color	Odor	Field	Parameters	9:12 am (14 gal.)	9:19 am (14 gal.)	9:30 am (16 gal.)	After Sampling
Grayish	Strong Odor		pH	7.15	7.12	7.14	7.16
			Temp. (°C)	33.2	28.88	32.2	31.2
			Spec. Cond. (umhos)	1386	1490	1486	1480
			PID (ppm)	<2000	800	780	680
Sampling Method and Material	<u>Teflon Bailor</u>						

Constituents Sampled	Container Description From Lab <u>X</u> or G&M _____	Preservative
VOCs	5-40ml vials	HCL pH-1
TCL BNAs	2-500 ml amber glass	None
TAL Total/Dissolved Metals	1-500 ml plastic	HNO3
TAL Cyanide	1-500 ml plastic	NaOH
TPH	2-500 ml amber glass	HCL

Remarks Strong petroleum odor (oil).

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

	WELL CASING VOLUMES			
GAL./FT.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

Tutu-PR01301 MW-9 (sk)

TUT 002 1461

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>		
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>		
Site/Well No.	<u>MW-9S</u>	Coded/ Replicate No.	<u>None</u>
Weather	<u>Partly cloudy; 85° F.</u>	Time Sampling Began	<u>9:40 am</u>
		Date Time Sampling Completed	<u>10/07/92</u> <u>11:15 am</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing.</u>		
Height of MP Below Land Surface	<u>0.10 ft</u>	MP Elevation	<u>162.37 ft</u>
Total Sounded Depth of Well Below MP	<u>18.67 ft</u>	Water - Level Elevation	<u>149.53 ft</u>
Depth to Water Below MP	<u>12.84 ft</u>	Diameter of Casing	<u>4 - inch</u>
Water Column in Well	<u>5.83 ft</u>	Gallons Pumped Prior to Sampling	<u>22</u>
Gallons per Foot	<u>0.65</u>	Sampling Pump Intake Setting (feet below land surface)	<u>NA</u>
Gallons in Well	<u>3.79</u>		
Evacuation Method	<u>Centrifugal Pump</u>	<u>Pump start - 9:43 am</u>	<u>Pump off - 9:56 am</u>

SAMPLING DATA/FIELD PARAMETERS

			TIME (ET from Start Pumping)				
Color	Odor	Field	Parameters	9:47 am (4 gal.)	9:51 am (6 gal.)	9:56 am (12 gal.)	After Sampling
Brownish	Strong Odor	pH		7.13	7.15	7.11	7.17
		Temp. (°C)		32.6	32.4	32.0	31.8
		Spec. Cond. (umhos)		1250	1325	1322	1320
		PID (ppm)		600	696	520	1200
Sampling Method and Material	<u>Teflon Bailor</u>						

Constituents Sampled	Container Description From Lab <u>X</u> or G&M _____	Preservative
VOCs	<u>5 - 40ml vials</u>	<u>HCL pH-1</u>
TCL BNAs	<u>2 - 500 ml amber glass</u>	<u>None</u>
TAL Total/Dissolved Metals	<u>1 - 500 ml plastic</u>	<u>HNO3</u>
TAL Cyanide	<u>1 - 500 ml plastic</u>	<u>NaOH</u>
TPH	<u>2 - 500 ml amber glass</u>	<u>HCL</u>

Remarks Trace of product observed in this well. Well went dry. Ground-water sample collected following the procedure specified in Appendix G, Section 1.6.2 of Work Plan.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

	WELL CASING VOLUMES			
GAL/FT.	1 - 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1 - 1/2" = 0.09	2 - 1/2" = 0.26	3 - 1/2" = 0.50	6" = 1.47

Tutu-9S dated 10/7/92 - 9S.wj3

TUT 002 1462

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>				
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>				
Site/Well No.	<u>MW-10</u>	Coded/ Replicate No.	<u>None</u>	Date	<u>10/6/92</u>
Weather	<u>Clear, Cool</u>	Time Sampling Began	<u>6:30 am</u>	Time Sampling Completed	<u>9:00 am</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing</u>	MP Elevation	<u>161.50 ft</u>
Height of MP Above Land Surface	<u>0.14 ft</u>	Water-Level Elevation	<u>140.98 ft</u>
Total Sounded Depth of Well Below MP	<u>35.60 ft</u>	Diameter of Casing	<u>4-inch</u>
Depth to Water Below MP	<u>20.52 ft</u>	Gallons Pumped Prior to Sampling	<u>30</u>
Water Column in Well	<u>15.08 ft</u>	Sampling Pump Intake Setting (feet below land surface)	<u>33.0 ft</u>
Gallons per Foot	<u>0.65</u>		
Gallons in Well	<u>9.80</u>		

Evacuation Method Submersible Pump Pump start - 6:30 am Pump off - 6:42 am

SAMPLING DATA/FIELD PARAMETERS

Color	Odor	Field	6:30 am	7:54 am	7:55 am	After Sampling
Clear	None	Parameters	<u>7.23</u>	<u>7.18</u>	<u>7.15</u>	<u>7.05</u>
		pH	<u>31.0</u>	<u>31.4</u>	<u>31.5</u>	<u>31.1</u>
		Temp. (°C)	<u>469</u>	<u>1225</u>	<u>1229</u>	<u>1229</u>
		Spec. Cond. (umhos)	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
		PID (ppm)				

Sampling Method and Material Teflon Bailor

Constituents Sampled	Container Description From Lab <u>X</u> or G&M _____	Preservative
VOCs	<u>5-40ml vials</u>	<u>HCL pH-1</u>
TCL BNAs	<u>2-500 ml amber glass</u>	<u>None</u>
TAL Total/Dissolved Metals	<u>1-500 ml plastic</u>	<u>HNO3</u>
TAL Cyanide	<u>1-500 ml plastic</u>	<u>NaOH</u>
TPH	<u>2-500 ml amber glass</u>	<u>HCL</u>

Remarks Well went dry. Well was pumped until specific conductivity stabilized.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

	WELL CASING VOLUMES			
GAL./FT.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

Tutu needs data/MW - 10.003

TUT 002 1463

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>			
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>	Coded/		
Site/Well No.	<u>MW-100</u>	Replicate No.	<u>None</u>	Date
Weather	<u>Partly cloudy, 85°</u>	Time Sampling Began	<u>5:14 am</u>	Time Sampling Completed
				<u>10/6/92</u>
				<u>7:30 am</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing.</u>		
Height of MP Below Land Surface	<u>0.14 ft</u>	MP Elevation	<u>161.38 ft</u>
Total Sounded Depth of Well Below MP	<u>75.0 ft</u>	Water-Level Elevation	<u>140.72 ft</u>
Depth to Water Below MP	<u>20.66 ft</u>	Diameter of Casing	<u>6-inch</u>
Water Column in Well	<u>54.34 ft</u>	Gallons Pumped Prior to Sampling	<u>250</u>
Gallons per Foot	<u>1.47</u>	Sampling Pump Intake Setting (feet below land surface)	<u>70.0 ft</u>
Gallons in Well	<u>79.88</u>		
Evacuation Method	<u>Submersible Pump Pump start - 5:14 am Pump off - 6:04 am</u>		

SAMPLING DATA/FIELD PARAMETERS

			TIME (ET from Start Pumping)				
Color	Odor	Field Parameters	5:24 am (80 gal.)	5:34 am (80 gal.)	5:55 am	6:04 am	After Sampling
Clear	None	pH	7.10	7.49	7.23	7.23	7.22
		Temp. (°C)	29.3	30.1	29.8	29.5	29.8
		Spec. Cond. (umhos)	606	1106	1264	1273	1266
		PID (ppm)	0	0	0	0	0
Sampling Method and Material	<u>Teflon Bailer</u>						

Constituents Sampled	Container Description	Preservative
VOCs	From Lab <u>X</u> or O&M	
TCL BNAs	5-40ml vials	HCL pH-1
TAL Total/Dissolved Metals	2-500 ml amber glass	None
TAL Cyanide	1-500 ml plastic	HNO3
TPH	1-500 ml plastic	NaOH
	2-500 ml amber glass	HCL

Remarks Well went dry. Ground-water was sampled according to the procedure specified in Appendix G, Section 1.6.2 of Work Plan.

Sampling Personnel C. Molfatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

WELL CASING VOLUMES			
GAL./FT.	1-1/2" = 0.06	2" = 0.16	3" = 0.37
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50
			6" = 1.47

This work sheet is for use with the following equipment:

FUT 002 1464

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>				
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>				
Site/Well No.	<u>MW-11D</u>	Coded/ Replicate No.	<u>MS/MSD</u>	Date	<u>10/2/92</u>
Weather	<u>Partly cloudy, 90°</u>	Time Sampling Began	<u>10:12 am</u>	Time Sampling Completed	<u>11:30 am</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing.</u>		
Height of MP Below Land Surface	<u>0.12 ft</u>	MP Elevation	<u>153.22 ft</u>
Total Sounded Depth of Well Below MP	<u>74.3 ft</u>	Water-Level Elevation	<u>133.22 ft</u>
Depth to Water Below MP	<u>20.0 ft</u>	Diameter of Casing	<u>6-inch</u>
Water Column in Well	<u>54.3 ft</u>	Gallons Pumped Prior to Sampling	<u>280</u>
Gallons per Foot	<u>1.47</u>	Sampling Pump Intake Setting (feet below land surface)	<u>NA</u>
Gallons in Well	<u>79.82</u>		
Evacuation Method	<u>Submersible Pump</u>	<u>Pump start - 10:12 am</u>	<u>Pump off - 10:47 am</u>

SAMPLING DATA/FIELD PARAMETERS

Color	Odor	Field				
Clear	None	Parameters	10:12 am (88 gal.)	10:34 am (88 gal.)	10:45 am (104 gal.)	After Sampling
		pH	6.78	7.00	7.00	9.38
		Temp. (°C)	29.2	29.4	29.3	29.9
		Spec. Cond. (umhos)	1438	1556	1589	192
		PID (ppm)	0	0	0	0

Sampling Method and Material Teflon Bailor

Constituents Sampled	Container Description From Lab <u>X</u> or G&M _____	Preservative
VOCs	5-40ml vials	HCL pH-1
TCL BNAs	2-500 ml amber glass	None
TAL Total/Dissolved Metals	1-500 ml plastic	HNO3
TAL Cyanide	1-500 ml plastic	NaOH
TPH	2-500 ml amber glass	HCL

Remarks _____

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

	WELL CASING VOLUMES			
GAL./FT.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

This work done by MW-11D.mh

TUT 002 1465

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>		
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>		
Site/Well No.	<u>MW-12D</u>	Coded/ Replicate No.	<u>None</u>
Weather	<u>Partly cloudy, 85°</u>	Time Sampling Began	<u>10:13 am</u>
		Date	<u>10/5/92</u>
		Time Sampling Completed	<u>11:30 am</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing.</u>			
Height of MP Above Land Surface	<u>0.23 ft</u>	MP Elevation	<u>161.81 ft</u>	
Total Sounded Depth of Well Below MP	<u>80.65 ft</u>	Water-Level Elevation	<u>133.99 ft</u>	
Depth to Water Below MP	<u>27.82 ft</u>	Diameter of Casing	<u>4-inch</u>	
Water Column in Well	<u>52.83 ft</u>	Gallons Pumped Prior to Sampling	<u>123</u>	
Gallons per Foot	<u>0.65</u>			
Gallons in Well	<u>34.34</u>	Sampling Pump Intake Setting (feet below land surface)	<u>75 ft</u>	
Evacuation Method	<u>Submersible Pump Pump start - 10:13 am Pump off - 10:44 am</u>			

SAMPLING DATA/FIELD PARAMETERS

			TIME (ET from Start Pumping)				
Color	Odor	Field	Parameters	10:23 am (34 gal.)	10:32 am (38.75 gal.)	10:44 am (51 gal.)	After Sampling
Clear	None		pH	<u>7.23</u>	<u>7.50</u>	<u>7.07</u>	<u>7.28</u>
			Temp. (°C)	<u>31.1</u>	<u>31.7</u>	<u>31.1</u>	<u>32.1</u>
			Spec. Cond. (umhos)	<u>1459</u>	<u>1453</u>	<u>1455</u>	<u>1607</u>
			PID (ppm)	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Sampling Method and Material	<u>Teflon Bailer</u>						

Constituents Sampled	Container Description From Lab <u>X</u> or G&M _____	Preservative
VOCs	<u>5-40 ml vials</u>	<u>HCL pH-1</u>
TCL BNAs	<u>2-500 ml amber glass</u>	<u>None</u>
TAL Total/Dissolved Metals	<u>1-500 ml plastic</u>	<u>HNO3</u>
TAL Cyanide	<u>1-500 ml plastic</u>	<u>NaOH</u>
TPH	<u>2-500 ml amber glass</u>	<u>HCL</u>

Remarks _____

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

	WELL CASING VOLUMES			
GAL/FT.	1-1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65
	1-1/2" = 0.09	2-1/2" = 0.26	3-1/2" = 0.50	6" = 1.47

This was checked by MW-12D (mb)

TUT 002 1466

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>		
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>		
Site/Well No.	<u>MW-13D</u>	Coded/ Replicate No.	<u>None</u>
Weather	<u>Partly cloudy</u>	Time Sampling Began	<u>11:04 am</u>
		Date Time Sampling Completed	<u>10/6/92</u> <u>1:15 pm</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing.</u>		
Height of MP Below Land Surface	<u>0.08 ft</u>	MP Elevation	<u>236.60 ft</u>
Total Sounded Depth of Well Below MP	<u>119.0 ft</u>	Water-Level Elevation	<u>153.40 ft</u>
Depth to Water Below MP	<u>83.20 ft</u>	Diameter of Casing	<u>6-inch</u>
Water Column in Well	<u>35.80 ft</u>	Gallons Pumped Prior to Sampling	<u>66</u>
Gallons per Foot	<u>1.47</u>	Sampling Pump Intake Setting (feet below land surface)	<u>115.0 ft</u>
Gallons in Well	<u>52.63</u>		
Evacuation Method	<u>Submersible Pump Pump start - 11:04 am Pump off - 11:15 am</u>		

SAMPLING DATA/FIELD PARAMETERS

Color	Odor	TIME (BT from Start Pumping)	
Clear	None		
		Field Parameters	After Sampling
		pH	<u>7.05</u>
		Temp. (°C)	<u>28.0</u>
		Spec. Cond. (umhos)	<u>2370</u>
		PID (ppm)	<u>0</u>

Sampling Method and Material Teflon Baller

Constituents Sampled	Container Description From Lab <u>X</u> or G&M _____	Preservative
VOCs	<u>5-40ml vials</u>	<u>HCL pH-1</u>
TCL BNAs	<u>2-500 ml amber glass</u>	<u>None</u>
TAL Total/Dissolved Metals	<u>1-500 ml plastic</u>	<u>HNO3</u>
TAL Cyanide	<u>1-500 ml plastic</u>	<u>NaOH</u>
TPH	<u>2-500 ml amber glass</u>	<u>HCL</u>

Remarks Well went dry after 11 minutes of pumping at a rate of 6 gpm. Field parameters were not measured. Ground-water was sampled according to the procedure specified in Appendix G, Section 1.6.2 of Work Plan.

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

	WELL CASING VOLUMES			
GAL/FT.	<u>1-1/4" = 0.06</u>	<u>2" = 0.16</u>	<u>3" = 0.37</u>	<u>4" = 0.65</u>
	<u>1-1/2" = 0.09</u>	<u>2-1/2" = 0.26</u>	<u>3-1/2" = 0.50</u>	<u>6" = 1.47</u>

Two vials each MW-13D.m3

TUT 002 1467

WATER SAMPLING LOG

Page 1 of 1

Project/No.	<u>Tutu/PR01301</u>			
Site Location	<u>St. Thomas, U.S. Virgin Islands</u>			
Site/Well No.	<u>MW-14</u>	Coded/ Replicate No.	<u>None</u>	Date Time Sampling
Weather	<u>Partly cloudy, 88°</u>	Time Sampling Began	<u>12:02 am</u>	Completed
				<u>12:35 pm</u>

EVACUATION DATA

Description of Measuring Point (MP)	<u>Top of well casing.</u>		
Height of MP Above Land Surface	<u>0.08 ft</u>	MP Elevation	<u>196.12 ft</u>
Total Sounded Depth of Well Below MP	<u>45.5 ft</u>	Water - Level Elevation	<u>173.32 ft</u>
Depth to Water Below MP	<u>22.80 ft</u>	Diameter of Casing	<u>4 - inch</u>
Water Column in Well	<u>22.70 ft</u>	Gallons Pumped Prior to Sampling	<u>45</u>
Gallons per Foot	<u>0.65</u>	Sampling Pump Intake Setting (feet below land surface)	<u>40.0 ft</u>
Gallons in Well	<u>14.76</u>		
Evacuation Method	<u>Submersible Pump Pump start - 12:02 am Pump off - 12:35 am</u>		

SAMPLING DATA/FIELD PARAMETERS

		TIME (ET from Start Pumping)				
Color	Odor	Field Parameters	12:10 (11.5 gal.)	12:20 (13.75 gal.)	12:30	After Sampling
Clear	Slight	pH	7.34	7.14	7.00	6.54
		Temp. (°C)	31.1	30.8	30.7	30.0
		Spec. Cond. (umhos)	1096	1084	1086	1084
		PID (ppm)	<2000		0	0

Sampling Method and Material Teflon Bailor

Constituents Sampled	Container Description From Lab <u>X</u> or G&M _____	Preservative
VOCs	5 - 40ml vials	HCL pH - 1
TCL BNAs	2 - 500 ml amber glass	None
TAL Total/Dissolved Metals	1 - 500 ml plastic	HNO3
TAL Cyanide	1 - 500 ml plastic	NaOH
TPH	2 - 500 ml amber glass	HCL

Remarks _____

Sampling Personnel C. Moffatt, R. Ponciano (Geraghty & Miller)/ A. Barrera, G. González (Soil Tech).

GAL./FT.	WELL CASING VOLUMES			
1 - 1/4" = 0.06	2" = 0.16	3" = 0.37	4" = 0.65	
1 - 1/2" = 0.09	2 - 1/2" = 0.26	3 - 1/2" = 0.50	6" = 1.47	

Tutu was 14.46 MW - 1 (4.46)

TUT 002 1468

APPENDIX H
MONITORING WELL HYDROGRAPHS

TUT 002 1469

BACKGROUND WATER LEVELS

October 19 to 28, 1992

**Monitoring Wells: MW-6R, MW-4, MW-9,
MW-10D, MW-11D, and MW-12D.**

TUT 002 1470

APPENDIX H

FIGURES

- H-1. Background Water Levels Measured at Monitoring Well MW-6R, October 19 to 27, 1992.
- H-2. Background Water Levels Measured at Monitoring Well MW-4, October 19 to 27, 1992.
- H-3. Background Water Levels Measured at Monitoring Well MW-9, October 20 to 27, 1992.
- H-4. Background Water Levels Measured at Monitoring Well MW-10D, October 19 to 28, 1992.
- H-5. Background Water Levels Measured at Monitoring Well MW-11D, October 19 to 27, 1992.
- H-6. Background Water Levels Measured at Monitoring Well MW-12D, October 19 to 27, 1992.

DWG DATE: 24MAY93

PRJCT NO.: PR01301

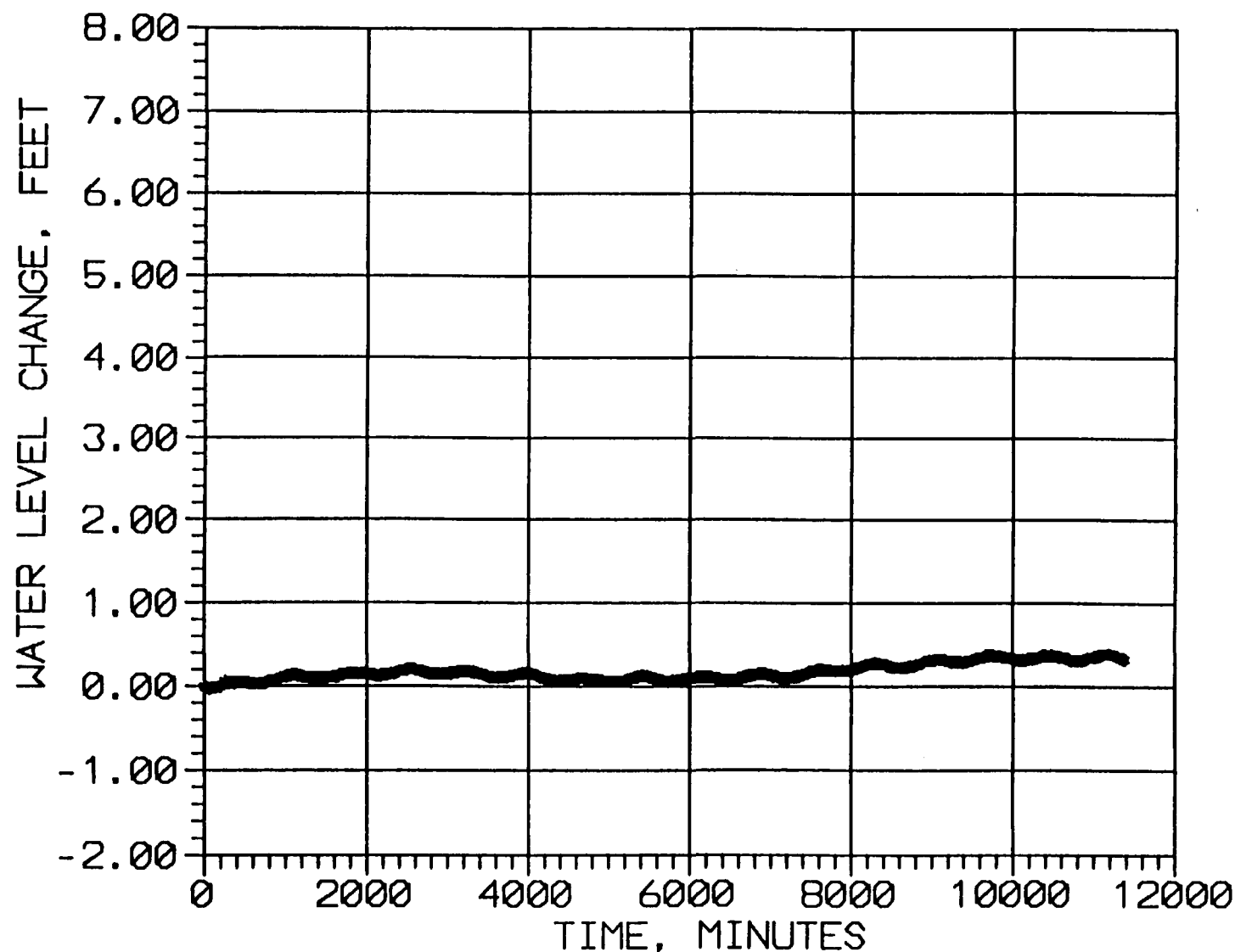
FILE: TU-190

DRAWING: TU-190

CHECKED: J. BURDICK

APPROVED: T. DANAHY

DRAFTER: K. MC CANN



TIME
ZERO:
16:00 10/19/92
END OF
MEASUREMENTS:
13:40 10/27/92

 **GERAGHTY
& MILLER, INC.**
Environmental Services

**BACKGROUND WATER LEVELS MEASURED AT
MONITORING WELL MW-6R, OCTOBER 19 TO 27, 1992**

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

H-1

DWG DATE: 24MAY93

PRJCT NO.: PR01301

FILE: TU-189

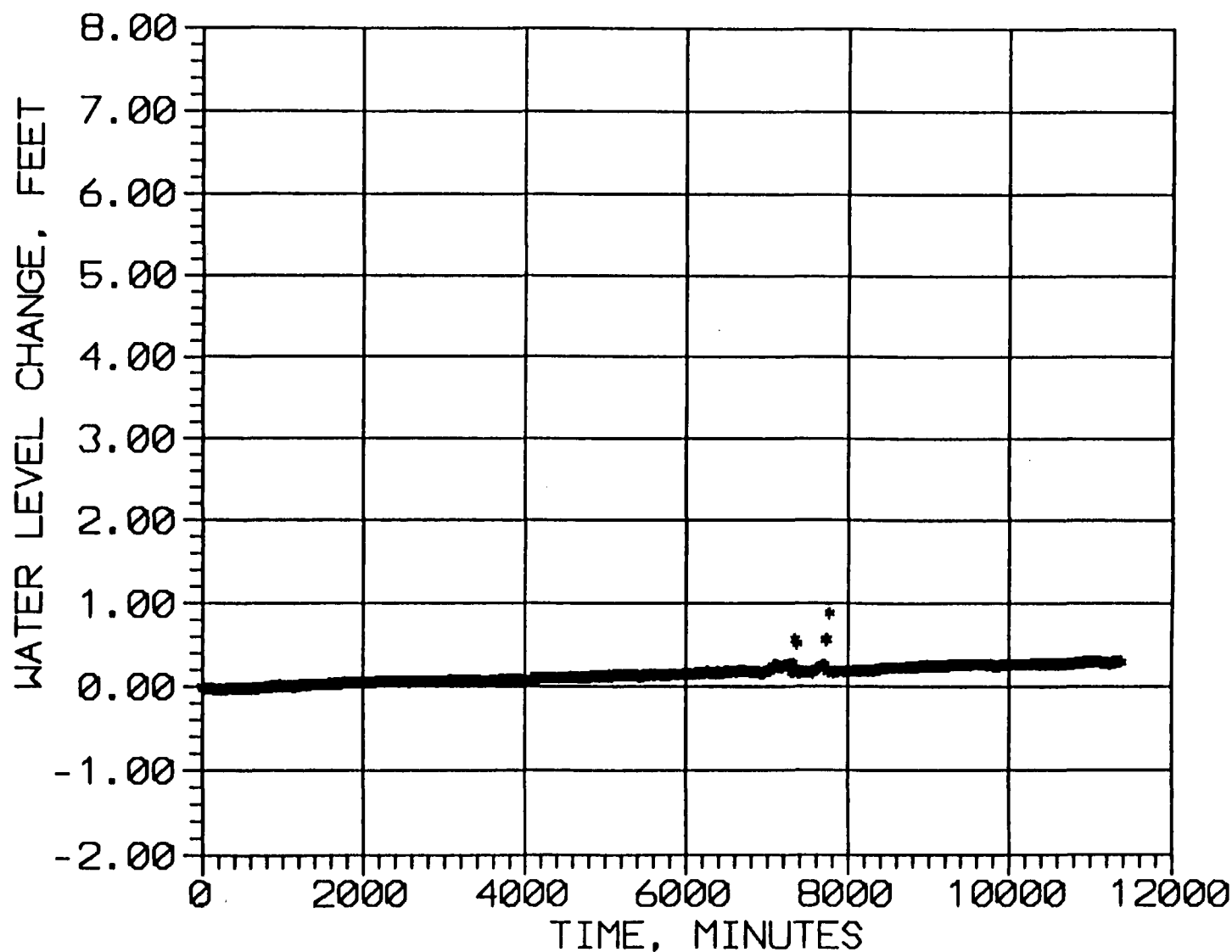
DRAWING: TU-189

CHECKED: J. BURDICK

APPROVED: T. DANAHY

DRAFTER: K. MC CANN

TIME
ZERO:
16:30 10/19/92
END OF
MEASUREMENTS:
14:00 10/27/92



GERAGHTY
& MILLER, INC.
Environmental Services

BACKGROUND WATER LEVELS MEASURED AT MONITORING WELL MW-4, OCTOBER 19 TO 27, 1992

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

H-2

TUT 002 1473

DWG DATE: 24MAY93

PRJCT NO.: PR01301

FILE: TU-191

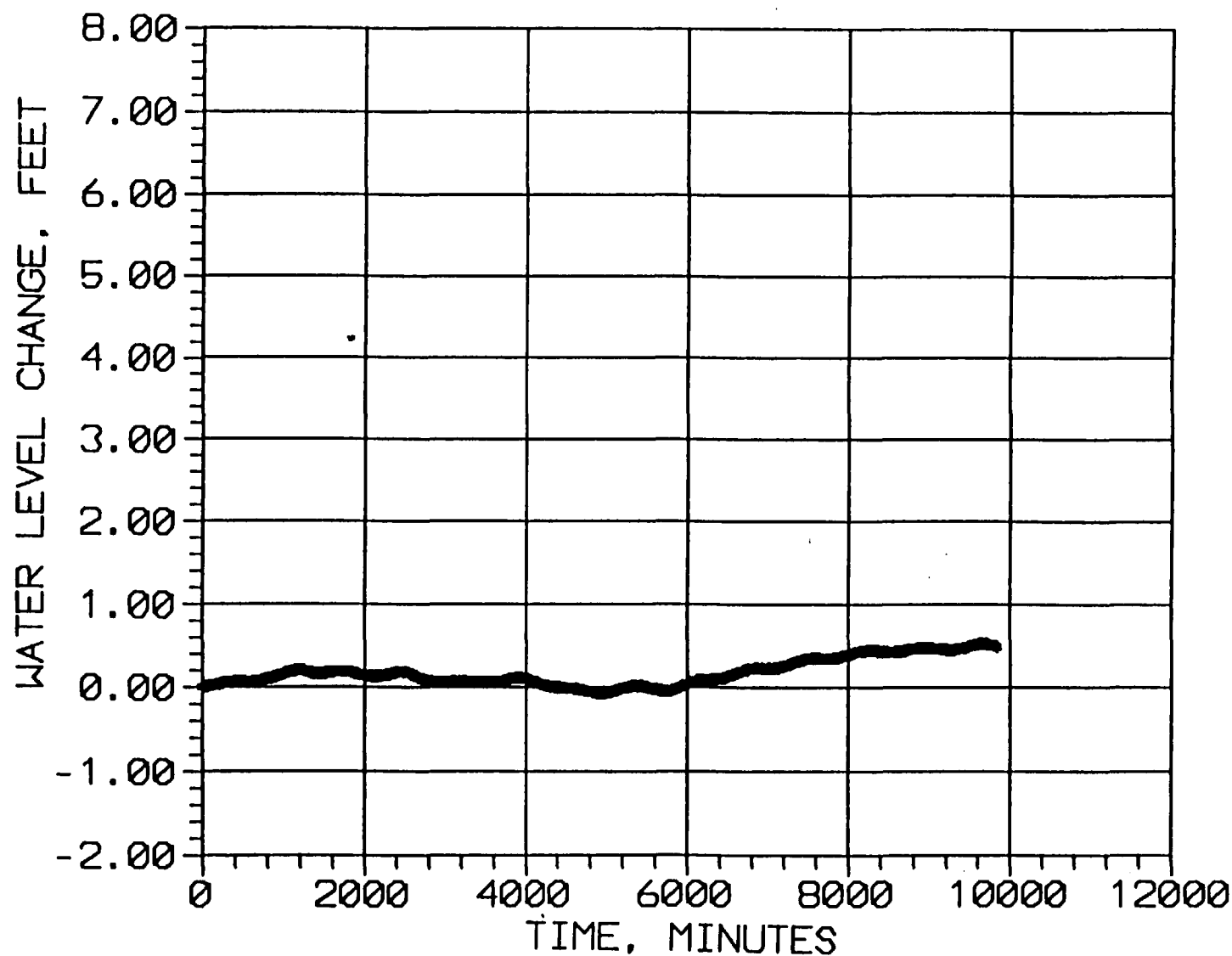
DRAWING: TU-191

CHECKED: J. BURDICK

APPROVED: T. DANAHY

DRAFTER: K. MC CANN

TIME
ZERO:
18:00 10/20/92
END OF
MEASUREMENTS:
13:50 10/27/92



TUT 002 1474



GERAGHTY
& MILLER, INC.
Environmental Services

BACKGROUND WATER LEVELS MEASURED AT MONITORING WELL MW-9, OCTOBER 20 TO 27, 1992

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

H-3

DWG DATE: 24MAY93

PRJCT NO.: PR01301

FILE: TU-192

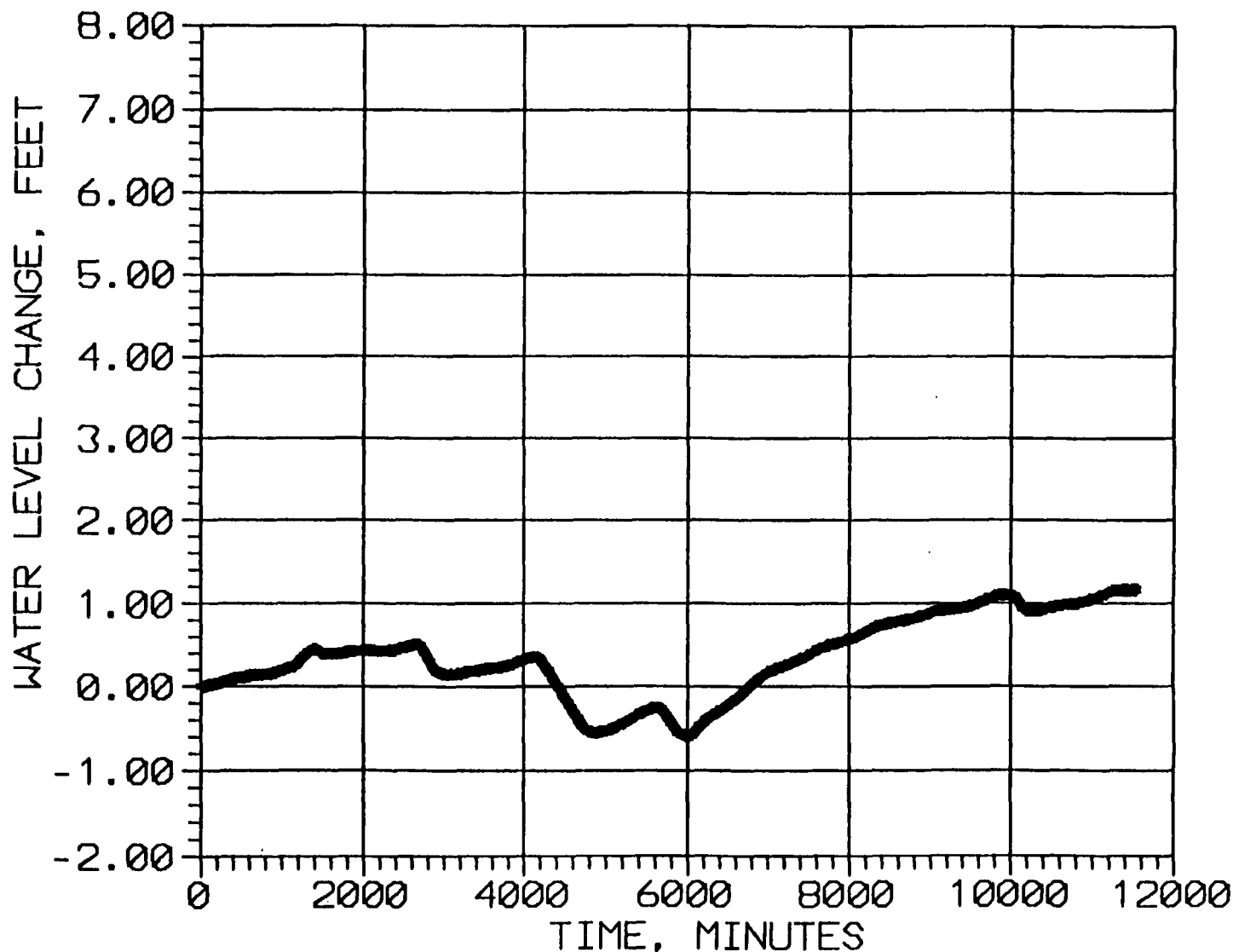
DRAWING: TU-192

CHECKED: J. BURDICK

APPROVED: T. DANAHY

DRAFTER: K. MC CANN

TIME
ZERO:
14:10 10/19/92
END OF
MEASUREMENTS:
14:30 10/28/92



TUT 002 1475



**GERAGHTY
& MILLER, INC.**
Environmental Services

BACKGROUND WATER LEVELS MEASURED AT MONITORING WELL MW-10D, OCTOBER 19 TO 28, 1992

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

H-4

DWG DATE: 24MAY93

PRJCT NO.: PR01301

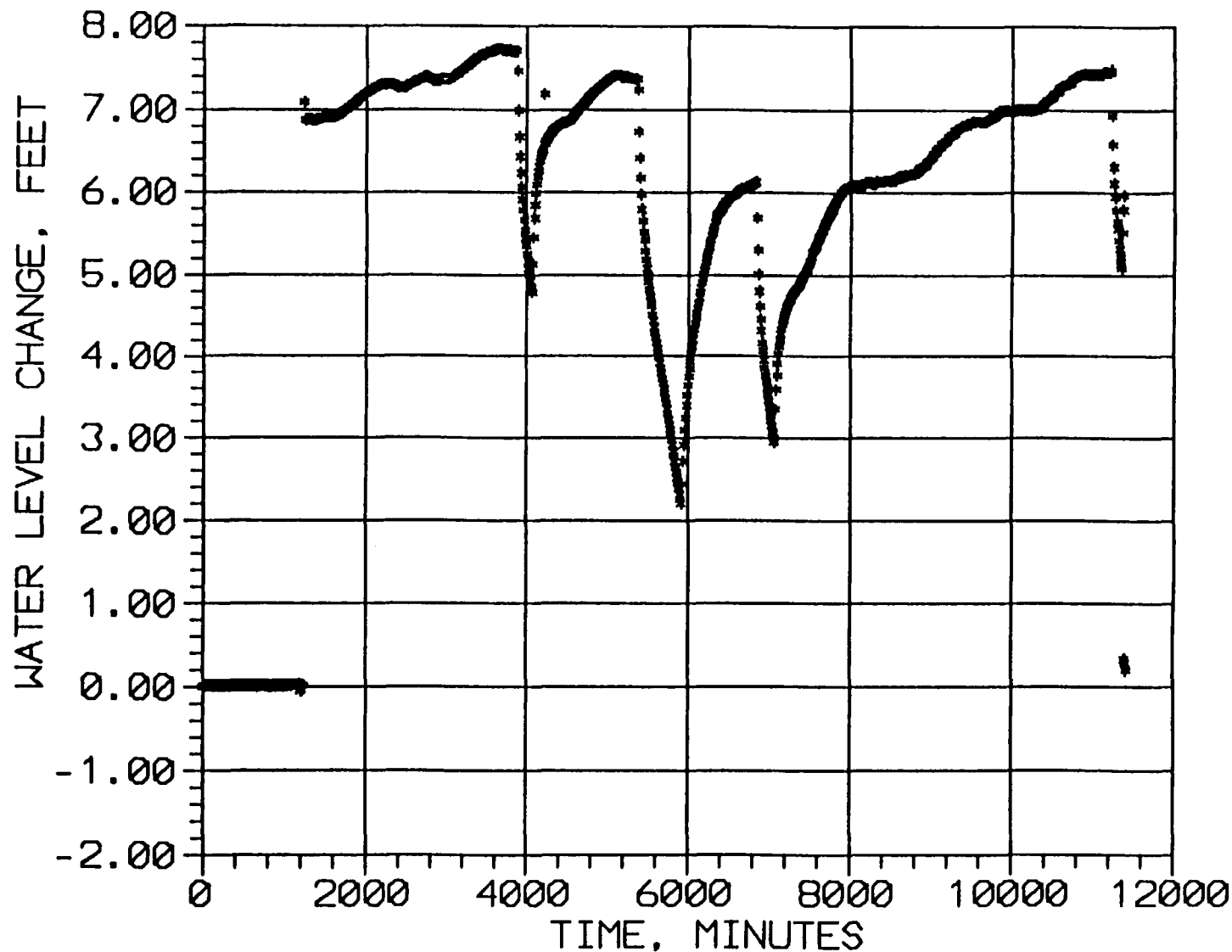
FILE: TU-193

DRAWING: TU-193

CHECKED: J. BURDICK

APPROVED: T. DANAHY

DRAFTER: K. MC CANN



TIME
ZERO:
18:00 10/19/92

END OF
MEASUREMENTS:
16:09 10/27/92

TUT 002 1476

 **GERAGHTY
& MILLER, INC.**
Environmental Services

BACKGROUND WATER LEVELS MEASURED AT MONITORING WELL MW-11D, OCTOBER 19 TO 27, 1992

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

H-5

DWG DATE: 24MAY93

PRJCT NO.: PR01301

FILE: TU-194

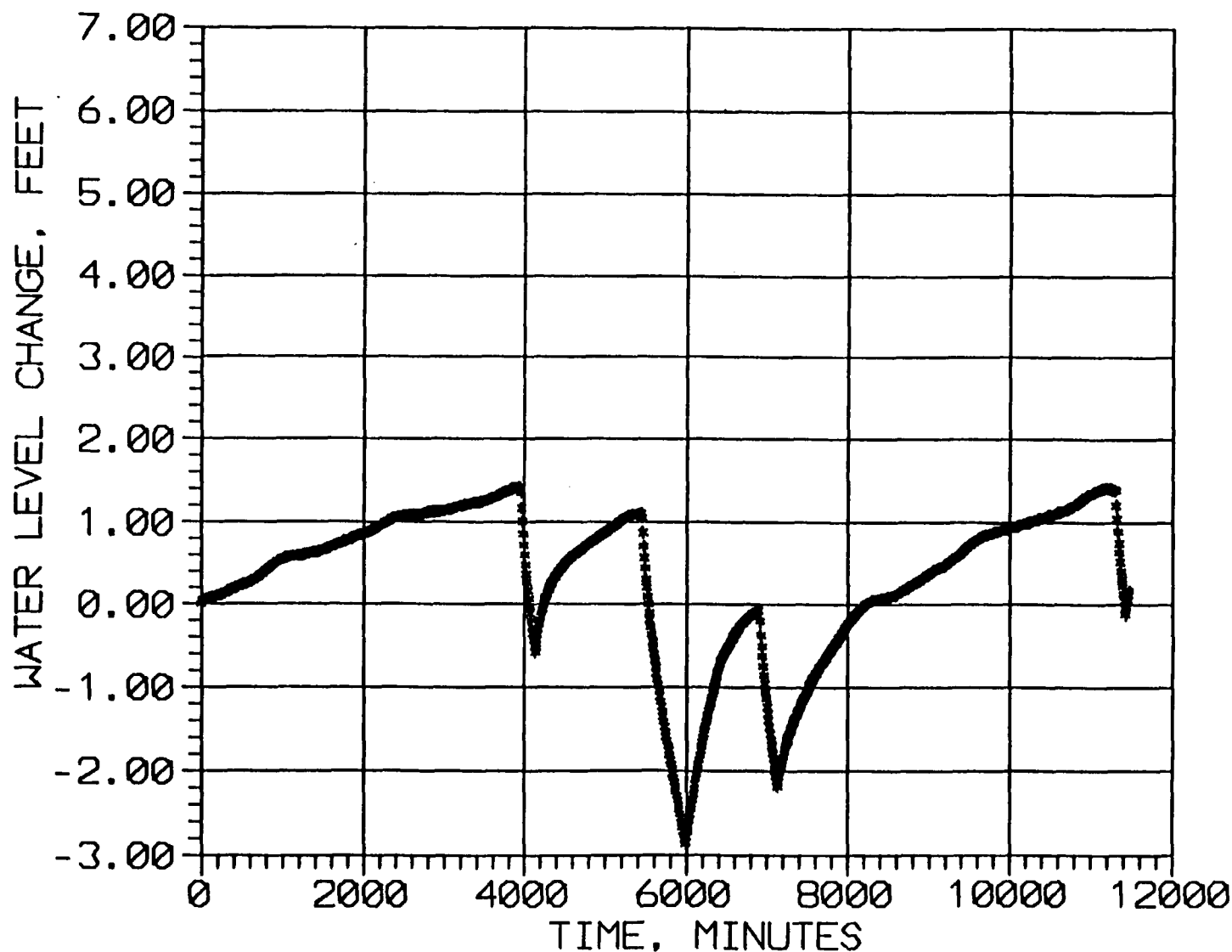
DRAWING: TU-194

CHECKED: J. BURDICK

APPROVED: T. DANAHY

DRAFTER: K. MC CANN

TIME
ZERO:
16:50 10/19/92
END OF
MEASUREMENTS:
15:50 10/27/92



**BACKGROUND WATER LEVELS MEASURED AT
MONITORING WELL MW-12D, OCTOBER 19 TO 27, 1992**

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

H-6

TUT 002 1477

**HYDROGRAPHS FOR PUMPING TEST AT
MONITORING WELL MW-6R**

November 2, 1992

**Observation Wells: MW-6R, MW-6D, CHT-6D,
MW-7, MW-4, MW-8, MW-4D, and MW-5.**

TUT 002 1478

APPENDIX H

FIGURES

- H-7. Pumping Well MW-6R Hydrograph for Pumping Test at Monitoring Well MW-6R, November 2 - 3, 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.
- H-8. Observation Well MW-6D Hydrograph for Pumping Test at Monitoring Well MW-6R, November 2 - 3, 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.
- H-9. Observation Well CHT-6D Hydrograph for Pumping Test at Monitoring Well MW-6R, November 2 - 3, 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.
- H-10. Observation Well MW-7 Hydrograph for Pumping Test at Monitoring Well MW-6R, November 2 - 3, 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.
- H-11. Observation Well MW-4 Hydrograph for Pumping Test at Monitoring Well MW-6R, November 2 - 3, 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.
- H-12. Observation Well MW-8 Hydrograph for Pumping Test at Monitoring Well MW-6R, November 2 - 3, 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.
- H-13. Observation Well MW-4D Hydrograph for Pumping Test at Monitoring Well MW-6R, November 2 - 3, 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.
- H-14. Observation Well MW-5 Hydrograph for Pumping Test at Monitoring Well MW-6R, November 2 - 3, 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

DWG DATE: 24MAY93

PRJCT NO.: PR01301

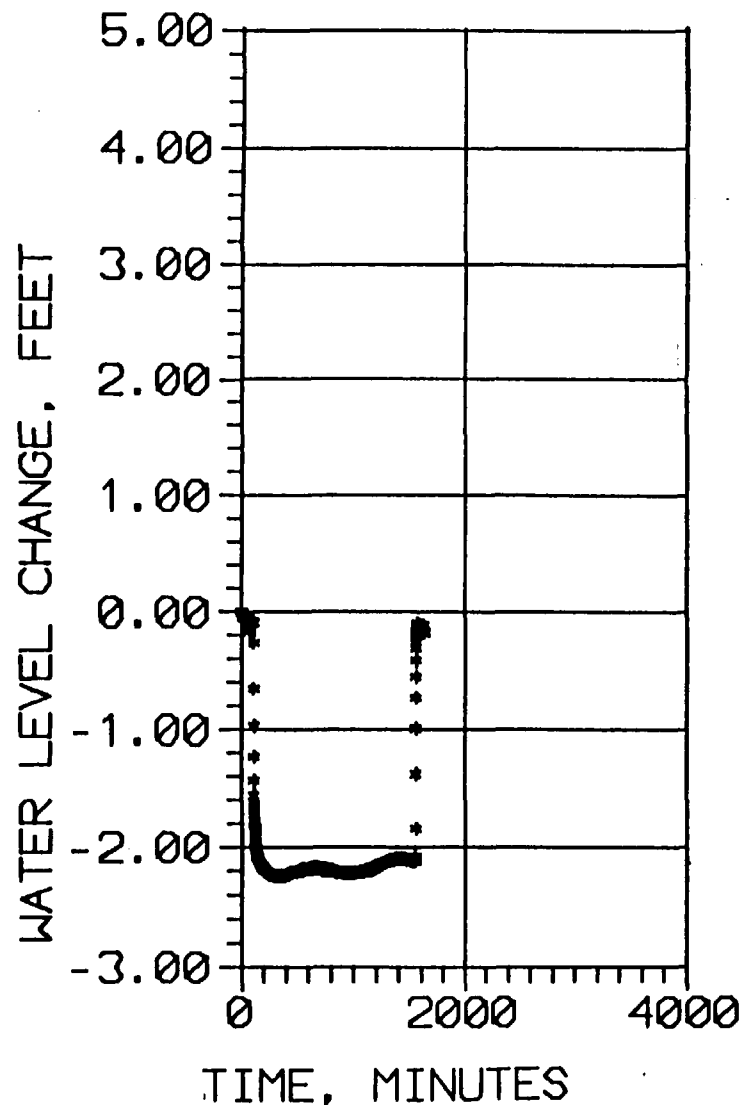
FILE: TU-200

DRAWING: TU-200

CHECKED: J. BURDICK

APPROVED: T. DANAHY

DRAFTER: K. MC CANN



PUMPING WELL: MW-6R
PUMPING RATE: 9.3 GPM
PUMP ON: 13:20 11/2/92
PUMP OFF: 13:20 11/3/92

TIME ZERO: 11:30 11/2/92

DISTANCE BETWEEN
PUMPING WELL AND
OBSERVATION WELL:
0 FEET

TUT 002 1486



GERAGHTY
& MILLER, INC.
Environmental Services

**PUMPING WELL MW-6R HYDROGRAPH FOR
PUMPING TEST AT MONITORING WELL MW-6R
NOVEMBER 2-3, 1992**

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

H-7

DWG DATE: 24MAY93

PRJCT NO.: PR01301

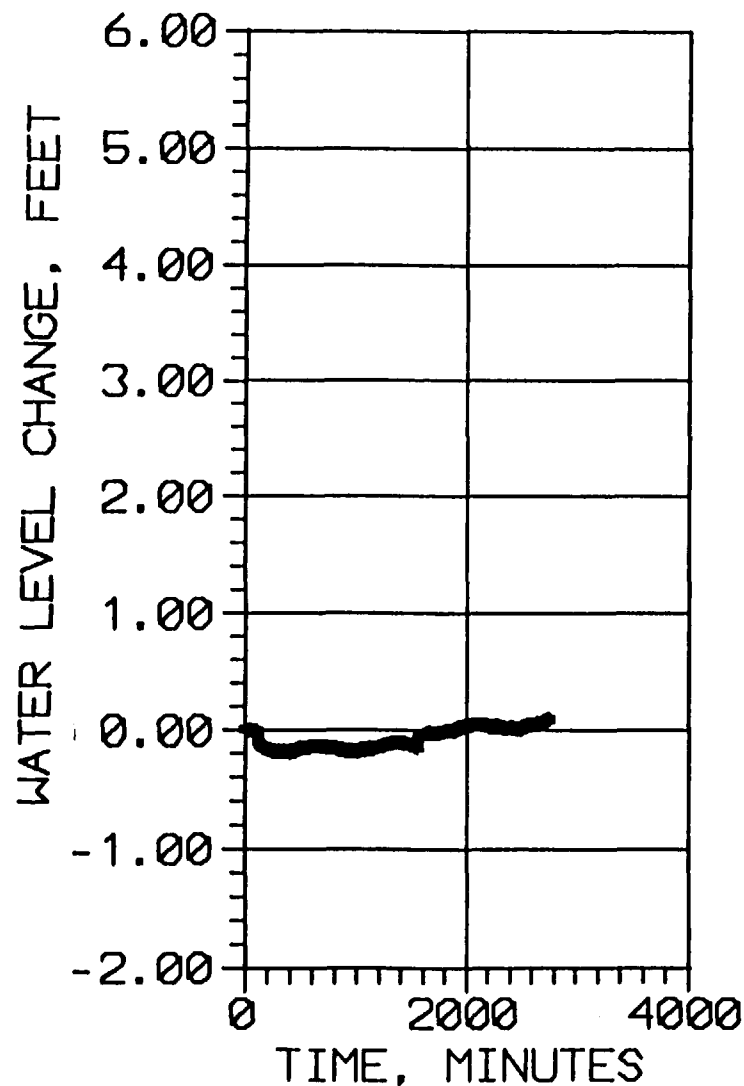
FILE: TU-199

DRAWING: TU-199

CHECKED: J. BURDICK

APPROVED: T. DANAHY

DRAFTER: K. MC CANN



PUMPING WELL: MW-6R
PUMPING RATE: 9.3 GPM
PUMP ON: 13:20 11/2/92
PUMP OFF: 13:20 11/3/92

TIME ZERO: 11:30 11/2/92

DISTANCE BETWEEN
PUMPING WELL AND
OBSERVATION WELL:
10 FEET

 **GERAGHTY
& MILLER, INC.**
Environmental Services

**OBSERVATION WELL MW-6D HYDROGRAPH FOR
PUMPING TEST AT MONITORING WELL MW-6R
NOVEMBER 2-3, 1992**

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

H-8

TUT 002 1481

DWG DATE: 24MAY93

PRJCT NO.: PR01301

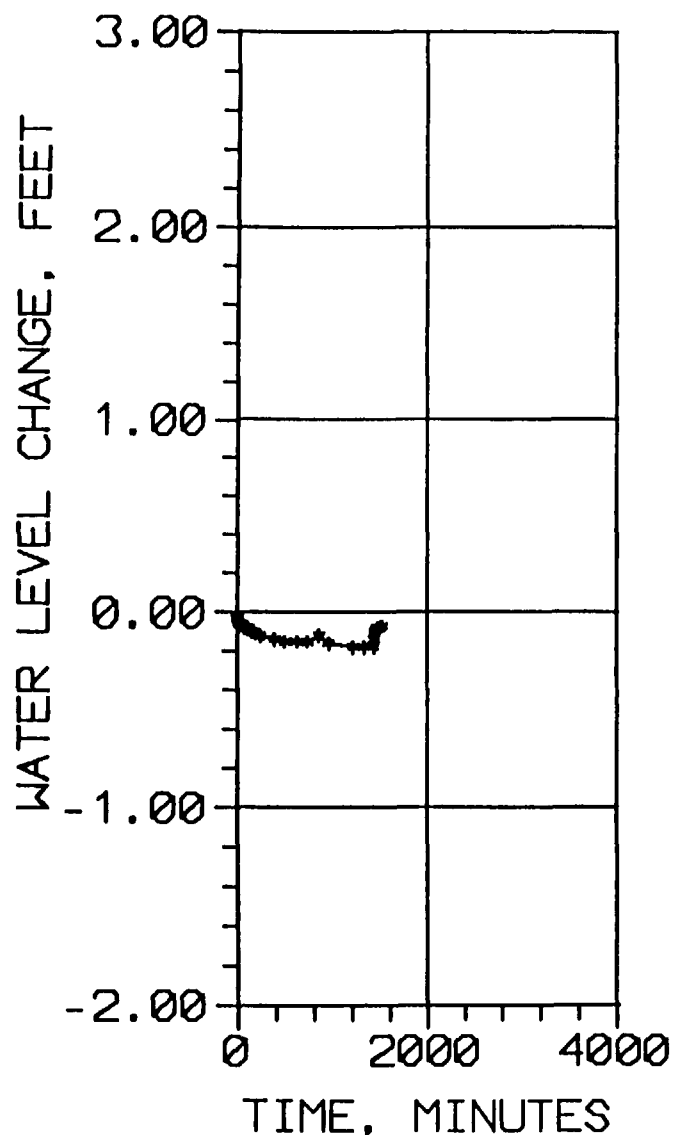
FILE: TU-195

DRAWING: TU-195

CHECKED: J. BURDICK

APPROVED: T. DANAHY

DRAFTER: K. MC CANN



PUMPING WELL: MW-6R
PUMPING RATE: 9.3 GPM
PUMP ON: 13:20 11/2/92
PUMP OFF: 13:20 11/3/92

TIME ZERO: 13:20 11/2/92

DISTANCE BETWEEN
PUMPING WELL AND
OBSERVATION WELL:
88 FEET

 **GERAGHTY
& MILLER, INC.**
Environmental Services

**OBSERVATION WELL CHT-6D HYDROGRAPH FOR
PUMPING TEST AT MONITORING WELL MW-6R
NOVEMBER 2-3, 1992**

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

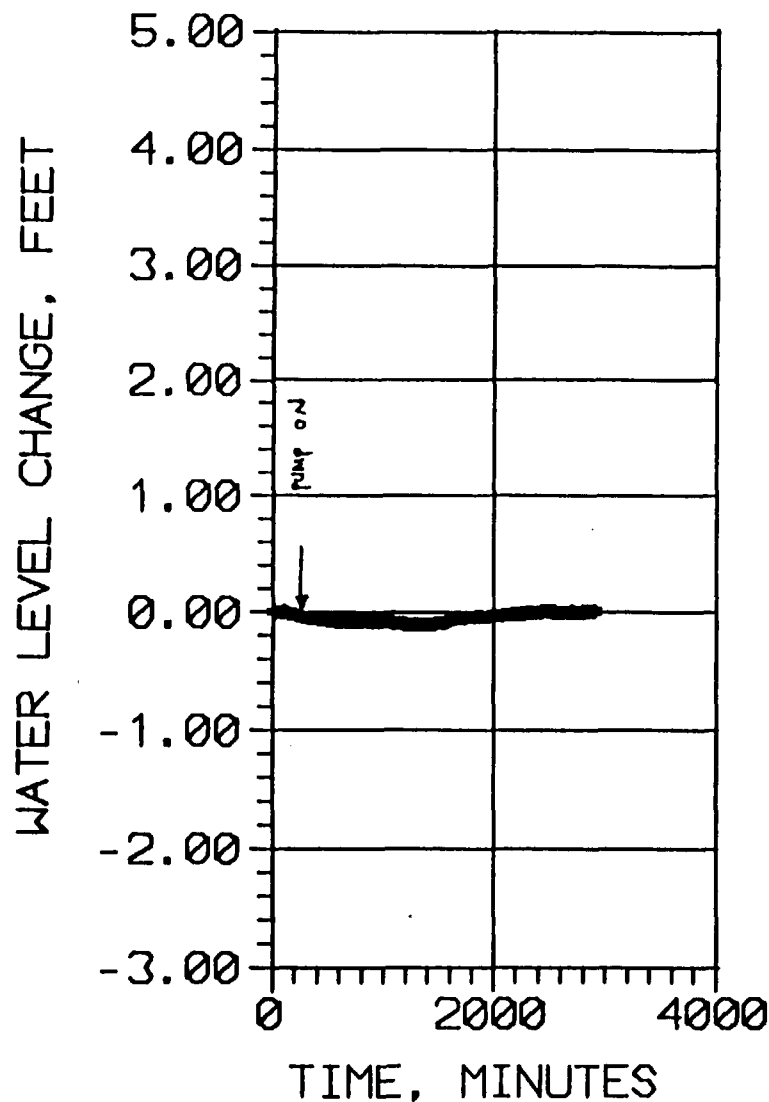
FIGURE

H-9

PUMPING WELL: MW-6R
PUMPING RATE: 9.3 GPM
PUMP ON: 13:20 11/2/92
PUMP OFF: 13:20 11/3/92

TIME ZERO: 11:30 11/2/92

DISTANCE BETWEEN
PUMPING WELL AND
OBSERVATION WELL:
231 FEET



TUT 002 1483

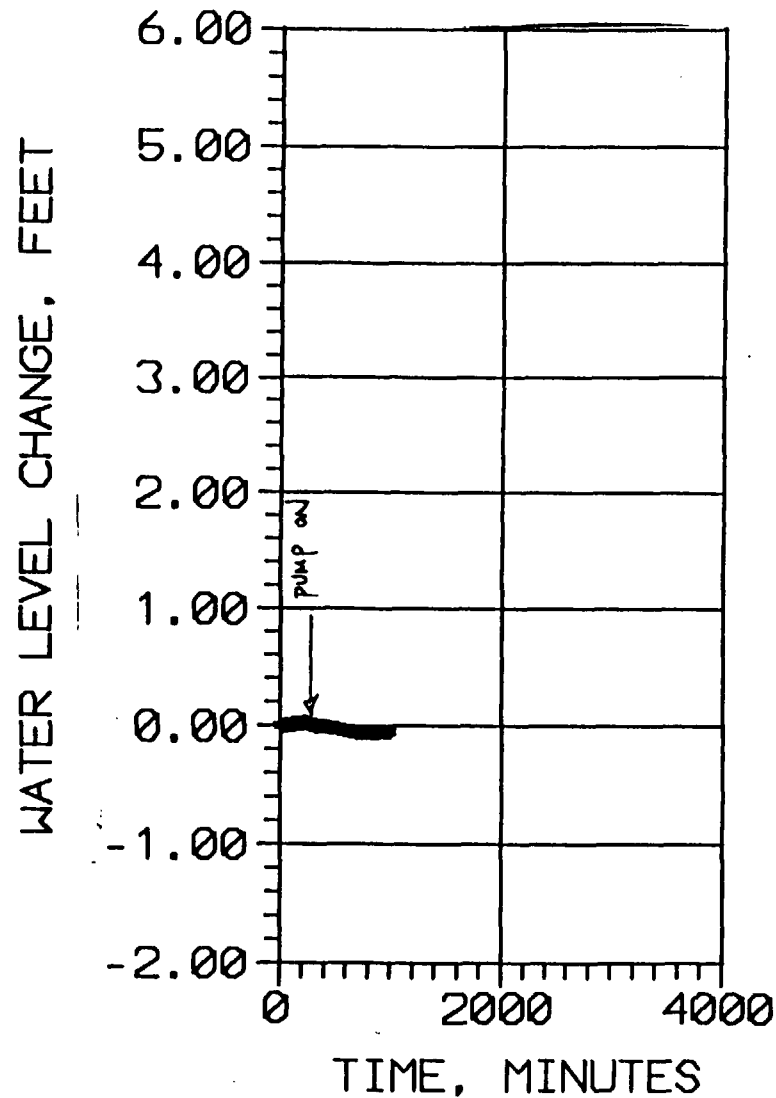
 **GERAGHTY
& MILLER, INC.**
Environmental Services

**OBSERVATION WELL MW-7 HYDROGRAPH FOR
PUMPING TEST AT MONITORING WELL MW-6R
NOVEMBER 2-3, 1992**

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

H-10



PUMPING WELL: MW-6R
PUMPING RATE: 9.3 GPM
PUMP ON: 13:20 11/2/92
PUMP OFF: 13:20 11/3/92

TIME ZERO: 9:30 11/2/92

DISTANCE BETWEEN
PUMPING WELL AND
OBSERVATION WELL:
288 FEET



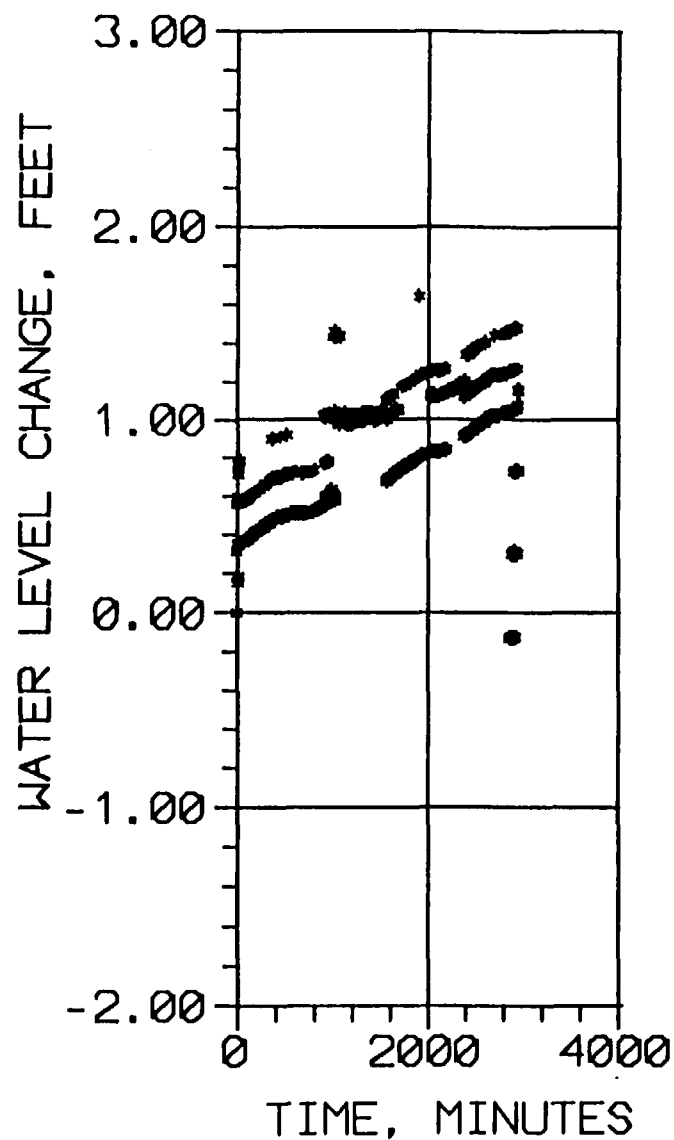
**OBSERVATION WELL MW-4 HYDROGRAPH FOR
PUMPING TEST AT MONITORING WELL MW-6R
NOVEMBER 2-3, 1992**

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

H-11

TUT 002 1484



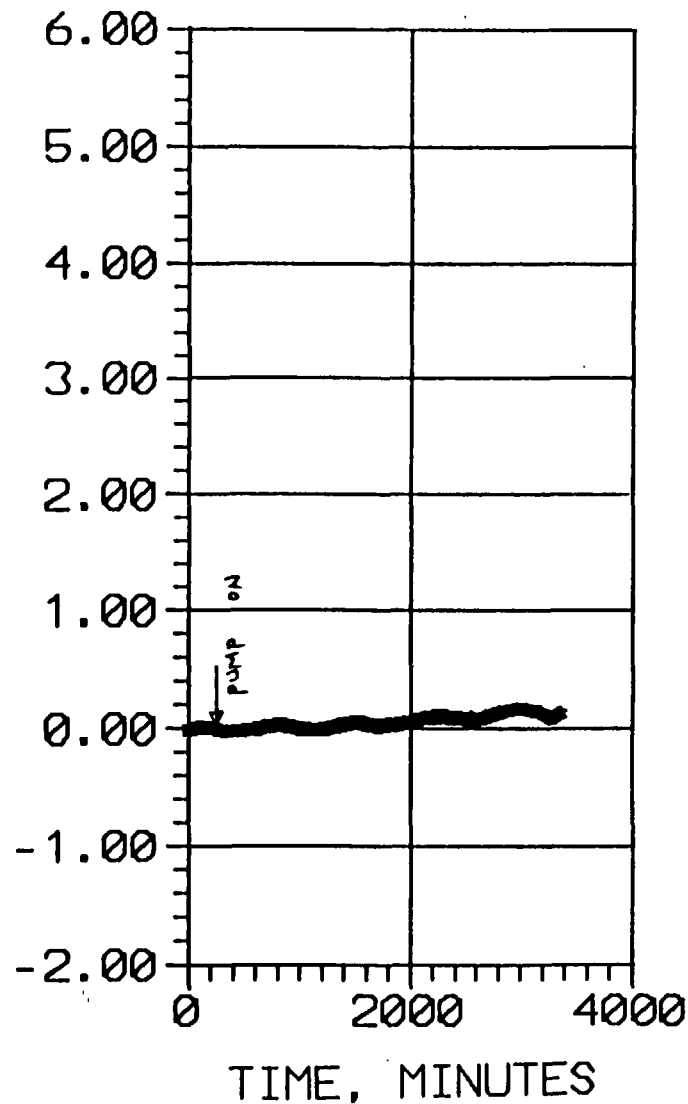
PUMPING WELL: MW-6R
PUMPING RATE: 9.3 GPM
PUMP ON: 13:20 11/2/92
PUMP OFF: 13:20 11/3/92

TIME ZERO: 8:25 11/2/92

DISTANCE BETWEEN
PUMPING WELL AND
OBSERVATION WELL:
308 FEET

TRANSDUCER WAS
APPARENTLY DAMAGED.

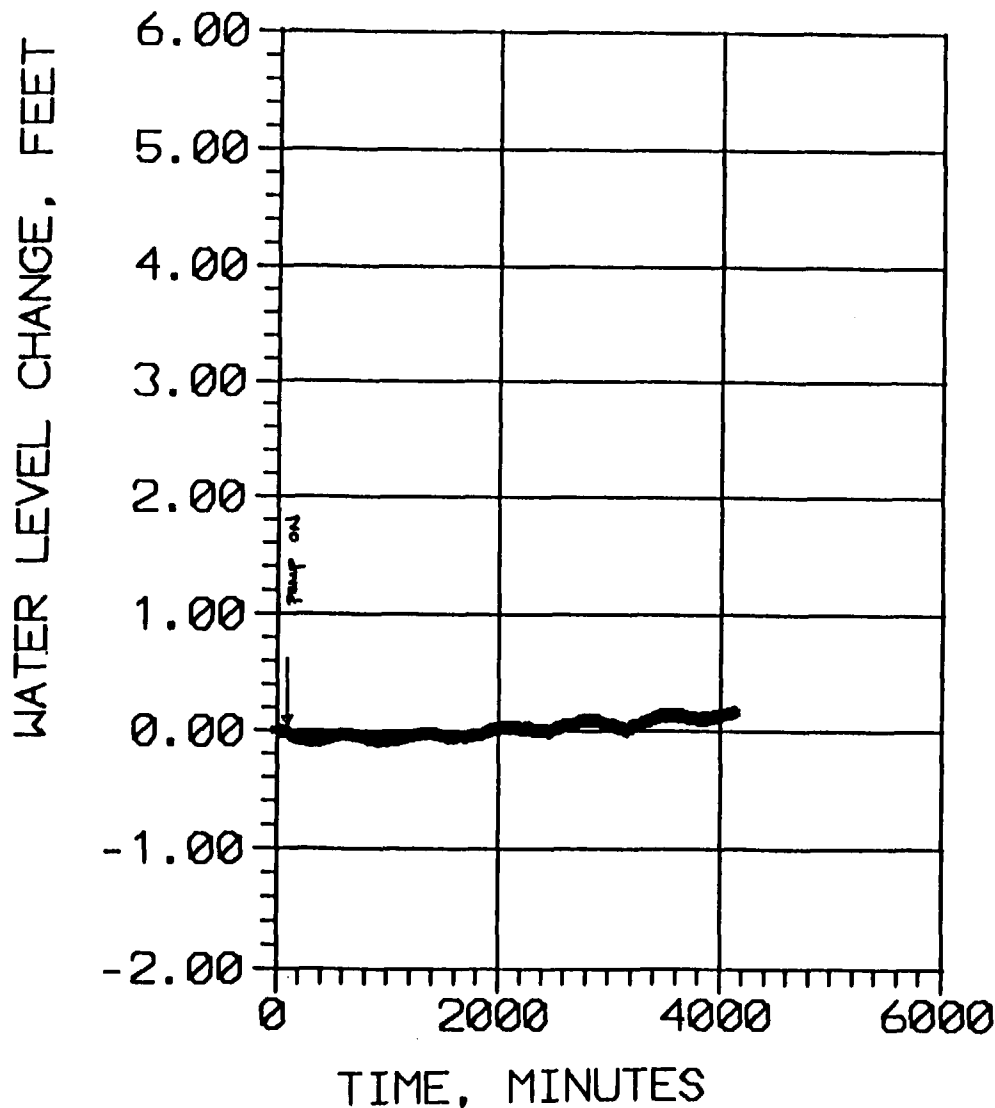
WATER LEVEL CHANGE, FEET



PUMPING WELL: MW-6R
PUMPING RATE: 9.3 GPM
PUMP ON: 13:20 11/2/92
PUMP OFF: 13:20 11/3/92

TIME ZERO: 9:11 11/2/92

DISTANCE BETWEEN
PUMPING WELL AND
OBSERVATION WELL:
279 FEET



PUMPING WELL: MW-6R
PUMPING RATE: 9.3 GPM
PUMP ON: 13:20 11/2/92
PUMP OFF: 13:20 11/3/92

TIME ZERO: 11:20 11/2/92

DISTANCE BETWEEN
PUMPING WELL AND
OBSERVATION WELL:
210 FEET



**OBSERVATION WELL MW-5 HYDROGRAPH FOR
PUMPING TEST AT MONITORING WELL MW-6R
NOVEMBER 2-3, 1992**

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

H-14

TUT 002 1487

**HYDROGRAPHS FOR PUMPING TEST AT
MONITORING WELL MW-6D**

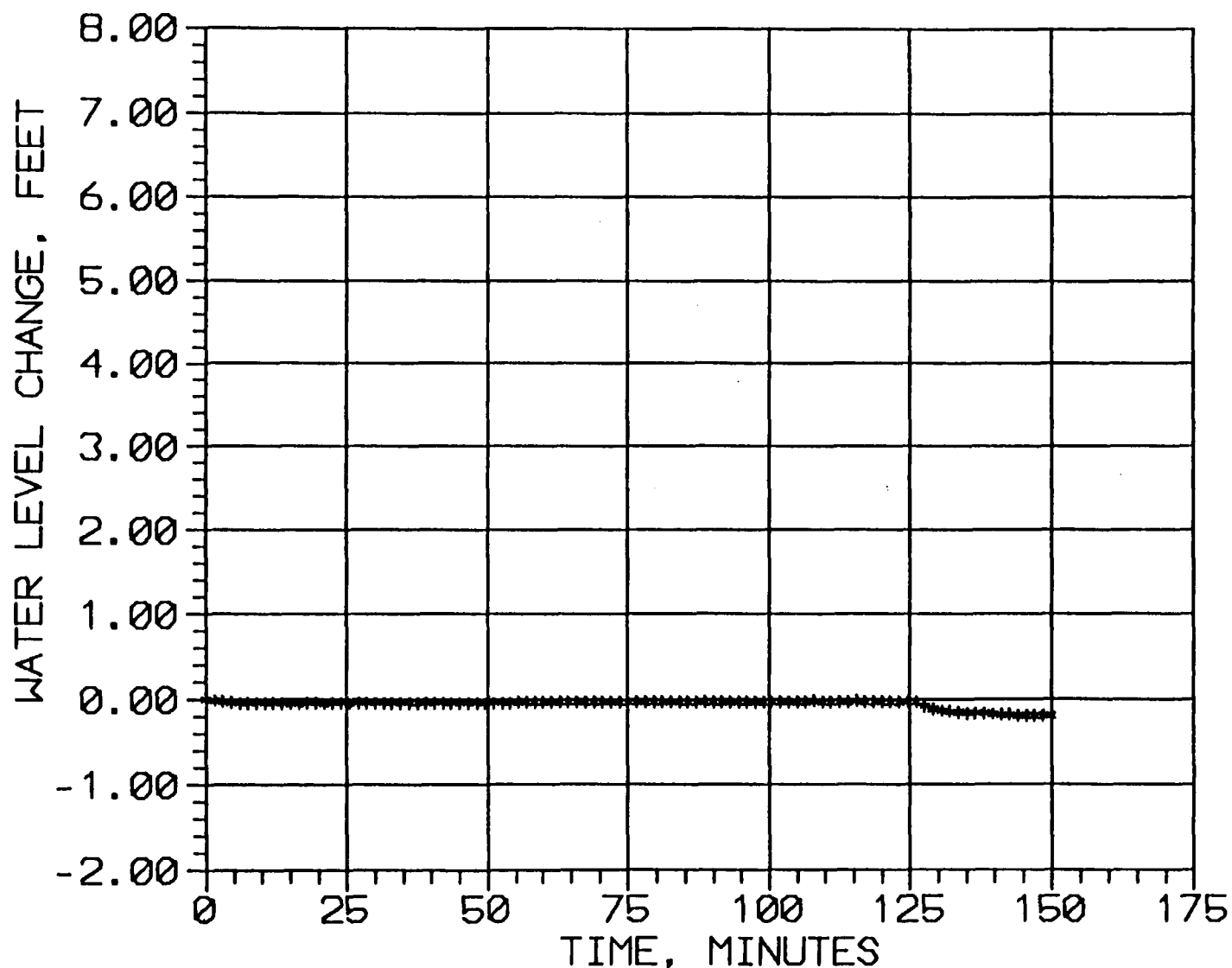
November 5, 1992

**Observation Wells: MW-6R, MW-6D,
CHT-6D, MW-7, MW-4, and MW-12D.**

APPENDIX H

FIGURES

- H-15. Monitoring Well MW-6R Pre-pumping Trend for Pumping Test of MW-6D, November 5, 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.
- H-16. Pumping Well MW-6D Hydrograph for Pumping Test at Monitoring Well MW-6D, November 5 - 6, 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.
- H-17. Observation Well MW-6R Hydrograph for Pumping Test at Monitoring Well MW-6D, November 5 - 6, 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.
- H-18. Observation Well CHT-6D Hydrograph for Pumping Test at Monitoring Well MW-6D, November 5 - 6, 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.
- H-19. Observation Well MW-7 Hydrograph for Pumping Test at Monitoring Well MW-6D, November 5 - 6, 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.
- H-20. Observation Well MW-4 Hydrograph for Pumping Test at Monitoring Well MW-6D, November 5 - 6, 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.
- H-21. Observation Well MW-12D Hydrograph for Pumping Test at Monitoring Well MW-6D, November 5 - 6, 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.



TIME
ZERO:
8:23 11/5/92



**MONITORING WELL MW-6R PRE-PUMPING TREND
FOR PUMPING TEST OF MW-6D
NOVEMBER 5, 1992**

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

H-15

TUT 002 1490

DWG DATE: 24MAY93

PRJCT NO.: PR01301

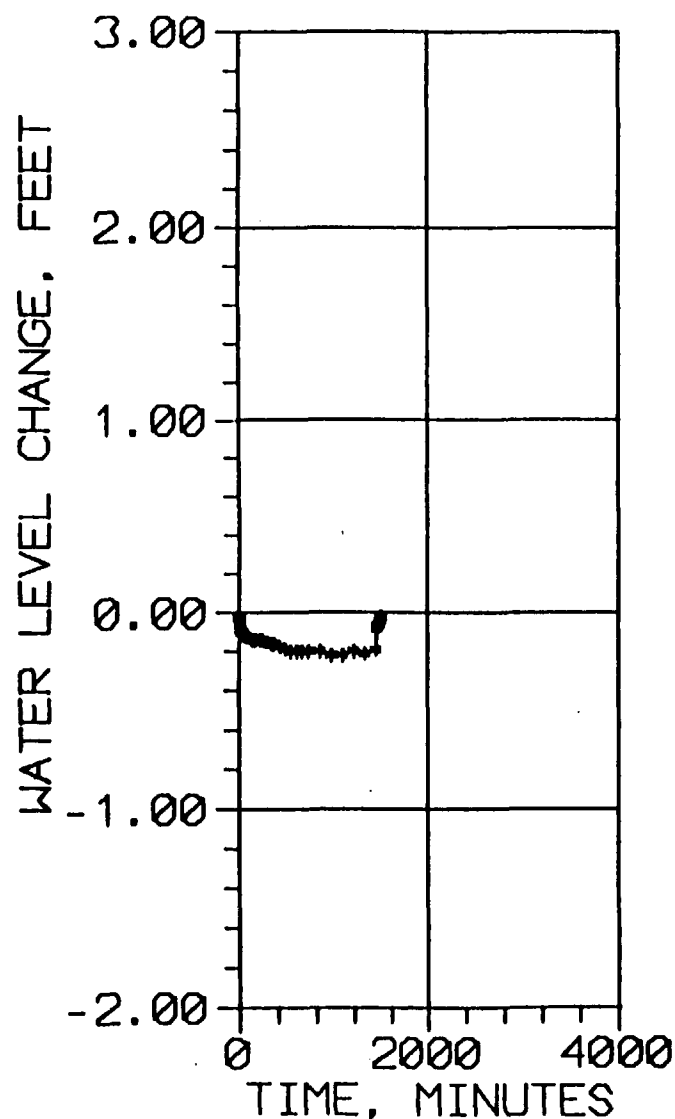
FILE: TU-206

DRAWING: TU-206

CHECKED: J. BURDICK

APPROVED: T. DANAHY

DRAFTER: K. MC CANN



PUMPING WELL: MW-6D
PUMPING RATE: 14 GPM
PUMP ON: 10:30 11/5/92
PUMP OFF: 10:30 11/6/92

TIME ZERO: 10:30 11/5/92

DISTANCE BETWEEN
PUMPING WELL AND
OBSERVATION WELL:
0 FEET

WATER LEVELS WERE
MEASURED MANUALLY
USING AN ELECTRONIC
WATER LEVEL INDICATOR.



**PUMPING WELL MW-6D HYDROGRAPH FOR
PUMPING TEST AT MONITORING WELL MW-6D
NOVEMBER 5-6, 1992**

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

H-16

TUT 002 1491

DWG DATE: 24MAY93

PRJCT NO.: PR01301

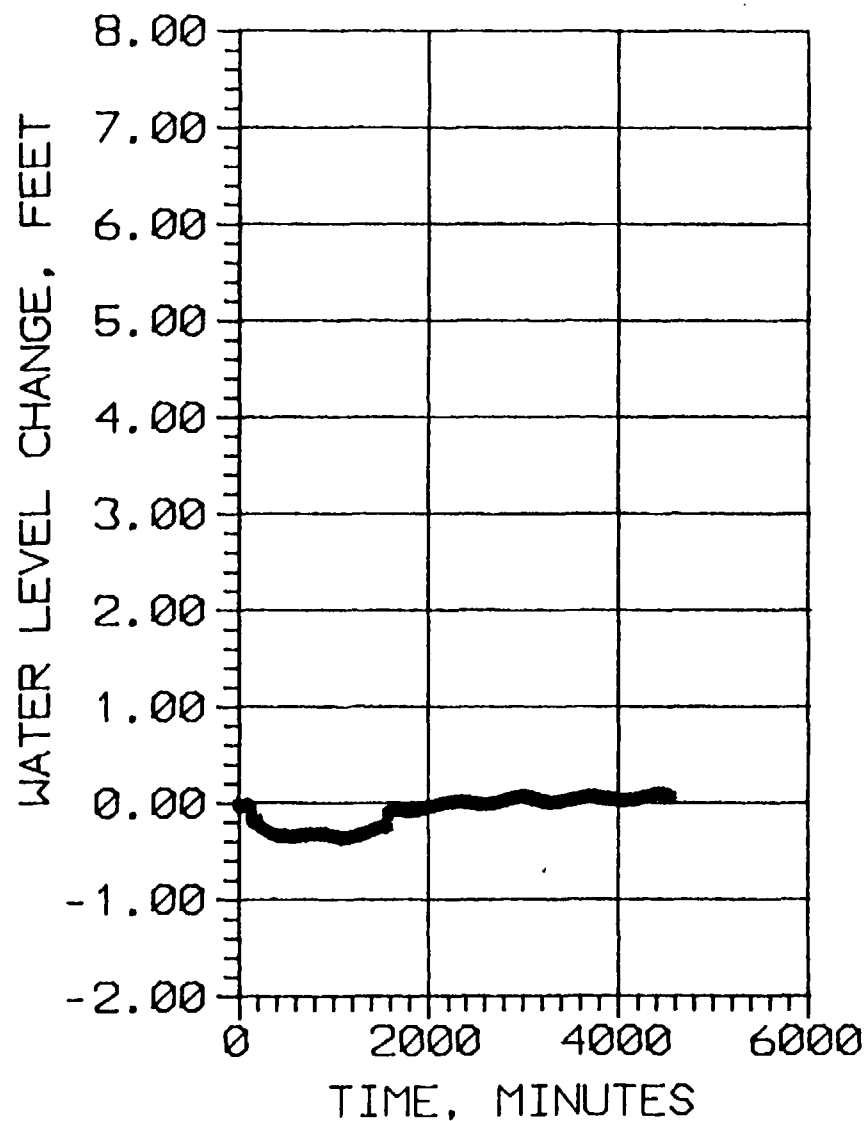
FILE: TU-205

DRAWING: TU-205

CHECKED: J. BURDICK

APPROVED: T. DANAHY

DRAFTER: K. MC CANN



PUMPING WELL: MW-6D
PUMPING RATE: 14 GPM
PUMP ON: 10:30 11/5/92
PUMP OFF: 10:30 11/6/92

TIME ZERO: 8:23 11/5/92

DISTANCE BETWEEN
PUMPING WELL AND
OBSERVATION WELL:
10 FEET

WATER LEVELS WERE
MEASURED MANUALLY
USING AN ELECTRONIC
WATER LEVEL METER.



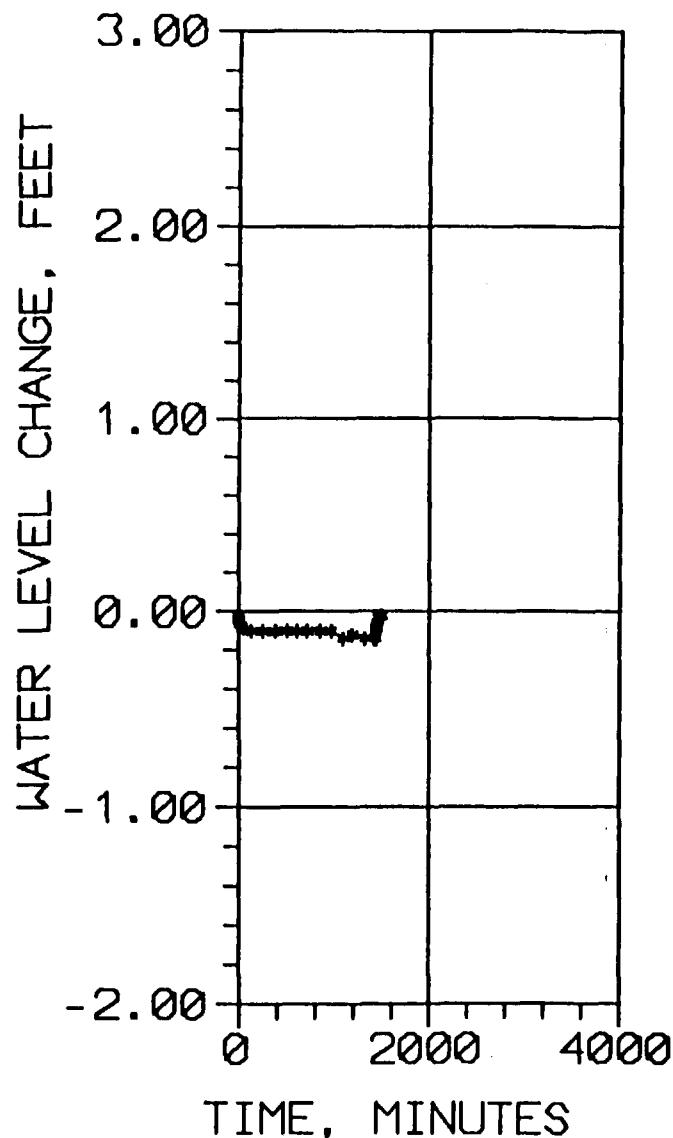
**OBSERVATION WELL MW-6R HYDROGRAPH FOR
PUMPING TEST AT MONITORING WELL MW-6D
NOVEMBER 5-6, 1992**

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S VIRGIN ISLANDS

FIGURE

H-17

TUT 002 1492



PUMPING WELL: MW-6D
PUMPING RATE: 14 GPM
PUMP ON: 10:30 11/5/92
PUMP OFF: 10:30 11/6/92

TIME ZERO: 10:30 11/5/92

DISTANCE BETWEEN
PUMPING WELL AND
OBSERVATION WELL:
105 FEET

WATER LEVELS WERE
MEASURED MANUALLY
USING AN ELECTRONIC
WATER LEVEL METER.

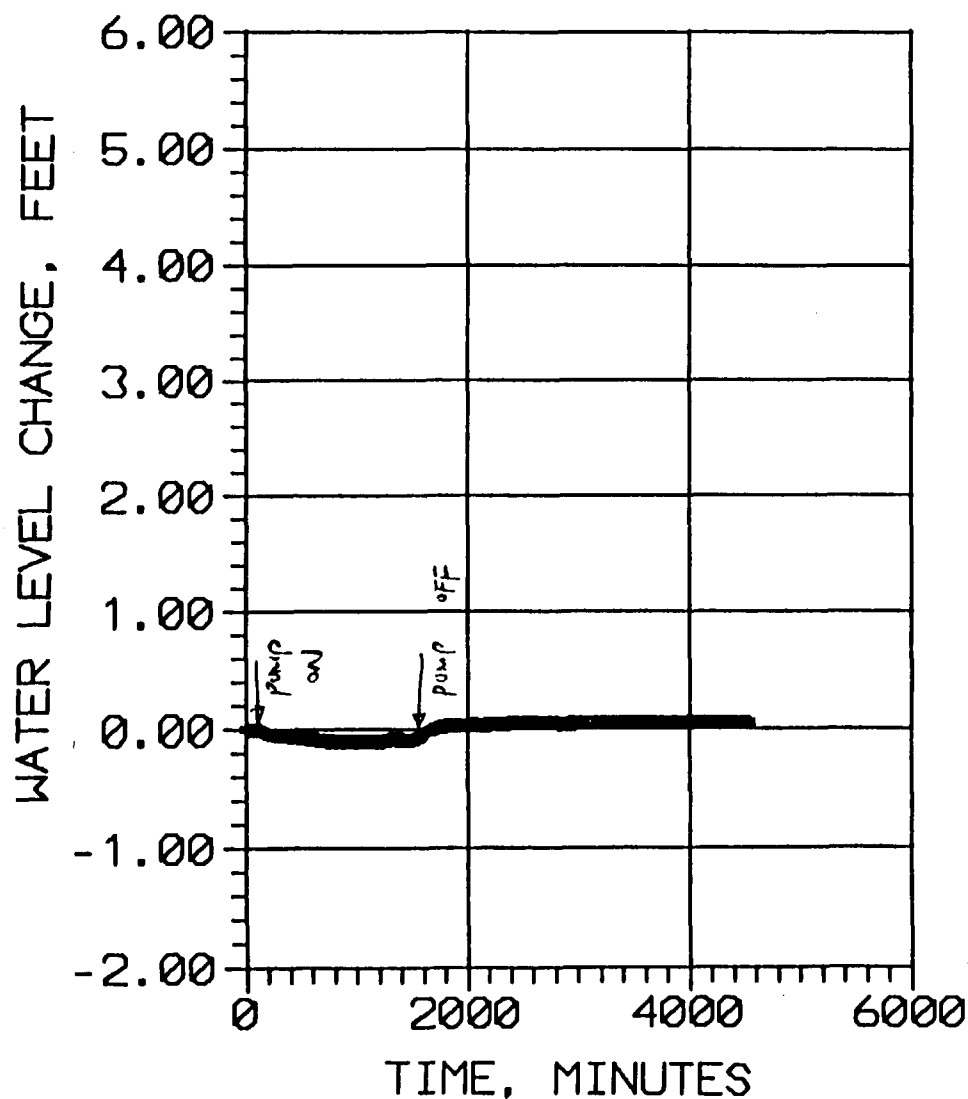


**OBSERVATION WELL CHT-6D HYDROGRAPH FOR
PUMPING TEST AT MONITORING WELL MW-6D
NOVEMBER 5-6, 1992**

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

H-18



PUMPING WELL: MW-6D
PUMPING RATE: 14 GPM
PUMP ON: 10:30 11/5/92
PUMP OFF: 10:30 11/6/92

TIME ZERO: 8:30 11/5/92

DISTANCE BETWEEN
PUMPING WELL AND
OBSERVATION WELL:
227 FEET

WATER LEVELS WERE
MEASURED MANUALLY
USING AN ELECTRONIC
WATER LEVEL METER.



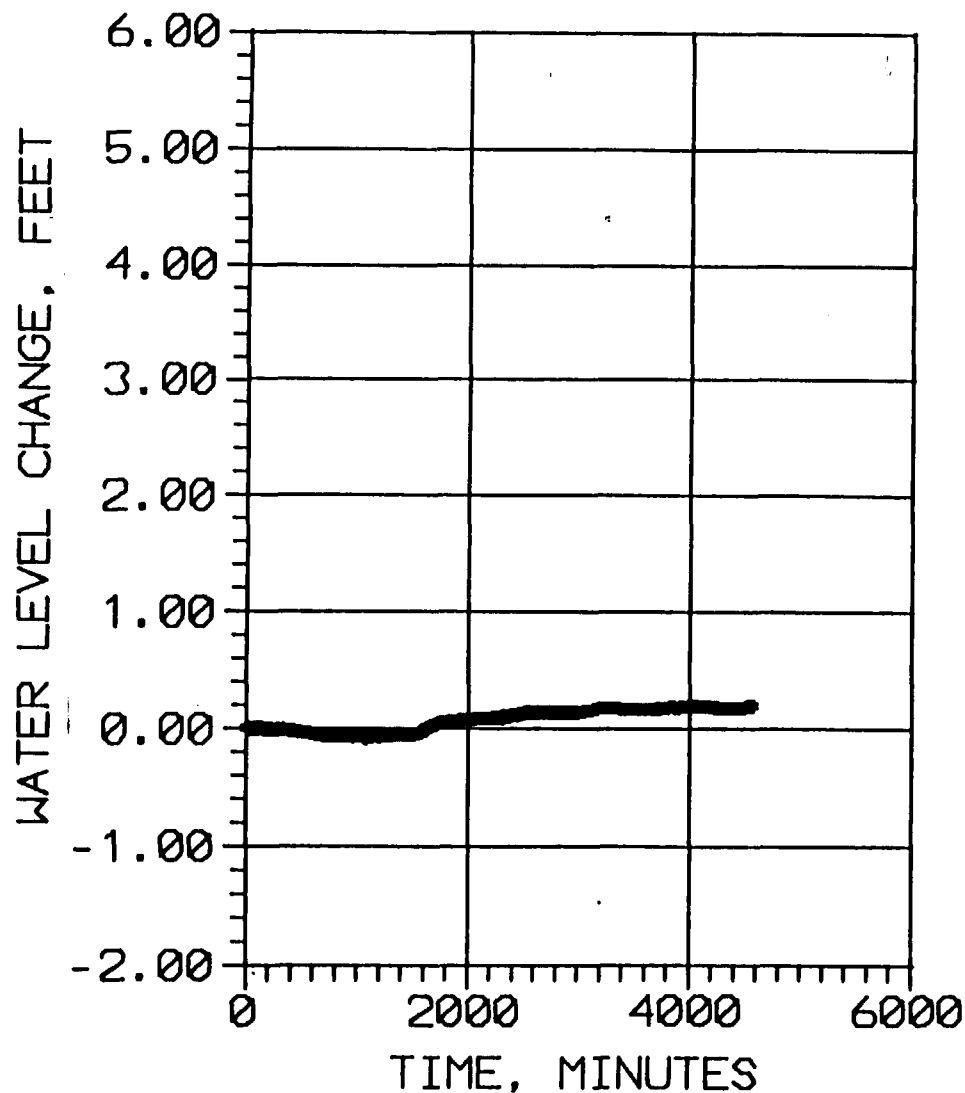
GERAGHTY
& MILLER, INC.
Environmental Services

**OBSERVATION WELL MW-7 HYDROGRAPH FOR
PUMPING TEST AT MONITORING WELL MW-6D
NOVEMBER 5-6, 1992**

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

H-19

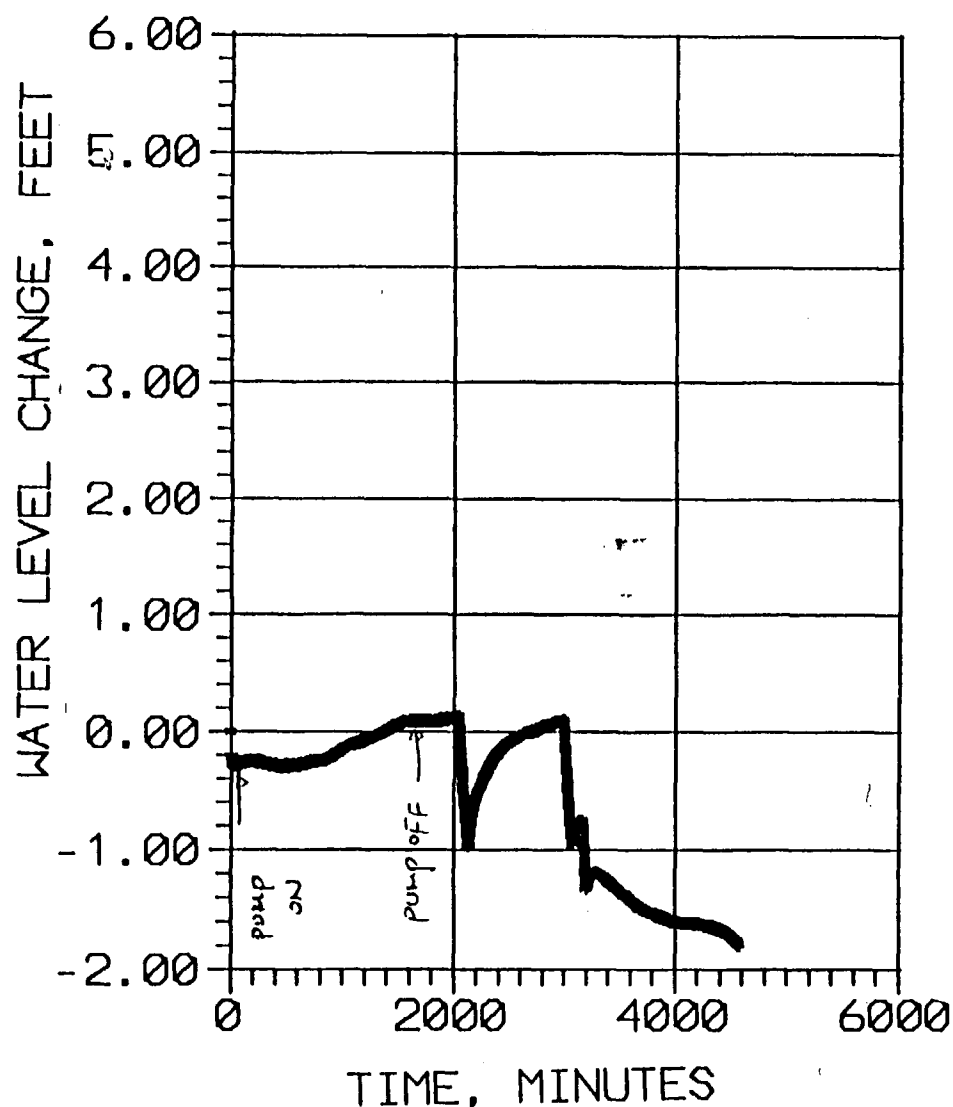


PUMPING WELL: MW-6D
PUMPING RATE: 14 GPM
PUMP ON: 10:30 11/5/92
PUMP OFF: 10:30 11/6/92

TIME ZERO: 8:00 11/5/92

DISTANCE BETWEEN
PUMPING WELL AND
OBSERVATION WELL:
305 FEET

WATER LEVELS WERE
MEASURED MANUALLY
USING AN ELECTRONIC
WATER LEVEL METER.



PUMPING WELL: MW-6D
PUMPING RATE: 14 GPM
PUMP ON: 10:30 11/5/92
PUMP OFF: 10:30 11/6/92

TIME ZERO: 8:00 11/5/92

DISTANCE BETWEEN
PUMPING WELL AND
OBSERVATION WELL:
722 FEET

WATER LEVELS WERE
MEASURED MANUALLY
USING AN ELECTRONIC
WATER LEVEL METER.



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**OBSERVATION WELL MW-12D HYDROGRAPH FOR
PUMPING TEST AT MONITORING WELL MW-6D
NOVEMBER 5-6, 1992**

TUTU SERVICE STATION INVESTIGATION
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE

H-21

APPENDIX I
SOILS DATA VALIDATION REPORT

APPENDIX I

SOILS DATA VALIDATION REPORT

Appendix I includes the data validation summary and the supporting documentation generated during the analytical data review of soil samples collected from June to August 1992 for the Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands. The soils were analyzed by Enseco East (Enseco) of Somerset, New Jersey.

REPORT FORMAT

The data validation report is divided in the following sections:

- Introduction.
- Attachment I1 - The U.S. Environmental Protection Agency (USEPA) Standard Operating Procedure (SOP) Number (No.) HW-6 (Revision No. 8) Contract Laboratory Program (CLP) organics data review and preliminary review checklist, and the data assessment narrative.
- Attachment I2 - The USEPA SOP No. HW-2 (Revision No. 11) "Evaluation of Metals Data for the CLP" total review inorganics checklist and the data assessment narrative for the target analyte list (TAL).
- Attachment I3 - Tables associated with the validation checklists and narratives.

The introduction summarizes (1) the field investigation sampling effort, (2) the analytical parameters and methods employed in support of the field investigation, (3) the data validation requirements and validation protocols used for the data assessment, and (4) an overall assessment.

Attachment I1 is comprised of the USEPA Region II SOP No. HW-6 (Revision No. 8) CLP organics preliminary data review checklist and the data assessment narrative (USEPA 1992a). The data review checklist guides the data reviewer in evaluating pertinent field and

laboratory sample documentation and analytical procedures. By evaluating critical quality control (QC) criteria, the data reviewer determines the validity of the analytical data and places limitations on data use. In the data assessment narrative, the data reviewer summarizes the validation, discusses sample anomalies and QC outliers, and provides an overall assessment of the analytical data generated in support of the field investigation.

Attachment I2 is comprised of the USEPA Region II SOP No. HW-2 (Revision No. 11) data review checklist and associated narrative for the evaluation of CLP inorganics (USEPA 1992b).

In Attachment I3, tables are provided that summarize sample identification/delivery groups; holding time non-compliance; associated trip blank, field blank, and method blank contamination; calibration outliers; and matrix spike outliers.

INTRODUCTION

This report represents the data validation and narrative summary for 47 soil samples (including four field replicates [FR]), 25 field blanks, 26 trip blanks, one field-decontamination water blank, two matrix spikes (MS), two matrix spike duplicates (MSD), and two matrix duplicate samples collected from June to August 1992 for the Tutu Service Station Investigation.

SAMPLING

The samples were collected during the period of June 4, 1992 to August 19, 1992. They were delivered to the laboratory in 24 sample delivery groups (SDGs). An SDG and sample identification (ID) summary is provided in Table I3-1 (Attachment I3).

Three replicate soil samples were collected and provided to the laboratory with blind field identifications. The field replicates were collected at a frequency of 10 percent of the total field sample number. The sample/field replicate pairs were as follows:

<u>Sample ID</u>	<u>Field Replicate ID</u>	<u>Report ID</u>
MW-7	MW-100	MW-7 FR
B-8	MW-101	B-8 FR
MW-2	MW-102	MW-2 FR
B-14	MW-103	B-14 FR
SS-6	SS-7	SS-6 FR

Field blanks and trip blanks were prepared daily and accompanied each SDG shipment with the exception of SDG 22688. In some SDGs, more than one field blank was delivered with the sample shipment since the SDG contained samples collected on more than one collection date. In these instances, only one trip blank was delivered with the SDG. SDG 22688 contained the field-decontamination water blank (FIREHOUSE - WAPA) and was collected without the use of field equipment. Therefore, a field blank was not required for this SDG.

ANALYSIS

Samples collected during the field investigation were analyzed for the target compound list (TCL) volatile organic compounds (VOCs), 1,2-dibromoethane (EDB), n-propylbenzene, methyl tert-butyl ether (MTBE), TCL semivolatiles (i.e., base neutral and acid extractable compounds [BNA]), TAL metals, cyanide, and total petroleum hydrocarbons (TPH).

All VOC and BNA analyses were performed in accordance with the USEPA March 1990 CLP organic routine analytical services (RAS) Statement of Work (SOW) (USEPA 1990a). The SOW was modified during the VOC analysis in order to analyze and quantitate EDB, MTBE, and n-propylbenzene.

For TAL metals and cyanide analyses, the USEPA March 1990 inorganic SOW protocols were used for the quantitation of TAL analytes (USEPA 1990b).

For the analysis of TPH in field blank samples, preparation and instrumental analysis was performed in accordance with USEPA Method 418.1 in *Methods of Chemical Analysis of Water*

and Wastes (USEPA 1983). Soil samples for TPH analysis were prepared in accordance with the U.S. Army Corps of Engineers (USACOE) Oil and Grease Method CE81-1 following the infrared (IR) analysis option (Plumb 1981). The extract generated using the USACOE sediment preparation was analyzed in accordance with the IR instrumental procedure of USEPA Method 418.1 (USEPA 1983) starting at procedural step 7.6.

DATA VALIDATION

All VOC, BNA, metals, and cyanide data were validated in accordance with the USEPA Region II data validation guidelines for organic and inorganic analyses performed in accordance with CLP RAS protocols. The guidelines for organics and inorganics are provided in the regional SOP No. HW-6, Revision 8, and No. HW-2, Revision No. 11, respectively (USEPA 1992a; 1992b).

Data validation of TPH data was performed according to the criteria specified in USEPA Method 418.1 (USEPA 1983) and in accordance with the following guidelines:

- Method and/or reagent blanks - Reported concentration should be less than the quantitation limit. Blanks, including field blanks, associated with field samples were reviewed for contamination. Sample results were evaluated using a five times (5x) multiplier of the highest concentration associated TPH blank.
- Precision of duplicates - Acceptance precision was demonstrated by calculation of relative percent difference (RPD) with a limit of 20 percent. For calculated RPD between 20 to 40 percent, all associated sample data for the analytical batch was estimated and qualified with a "J" flag.
- Accuracy of matrix spike - Acceptable accuracy was demonstrated by percent recovery (%R) of MS and MSD in the acceptance window range of 80 to 120

percent. For %R values outside of the 80 to 120 window, but within 50 to 150 %R, associated sample data was qualified as estimated.

- Accuracy of laboratory control spikes - Acceptable %R of blank spikes was within the window of 80 to 120 percent. For %R values outside of the 80 to 120 window, but within 50 to 150 %R, associated sample data in the SDG were qualified as estimated concentrations.

OVERALL ASSESSMENT

Overall, the data submitted by Enseco-East are of good quality and demonstrate acceptable precision, accuracy, and completeness.

ORGANICS DATA REVIEW SUMMARY

Some data generated for the VOC and BNA organic analyses have been negated for blank contamination and estimated for holding time, calibration criteria, surrogate and MS/MSD recoveries, and for sample disposition issues. The following organic data were determined unusable due to QC outliers and/or sample disposition issues:

- The BNA data for samples SS-3 and its reanalysis (SS-3 RE), SS-4, and SS-6 due to holding time exceedances.
- The 2,4-dinitrophenol data in sample SS-6 (already rejected for exceeded holding time) and method blank SMB-25SEP92A due to a deficient response factor in the BNA continuing calibration check.
- The 3,3-dichlorobenzidine data in field samples B-4, MW-1D, MW-4D; field blanks FB060492, FB060592, FB060992; and method blanks WB-10JUN92C,

WB-11JUN92B, SB-10JUN92C, and SB-12JUN92B due to poor precision in the associated BNA continuing calibration check.

- The volatile data for the field blanks collected on July 21, 1992 (FB072192) and August 14, 1992 (FB081492) and the trip blank collected on August 14, 1992 (TB081492) due to sample disposition upon receipt at the laboratory.

INORGANICS DATA REVIEW SUMMARY

In the data review of TAL inorganics, some data were estimated for the following criteria: sample preservation, calibration, precision and accuracy outliers, and serial dilution. The following data were determined unusable because of QC outliers:

- The arsenic result for sample MW-3 because the method of standard addition (MSA) correlation coefficient was less than 0.990 for both runs.
- The lead results for samples B-8 and MW-5 due to high contract required detection limit (CRDL) standard spike recoveries.

REFERENCES

- Plumb, R.H. 1981. Procedures for Handling and Chemical Analysis of Sediment and Water Samples. Prepared for the U.S. Environmental Protection Agency and Corps of Engineers Technical Committee on Criteria for Dredged and Fill Material, May 1981.
- U.S. Environmental Protection Agency (USEPA). 1983. Methods of Chemical Analysis of Water and Wastes, EPA-600/4-7-90-020, United States Environmental Protection Agency, Cincinnati, Ohio, March 1983.
- U.S. Environmental Protection Agency (USEPA). 1990a. USEPA Contract Laboratory Program, Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, SOW No. 3/90 including Rev. 12/90 and 2/91, United States Environmental Protection Agency, March 1990.
- U.S. Environmental Protection Agency (USEPA). 1990b. USEPA Contract Laboratory Program, Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration, SOW No. 3/90, United States Environmental Protection Agency, March 1990.
- U.S. Environmental Protection Agency (USEPA). 1992a. Evaluation of Organic Data for the Contract Laboratory Program (CLP), Region II Standard Operating Procedure No. HW-6, Revision No. 8, United States Environmental Protection Agency, January 1992.
- U.S. Environmental Protection Agency (USEPA). 1992b. Evaluation of Metals Data for the Contract Laboratory Program (CLP), Region II Standard Operating Procedure No. HW-2, Revision No. 11, United States Environmental Protection Agency, January 1992.

LG/tj:lcb:ar
Tuturi-wp DV/030293.rpt

ATTACHMENT II
ORGANIC DATA VALIDATION REPORT

TUT 002 1505

SOP NO. HW-6
Revision #8

CLP ORGANICS DATA REVIEW
AND PRELIMINARY REVIEW

BY: Leon Lazarus
Leon Lazarus, Environmental Scientist
Toxic and Hazardous Waste Section

Date: January 2, 1992

BY: George Karras
George Karras, Chemist
Toxic and Hazardous Waste Section

Date: January 3, 1992

BY: Stelios Gerazounis
Stelios Gerazounis, Chemist
Toxic and Hazardous Waste Section

Date: 1/3/92

CONCURRED BY: Kevin W. Kubik
Kevin Kubik, Chief
Toxic and Hazardous Waste Section

Date: 1/3/92

APPROVED BY: Robert Runyon
Robert Runyon, Chief
Monitoring Management Branch

Date: 1/7/92

TUT 002 1506

STANDARD OPERATING PROCEDURE

Title: CLP Organics Data Review
and Preliminary Review

Page 1 of 61

Date: January 1992
Number HW-6
Revision: 8

YES NO N/A

PACKAGE COMPLETENESS AND DELIVERABLES

CASE NUMBER: N/A

LAB: Enseco, Inc.

SITE: Tutu Service Station Investigation (Soil Data)

1.0 DATA COMPLETENESS AND DELIVERABLES

- 1.1 Have any missing deliverables been received and added to the data package?

☒ ☐ ☐

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If lab cannot provide them, note the effect on review of the package under the "Contract Problems/Non-Compliance" section of reviewer narrative.

- 1.2 Was SMO CCS checklist included with package?

☐ ☐ ☒

2.0 COVER LETTER SDG NARRATIVE

- 2.1 Is the Narrative or Cover Letter Present?

☒ ☐ ☐

- 2.2 Are Case Number and/or SAS number contained in the Narrative or Cover letter?

☐ ☐ ☒

3.0 DATA VALIDATION CHECKLIST

The following checklist is divided into three parts.
Part A is filled out if the data package contains any VOA analyses, Part B for any BNA analyses and Part C for Pesticide/PCBs.

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YES NO N/A

3.0 DATA VALIDATION CHECKLIST (continued)

Does this package contain:

VOA Data? X

BNA Data? X

Pesticide/PCB data? X

ACTION: Complete corresponding parts of checklist.

PART A: VOA ANALYSES

1.0 TRAFFIC REPORTS AND LABORATORY NARRATIVE

1.1 Are the Traffic Report Forms present for all samples? [X]

ACTION: If no, contract lab for replacement of missing or illegible copies.

1.2 Do the Traffic Reports or Lab Narrative indicate any problems with sample receipt, condition of samples, analytical problems or special circumstances affecting the quality of the data? X []

ACTION: If any sample analyzed as a soil, other than TCLP, contains 50%-90% water, all data should be flagged as estimated (J). If a soil sample other than TCLP contains more than 90% water, all data should be qualified as unusable (R).

ACTION: If samples were not iced upon receipt at the laboratory, flag all positive results "J" and all Non-Detects "UJ".

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YES NO N/A

ACTION: If both VOA vials for a sample have air bubbles or the VOA vial analyzed had air bubbles, flag all positive results "J" and all non-detects "R".

2.0 HOLDING TIMES

- 2.1 Have any VOA technical holding times, determined from date of collection to date of analysis, been exceeded?

X ☐ ☐

If unpreserved, aqueous samples maintained at 4°C which are to be analyzed for aromatic hydrocarbons must be analyzed within 7 days of collection. If preserved with HCl (pH < 2) and stored at 4°C, then aqueous samples must be analyzed within 14 days of collection. If uncertain about preservation, contact sampler to determine whether or not samples were preserved.

The holding time for soils is 10 days.

Table of Holding Time Violations (See Table I3-2)

Sample ID	Sample Matrix	Preserved?	Date Sampled	Date Lab Received	Date Analyzed
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

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YES NO N/A

ACTION: If technical holding times are exceeded, flag all positive results as estimated ("J") and sample quantitation limits as estimated ("UJ"), and document in the narrative that holding times were exceeded. If analyses were done more than 14 days beyond holding time, either on the first analysis or upon re-analysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. At a minimum, all results must be qualified "J", but the reviewer may determine that non-detect data are unusable (R). If holding times are exceeded by more than 28 days, all non detect data are unusable (R).

3.0 System Monitoring Compound (SMC) Recovery (Form II)

3.1 Are the VOA SMC Recovery Summaries (Form II) present for each of the following matrices:

a.	Low Water	☒	___	___
b.	Low Soil	☒	___	___
c.	Med Soil	☐	___	<u>X</u>

3.2 Are all the VOA samples listed on the appropriate System Monitoring Compound Recovery Summary for each of the following matrices:

a.	Low Water	☒	___	___
b.	Low Soil	☒	___	___
c.	Med Soil	☐	___	<u>X</u>

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YES NO N/A

ACTION: Call lab for explanation/resubmittals. If missing deliverables are unavailable, document effect in data assessments.

3.3 Were outliers marked correctly with an asterisk?

☒ ☐ ☐

ACTION: Circle all outliers in red.

3.4 Was one or more VOA system monitoring compound recovery outside of contract specifications for any sample or method blank?

☒ ☐ ☐

If yes, were samples re-analyzed?

☒ ☐ ☐

Were method blanks re-analyzed?

☐ ☐ ☒

ACTION: If recoveries are > 10% but 1 or more compounds fail to meet SOW specifications:

1. All positive results are qualified as estimated (J).
2. Flag all non-detects as estimated detection limits ("UJ") where recovery is less than the lower acceptance limit.
3. If SMC recoveries are above allowable levels, do not qualify non-detects.

If any system monitoring compound recovery is < 10%:

1. Flag all positive results as estimated ("J").
2. Flag all non-detects as unusable ("R").

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YES NO N/A

Professional judgement should be used to qualify data that only have method blank SMC recoveries out of specification in both original and re-analyses. Check the internal standard areas.

- 3.5 Are there any transcription/calculation errors between raw data and Form II? _____ ☒ _____

ACTION: If large errors exist, call lab for explanation/resubmittal, make any necessary corrections and not errors in the data assessment.

4.0 Matrix Spikes (Form III)

- 4.1 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form (Form III) present? ☒ _____

- 4.2 Were matrix spikes analyzed at the required frequency for each of the following matrices:

a. Low Water	☐ _____	☒
b. Low Soil	☒ _____	_____
c. Med Soil	☐ _____	☒

ACTION: If any matrix spike data are missing, take the action specified in 3.2 above.

- 4.3 How many VOA spike recoveries are outside QC limits?

Water Soils

N/A out of 10 0 out of 20

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YES NO N/A

- 4.4 How may RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits?

Water

Soils

N/A out of 5 0 out of 10

ACTION: No action is taken based on MS/MSD data alone. However, using informed professional judgement, the MS/MSD results may be used in conjunction with other QC criteria to determine the need for qualification of the data.

5.0 Blanks (Form IV)

- 5.1 Is the Method Blank Summary (Form IV) present? ☒ ☐ ☐
- 5.2 Frequency of Analysis: for the analysis of VOA TCL compounds, has a reagent/method blank been analyzed for each SDG or every 20 samples of similar matrix (low water, low soil, medium soil), whichever is more frequent? ☒ ☐ ☐
- 5.3 Has a VOA method/instrument blank been analyzed at least once every twelve hours for each concentration level and GC/MS system used? ☒ ☐ ☐

ACTION: If any method blank data are missing, call lab for explanation/resubmittal. If method blank data are not available, reject (R) all associated positive data. However, using professional judgement, the data reviewer may substitute field blank or trip blank data for missing method blank data.

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YES NO N/A

- 5.4 Chromatography: review the blank raw data - chromatograms (RICs), quant reports or data system printouts and spectra.

Is the chromatographic performance (baseline stability) for each instrument acceptable for VOAs?

☒ ☐ ☐

ACTION: Use professional judgement to determine the effect on the data.

6.0 Contamination

NOTE: "Water Blanks", "drill blanks", and "distilled water blanks" are validated like any other sample, and are not used to qualify data. Do not confuse them with the other QC blanks discussed below.

- 6.1 Do any method/instrument/reagent blanks have positive results (TCL and/or TIC) for VOAs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample dilution factor and corrected for % moisture when necessary.

☒ ☐ ☐

- 6.2 Do any field/trip/rinse blanks have positive VOA results (TCL and/or TIC)?

☒ ☐ ☐

ACTION: Prepare a list of the sample associated with each of the contaminated blanks. (Attach a separate sheet).

NOTE: All field blank results associated to a particular group of samples (may exceed one per case) must be used to qualify data. Trip blanks are used to qualify only those samples with which they were shipped and are not required for non-aqueous matrices. Blanks may not be qualified

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YES NO N/A

because of contamination in another blank. Field blanks & Trip blanks must be qualified for system monitoring compound, instrument performance criteria, spectral or calibration QC problems.

ACTION: Follow the directions in the table below to qualify TCL results due to contamination. Use the largest value from all the associated blanks. If any blanks are grossly contaminated, all associated data should be qualified as unusable (R).

	Sample conc > CRQL but < 10 x blank value	Sample conc < CRQL & < 10x blank value	Sample conc > CRQL & > 10x blank value
Methylene Chloride Acetone Toluene 2-Butanone	Flag sample result with a "U"	Report CRQL & qualify "U"	No qualification is needed
	Sample conc > CRQL but < 5x blank	Sample conc < CRQL & is < 5x blank value	Sample conc > CRQL value & > 5x blank value
Other Contam- inants	Flag sample result with a "U"	Report CRQL & qualify "U"	No qualification is needed

NOTE: Analytes qualified "U" for blank contamination are still considered as "hits" when qualifying for calibration criteria.

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YES NO N/A

ACTION: For TIC compounds, if the concentration in the sample is less than five times the concentration in the most contaminated associated blank, flag the sample data "R" (unusable)

- 6.3 Are there field/rinse/equipment blanks associated with every sample?

☒ ☐ ☐

ACTION: For low level samples, note in data assessment that there is no associated field/rinse/equipment blank. Exception: samples taken from a drinking water tap do not have associated field blanks.

7.0 GC/MS Instrument Performance Check (Form V)

- 7.1 Are the GC/MS instrument Performance Check Forms (Form V) present for Bromofluorobenzene (BFB)?

☒ ☐ ☐

- 7.2 Are the enhanced bar graph spectrum and mass/charge (m/z) listing for the BFB provided for each twelve hour shift?

☒ ☐ ☐

- 7.3 Has an instrument performance compound been analyzed for every twelve hours of sample analysis per instrument?

☒ ☐ ☐

ACTION: List date, time, instrument ID, and sample analysis for which no associated GC/MS tuning data are available.

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YES NO N/A

DATE	TIME	INSTRUMENT	SAMPLE NUMBERS
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

ACTION: If lab cannot provide missing data, reject ("R") all data generated outside an acceptable twelve hour calibration interval.

7.4 Have the ion abundances been normalized to m/z 95? ☒ _____

ACTION: If mass assignment is in error, qualify all associated data as unusable (R).

7.5 Have the ion abundance criteria been met for each instrument used? ☒ _____

ACTION: List all data which do not meet ion abundance criteria (attach a separate sheet).

ACTION: If ion abundance criteria are not met, the Region II TPO must be notified.

7.6 Are there any transcription/calculation errors between mass lists and Form Vs? (Check at least two values but if errors are found, check more). _____ ☒ _____

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-
	YES	NO	N/A
7.7 Have the appropriate number of significant figures (two) been reported?	☐	☒	☐
ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary necessary corrections and document effect in data assessment.			
7.8 Are the spectra of the mass calibration compound acceptable?	☒	☐	☐
ACTION: Use professional judgement to determine whether associated data should be accepted, qualified, or rejected.			
8.0 <u>Target Compound List (TCL) Analytes</u>			
8.1 Are the Organic Analysis Data Sheets (Form I VOA) present with required header information on each page, for each of the following:			
a. Samples and/or fractions as appropriate	☒	☐	☐
b. Matrix spikes and matrix spike duplicates	☒	☐	☐
c. Blanks	☒	☐	☐
8.2 Are the VOA Reconstructed Ion Chromatograms, the mass spectra for the identified compounds, and the data system printouts (Quant Reports) included in the sample package for each of the following?			
a. Samples and/or fractions as appropriate	☒	☐	☐

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	YES	NO	N/A
b. Matrix spikes and matrix spike duplicates (Mass spectra not required)	☒	___	___
c. Blanks	☒	___	___
ACTION: If any data are missing, take action specified in 3.2 above.			
8.3 Are the response factors shown in the Quant Report?	☐	☒	___
8.4 Is chromatographic performance acceptable with respect to:			
Baseline stability?	☒	___	___
Resolution?	☒	___	___
Peak shape?	☒	___	___
Full-scale graph (attenuation)?	☒	___	___
Other: _____	☐	___	☒
ACTION: Use professional judgement to determine the acceptability of the data.			
8.5 Are the lab-generated standard mass spectra of the identified VOA compounds present for each sample?	☒	___	___
ACTION: If any mass spectra are missing, take action specified in 3.2 above. If lab does not generate their own standard spectra, make note in "Contract Problems/Non-compliance".			
8.6 Is the RRT of each reported compound within 0.06 RRT units of the standard RRT in the continuing calibration?	☐	☒	___

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	YES	NO	N/A
8.7 Are all ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the sample mass spectrum?	☒	___	___
8.8 Do sample and standard relative ion intensities agree within 20%?	☒	___	___

ACTION: Use professional judgement to determine acceptability of data. If it is determined that incorrect identifications were made, all such data should be rejected (R), flagged "N" (presumptive evidence of the presence of the compound) or changed to not detected (U) at the calculated detection limit. In order to be positively identified, the data must comply with the criteria listed in 8.6, 8.7, and 8.8.

ACTION: When sample carry-over is a possibility, professional judgement should be used to determine if instrument cross-contamination has affected any positive compound identification.

9.0 Tentatively Identified Compounds (TIC)

9.1 Are all Tentatively Identified Compound Forms (Form I Part B) present; and do listed TICS include scan number or retention time, estimated concentration and "JN" qualifier?	☐	☒	___
9.2 Are the mass spectra for the tentatively identified compounds and associated "best match" spectra included in the sample package for each of the following:			
a. Samples and/or fractions as appropriate	☒	___	___
b. Blanks	☒	___	___

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YES NO N/A

ACTION: If any TIC data are missing, take action specified in 3.2 above.

ACTION: Add "JN" qualifier if missing.

- 9.3 Are any TCL compounds (from any fraction) listed as TIC compounds (example: 1,2-dimethylbenzene is xylene-a VOA TCL analyte - and should not be reported as a TIC)?

___ ☒ ___

ACTION: Flag with "R" any TCL compound listed as a TIC.

- 9.4 Are all ions present in the reference mass spectrum with a relative intensity greater than 10% also present in the sample mass spectrum?

☒ ___

- 9.5 Do TIC and "best match" standard relative ion intensities agree within 20%?

☒ ___

ACTION: Use professional judgement to determine acceptable of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some less specific identification (example: "C3 substituted benzene") as appropriate.

Also, when a compound is not found in any blank, but is detected in a sample and is a suspected artifact of a common laboratory contaminant, the result should be qualified as unusable (R). (i.e. Common Lab Contaminants: Co₂ (M/E 44), Siloxanes (M/E 73) Hexane, Aldol Condensation

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YES NO N/A

Products, Solvent Preservatives, and related by products - see Functional Guidelines for more guidance).

10.0 Compound Quantitation and Reported Detection Limits

- 10.1 Are there any transcription/calculation errors in Form I results? Check at least two positive values. Verify that the correct internal standard, quantitation ion, and RRF were used to calculate Form I result. Were any errors found?

___ ☒ ___

- 10.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, sample moisture?

☒ ___ ___

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and note errors under "Conclusions".

ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" and its associated value on the original Form I and substituting the data from the analysis of the diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.

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YES NO N/A

11.0 Standards Data (GC/MS)

- 11.1 Are the Reconstructed Ion Chromatograms, and data system printouts (Quant. Reports) present) for initial and continuing calibration?

☒ ☐ ☐

ACTION: If any calibration standard data are missing, take action specified in 3.2 above.

12.0 GC/MS Initial Calibration (Form VI)

- 12.1 Are the Initial Calibration Forms (Form VI) present and complete for the volatile fraction at concentrations 10, 20, 50, 100, 200 ug/l? Are there separate calibrations for low water/med soils and low soil samples?

☒ ☐ ☐

ACTION: If any calibration standard forms are missing, take action specified in 3.2 above.

- 12.2 Were all low level soil standards, blanks and samples analyzed by heated purge?

☐ ☒ ☐

ACTION: If low level soil samples were not heated during purge, qualify positive hits "J" and non-detects "R".

- 12.3 Are response factors stable for VOA's over the concentration range of calibration (% Relative Standard Deviation (%RSD) < 30.0%)?

☐ ☒ ☐

ACTION: Circle all outliers in red.

NOTE: Although 11 VOA compounds have a minimum RRF and no maximum %RSD, the technical criteria are the same for all analytes.

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YES NO N/A

ACTION: If %RSD > 30.0%, qualify associated positive results for that analyte "J" and non-detects using professional judgement. When RSD > 90%, flag all non-detects for that analyte R (unusable).

NOTE: Analytes previously qualified "U" for blank contamination are still considered as "hits" when qualifying for initial calibration criteria.

12.4 Are the RRFs above 0.05?

☒ ☐ ☐

ACTION: Circle all outliers in red.

ACTION: If any RRF are < 0.05, qualify associated non-detects (R) and flag associated positive data as estimated (J).

12.5 Are there any transcription/calculation errors in the reporting of average response factors (RRF) or %RSD? (check at least 2 values, but if errors are found, check more).

☐ ☒ ☐

13.0 GC/MS Continuing Calibration (Form VII)

13.1 Are the Continuing Calibration Forms (Form VII) present and complete for the volatile fraction?

☒ ☐ ☐

13.2 Has a continuing calibration standard been analyzed for every twelve hours of sample analysis per instrument?

☒ ☐ ☐

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YES NO N/A

ACTION: List below all sample analyses that were not within twelve hours of the previous continuing calibration analysis.

ACTION: If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation/resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R").

- 13.3 Do any volatile compounds have a % Difference (%D) between the initial and continuing RRF which exceeds the $\pm 25\%$ criteria?

X

ACTION: Circle all outliers in red.

ACTION: Qualify both positive results and non-detects for the outlier compound(s) as estimated. When % D is above 90%, reject all non-detects for that analyte (R) unusable.

- 13.4 Do any volatile compounds have a RRF < 0.05 ?

 X

ACTION: Circle all outliers in red.

ACTION: If the RRF < 0.05 , qualify associated non-detects as unusable (R) and "J" associated positive values.

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YES NO N/A

- 13.5 Are there any transcription/calculation errors in the reporting of average response factors (RRF) or % difference (%D) between initial and continuing RRFs? (Check at least two values but if errors are found, check more.)

___ ☒ ___

ACTION: Circle errors in red.

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and note errors under "Conclusions".

14.0 Internal Standard (Form VIII)

- 14.1 Are the internal standard areas (From VIII) of every sample and blank within the upper and lower limits (-50% to +100 %) for each continuing calibration.

☒ ___

ACTION: List all the outliers below.

Sample #	Internal Std	Area	Lower Limit	Upper Limit
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

(Attach additional sheets if necessary).

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YES NO N/A

ACTION:

1. If the internal standard area count is outside the upper or lower limit, flag with "J" all positive results quantitated with this internal standard.
2. Non-detects associated with IS area counts > 100% should not be qualified.
3. If IS area is below the lower limit (<50%), qualify all associated non-detects (U values) "J". If extremely low area counts are reported, (<25% or if performance exhibits a major abrupt drop off, flag all associated non-detects as unusable ("R").

- 14.2 Are the retention times of the internal standards within 30 seconds of the associated calibration standard?

[X] — —

ACTION: Professional judgement should be used to qualify data if the retention times differ by more than 30 seconds.

15.0 Field Duplicates

- 15.1 Were any field duplicates submitted for VOA analysis?

[X] — —

ACTION: Compare the reported results for field duplicates and calculate the relative percent difference.

ACTION: Any gross variation between duplicate results must be addressed in the reviewer narrative. However, if large differences exist, identification of field duplicates should be confirmed by contacting the sampler.

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YES NO N/A

PART B: BNA ANALYSES

1.0 Traffic Reports and Laboratory Narrative

- 1.1 Are the Traffic Report Forms present for all samples?

☒ ☐ ☐

ACTION: If no, contact lab for replacement of missing or illegible copies.

- 1.2 Do the Traffic Reports or Lab Narrative indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data?

☒ ☐ ☐

ACTION: If any sample analyzed as a soil, other than TCLP, contains 50%-90% water, all data should be flagged as estimated ("J"). If a soil sample, other than TCLP, contains more than 90% water, all data should be qualified as usable (R).

ACTION: If samples were not iced upon receipt at the laboratory, flag all positive results "J" and all non-detects "UJ".

2.0 Holding Times

- 2.1 Have any BNA technical holding times, determined from date of collection to date of extraction, been exceeded?

☒ ☐ ☐

Continuous extraction of water samples for BNA analysis be started within seven days of the date of collection. Soil/sediment samples must be extracted within 7 days of collection. Extracts must be analyzed within 40 days of the date of extraction.

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YES NO N/A

Table of Holding Time Violations (See Table I3-2)

(See Traffic Report)					
Sample	Sample Matrix	Date Stamped	Date Lab Received	Date Extracted	Date Analyzed
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

ACTION: If technical holding times are exceeded, flag all positive results as estimated ("J") and sample quantitation limits as estimated ("UJ"), and document in the narrative that holding times were exceeded.

If analyses were done more than 14 days beyond holding time, either on the first analysis or upon reanalysis, reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. At a minimum, all results should be qualified "J", but the reviewer may determine that non-detect data are unusable ("R"). If holding times are exceeded by more than 28 days, all non detect data are unusable (R).

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	YES	NO	N/A
3.0 Surrogate Recovery (Form II)			
3.1 Are the BNA Surrogate Recovery Summaries (Form II) present for each of the following matrices:			
a. Low Water	☒	☐	☐
b. Low Soil	☒	☐	☐
c. Med Soil	☒	☐	☐
3.2 Are all the BNA Samples listed on the appropriate Surrogate Recovery Summaries for each of the following matrices:			
a. Low Water	☒	☐	☐
b. Low Soil	☒	☐	☐
c. Med Soil	☒	☐	☐
<u>ACTION:</u> Call lab for explanation/resubmittals. If missing deliverables are unavailable, document effect in data assessments.			
3.3 Were outliers marked correctly with an asterisk?	☒	☐	☐
3.4 Were two or more base-neutral <u>OR</u> acid surrogate recoveries out of specification for any sample or method blank?	☒	☐	☐
If yes, were samples reanalyzed?	☒	☐	☐
Were method blanks reanalyzed?	☐	☐	☒

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YES NO N/A

ACTION: If all BNA surrogate recoveries are > 10% but two within the base-neutral or acid fraction do not meet SOW specifications, for the affected fraction only (i.e. base-neutral or acid compounds):

1. Flag all positive results as estimated ("J").
2. Flag all non-detects as estimated detection limits ("UJ") when recoveries are less than the lower acceptance limit.
3. If recoveries are greater than the upper acceptance limit, do not qualify non-detects.

If any base-neutral or acid surrogate has a recovery of < 10%:

1. Positive results for the fraction with < 10% surrogate recovery are qualified with "J".
2. Non-detects for that fraction should be qualified as unusable (R).

- 3.5 Are there any transcription/calculation errors between raw data and Form II?

___ [X] ___

ACTION: If large errors exist, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments.

4.0 Matrix Spikes (Form III)

- 4.1 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form (Form III) present?

[X] ___

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	YES	NO	N/A
4.2 Were matrix spikes analyzed at the required frequently for each of the following matrices:			
a. Low Water	☐	—	<u>X</u>
b. Low Soil	☒	—	—
c. Med Soil	☐	<u>X</u>	—

ACTION: If any matrix spike data are missing, take the action specified in 3.2 above.

4.3 How may BNA spike recoveries are outside QC limits?

<u>Water</u>	<u>Soils</u>
<u>N/A</u> out of 22	<u>2</u> out of 44

4.4 How may RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits?

<u>Water</u>	<u>Soils</u>
<u>N/A</u> out of 11	<u>1</u> out of 22

ACTION: No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer may use the matrix spike and matrix spike duplicate results in conjunction with other QC criteria and determine the need for some qualification of the data.

5.0 Blanks (Form IV)

5.1 Is the Method Blank Summary (Form IV) present?	☒	—	—

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	YES	NO	N/A
5.2 Frequency of Analysis:			
Has a reagent/method blank analysis been reported per 20 samples of similar matrix, or concentration level, and for each extraction batch?	☒	☐	☐
5.3 Has a BNA method blank been analyzed for each GC/MS system used?	☒	☐	☐
(See SOW p. D - 59/SV, Section 8.7)			
ACTION: If any method blank data are missing, call lab for explanation/resubmittal. If not available, use professional judgement to determine if the associated sample data should be qualified.			
5.4 Chromatography: review the blank raw data - chromatograms (RICs), quant reports or data system printouts and spectra.			
Is the chromatographic performance (baseline stability) for each instrument acceptable for BNAs?	☒	☐	☐
ACTION: Use professional judgement to determine the effect on the data.			
6.0 <u>Contamination</u>			
NOTE: "Water blank", "drill blanks" and "distilled water blanks" are validated like any other sample and are <u>not</u> used to qualify the data. Do not confuse them with the other QC blanks discussed below.			

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	YES	NO	N/A
6.1 Do any method/instrument/reagent blanks have positive results (TCL and/or TIC) for BNAs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample dilution factor and corrected for % moisture where necessary.	<u>X</u>	☐	☐
6.2 Do any field/rinse/blanks have positive BNA results (TCL and/or TIC)?	<u>X</u>	☐	☐

ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet).

NOTE: All field blank results associated to a particular group of samples (may exceed one per case) must be used to qualify data. Blanks may not be qualified because of contamination in another blank. Field Blanks must be qualified for surrogate, spectral, instrument performance or calibration QC problems.

ACTION: Follow the directions in the table below to qualify TCL results due to contamination. Use the largest value from all the associated blanks. If gross contamination exists, all data in the associated samples should be qualified as unusable (R).

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Sample conc > CRQL but < 10x blank	Sample conc < CRQL & is < 10x blank value	Sample conc > CRQL value & > 10x blank

Common Phthalate Esters

Flag sample result with a "U"	Report CRQL & qualify "U"	No qualification is needed

Sample conc > CRQL but < 5x blank	Sample conc < CRQL & is < 5x blank value	Sample conc > CRQL value & > 5 blank value

Other Contaminants

Flag sample result with a "U"	Report CRQL & qualify "U"	No qualification is needed.

YES NO N/A

NOTE: Analytes qualified "U" for blank contamination are still considered as "hits" when qualifying for calibration criteria.

ACTION: For TIC compounds, if the concentration in the sample is less than five times the concentration in the most contaminated associated blank, flag the sample data "R" (unusable).

6.3 Are there field/rinse/equipment blanks associated with every sample?

☒ ☐ ☐

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YES NO N/A

ACTION: For low level samples, note in data assessment that there is no associated field/rinse/equipment blank. Exception: samples taken from a drinking water tap do not have associated field blanks.

7.0 GC/MS Instrument Performance Check

7.1 Are the GC/MS Instrument Performance Check Forms (Form V) present for Decafluorotriphenylphosphine (DFTPP)?

☒ ☐ ☐

7.2 Are the enhanced bar graph spectrum and mass/charge (m/z) listing for the DFTPP provided for each twelve hour shift?

☒ ☐ ☐

7.3 Has an instrument performance check solution been analyzed for every twelve hours of sample analysis per instrument?

☒ ☐ ☐

ACTION: List date, time, instrument ID, and sample analyses for which no associated GC/MS tuning data are available.

DATE	TIME	INSTRUMENT	SAMPLE NUMBERS

_____	_____	_____	_____

_____	_____	_____	_____

_____	_____	_____	_____

ACTION: If lab cannot provide missing data, reject ("R") all data generated outside an acceptable twelve hour calibration interval.

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YES NO N/A

ACTION: If mass assignment is in error, flag all associated sample data as unusable (R).

ACTION: If mass assignment is in error, flag all associated sample data as unusable (R).

7.4 Have the ion abundance been normalized to m/z 198?

☒ ☐ ☐

7.5 Have the ion abundance criteria been met for each instrument used?

☒ ☐ ☐

ACTION: List all data which do not meet ion abundance criteria (attach a separate sheet).

7.6 Are there any transcription/calculation errors between mass lists and Form Vs?

☐ ☒ ☐

7.7 Have the appropriate number of significant figures (two) been reported?

☐ ☒ ☐

ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and document effect in data assessments.

7.8 Are the spectra of the mass calibration compound acceptable?

☒ ☐ ☐

ACTION: Use professional judgement to determine whether associated data should be accepted, qualified, or rejected.

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	YES	NO	N/A
8.0 <u>Target Compound List (TCL) Analytes</u>			
8.1 Are the Organic Analysis Data Sheets (Form I BNA) present with required header information on each page, for each of the following:			
a. Samples and/or fractions as appropriate	☒	___	___
b. Matrix spikes and matrix spike duplicates	☒	___	___
c. Blanks	☒	___	___
8.2 Has GPC cleanup been performed on all soil/sediment sample extracts?	☒	___	___
<u>ACTION:</u> If data suggests that GPC was not performed, use professional judgement. Make note in "Contract Problems/Non-Compliance".			
8.3 Are the BNA Reconstructed Ion Chromatograms, the mass spectra for the identified compounds, and the data system printouts (Quant Reports) included in the sample package for each of the following?			
a. Samples and/or fractions as appropriate	☒	___	___
b. Matrix spikes and matrix spike duplicates (Mass spectra not required)	☒	___	___
c. Blanks	☒	___	___
<u>ACTION:</u> If any data are missing, take action specified in 3.2 above.			

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	YES	NO	N/A
8.4 Are the response factors shown in the Quant Report?	☐	☒	☐
8.5 Is chromatographic performance acceptable with respect to:			
Baseline stability?	☒	☐	☐
Resolution?	☒	☐	☐
Peak shape?	☒	☐	☐
Full-scale graph (attenuation)?	☒	☐	☐
Other: _____	☐	☐	☒
ACTION: Use professional judgement to determine the acceptability of the data.			
8.6 Are the lab-generated standard mass spectra of identified BNA compounds present for each sample?	☒	☐	☐
ACTION: If any mass spectra are missing, take action specified in 3.2 above. If lab does not generate their own standard spectra, make note in "Contract Problems/ Non-compliance". If spectra are missing, reject all positive data.			
8.7 Is the RRT of each reported compound within 0.06 RRT units of the standard RRT in the continuing calibration?	☒	☐	☐
8.8 Are all ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the sample mass spectrum?	☒	☐	☐

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YES NO N/A

- 8.9 Do sample and standard relative ion intensities agree within 20%?

☒ ☐ ☐

ACTION: Use professional judgement to determine acceptability of data. if it is determined that incorrect identifications were made, all such data should be rejected (R), flagged "N" (Presumptive evidence of the presence of the compound) or changed to not detected (U) at the calculated detection limit. In order to be positively identified, the data must comply with the criteria listed in 8.7, 8.8, and 8.9.

ACTION: When sample carry-over is a possibility, professional judgement should be used to determine if instrument cross-contamination has affected any positive compound identification.

9.0 Tentatively Identified Compounds (TIC)

- 9.1 Are all Tentatively Identified Compound Forms (Form I, Part B) present; and do listed TICs include scan number or retention time, estimated concentration and "JN" qualifier?

☐ ☒ ☐

- 9.2 Are the mass spectra for the tentatively identified compounds and associated "best match" spectra included in the sample package for each of the following:

a. Samples and/or fractions as appropriate

☒ ☐ ☐

b. Blanks

☒ ☐ ☐

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YES NO N/A

ACTION: If any TIC data are missing take action specified in 3.2 above.

ACTION: Add "JN" qualifier if missing.

- 9.3 Are any TCL compounds (from any fraction) listed as TIC compounds (example: 1,2-dimethylbenzene is xylene a VOA TCL - and should not be reported as a TIC)?

☒ ☐ ☐

ACTION: Flag with "R" any TCL compound listed as a TIC.

- 9.4 Are all ions present in the reference mass spectrum with a relative intensity greater than 10% also present in the sample mass spectrum?

☐ ☒ ☐

- 9.5 Do TIC and "best match" standard relative ion intensities agree within 20%?

☐ ☒ ☐

ACTION: Use professional judgement to determine acceptability of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some less specific identification (example: "C3 substituted benzene") as appropriate. Also, when a compound is not found in any blank, but is a suspected artifact of a common laboratory contaminant, the result should be qualified as unusable (R).

10.0 Compound Quantitation and Reported Detection Limits

- 10.1 Are there any transcription/calculation errors in Form I results? Check at least two positive values. Verify that the correct internal standard, quantitation ion,

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YES NO N/A

and RRF were used to calculate Form I result. Were
any errors found?

___ ☒ ___

- 10.2 Are the CRQLs adjusted to reflect sample dilutions and,
for soils, sample moisture?

☒ ___

ACTION: If errors are large, call lab for explanation/
resubmittal, make any necessary corrections and document
effect in data assessments.

ACTION: When a sample is analyzed at more than one
dilution, the lowest CRQLs are used (unless a QC
exceedance dictates the use of the higher CRQL data
from the diluted sample analysis). Replace concentrations
that exceed the calibration range in the original analysis
by crossing out the "E" and it's associated value on the
original Form I and substituting the data from the analysis
of the diluted sample. Specify which Form I is to be used,
then draw a red "X" across the entire page of all Form I's
that should not be used, including any in the summary
package.

11.0 Standard Data (GC/MS)

- 11.1 Are the Reconstructed Ion Chromatograms, and data
system printouts (Quant Reports) present for initial
and continuing calibration?

☒ ___

ACTION: If any calibration standard data are missing,
take action specified in 3.2 above.

12.0 GC/MS Initial Calibration (Form VI)

- 12.1 Are the Initial Calibration Forms (Form VI)
present and complete for the BNA fraction?

☒ ___

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YES NO N/A

ACTION: If any calibration standard forms are missing, take action specified in 3.2 above.

- 12.2 Are response factors stable for BNAs over the concentration range of the calibration?
(% Relative standard deviation (%RSD) < 30.0%)

☐ ☒ ☐

ACTION: Circle all outliers in red.

NOTE: Although 20 BNA compounds have a minimum RRF and no maximum %RSD, the technical criteria are the same for all analytes.

ACTION: If the % RSD is > 30.0, qualify positive results for that analyte "J" and non-detects using professional judgement. When RSD > 90%, flag all non-detect results for that analyte R (unusable).

NOTE: Analytes previously qualified "U" due to blank contamination are still considered as "hits" when qualifying for calibration criteria.

- 12.3 Are all BNA compound RRFs > 0.05?

☒ ☐ ☐

ACTION: Circle all outliers in red.

ACTION: If any RRF < 0.05

1. "R" all non-detects.
2. "J" all positive results.

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YES NO N/A

- 12.4 Are there any transcription/calculation errors in the reporting of average response factors (RRF) or % RSD? (Check at least two values but if errors are found, check more.)

___ ☒ ___

ACTION: Circle errors in red.

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and note errors in data assessments.

13.0 GC/MS Continuing Calibration (Form VII)

- 13.1 Are the Continuing Calibration Forms (Form VII) present and complete for the BNA fraction?

☒ ___

- 13.2 Has a continuing calibration standard been analyzed for every twelve hours of sample analysis per instrument?

☒ ___

ACTION: List below all sample analyses that were not within twelve hours of a continuing calibration analysis for each instrument used.

ACTION: If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation/resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R").

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YES NO N/A

- 13.3 Do any semivolatile compounds have a % Difference (%D) between the initial and continuing RRF which exceeds + 25.0% criteria?

X ☐ ☐

ACTION: Circle all outliers in red.

ACTION: Qualify both positive results and non-detects for the outlier compound(s) as estimated (J). When %D is above 90%, reject all non-detects for that analyte (R) unusable.

- 13.4 Do any semivolatile compounds have a RRF < 0.05?

X ☐ ☐

ACTION: Circle all outliers in red.

ACTION: If RRF < 0.05, qualify as unusable (R) associated non-detects and "J" associated positive values.

- 13.5 Are there any transcription/calculation errors in the reporting of average response factors (RRF) or % difference (%D) between initial and continuing RRFs? (Check at least two values but if errors are found, check more).

☐ [X] ☐

ACTION: Circle errors in red.

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments.

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YES NO N/A

14.0 Internal Standards (Form VIII)

14.1 Are the internal standard areas (Form VIII) of every sample and blank within the upper and lower limits (-50% to + 100%) for each continuing calibration?

☒ ☐ ☐

ACTION: List all the outliers below.

Sample #	Internal Std	Area	Lower Limit	Upper Limit
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

(Attach additional sheets if necessary).

ACTION:

1. If the internal standard area count is outside the upper or lower limit, flag with "J" all positive results and non-detects (U values) quantitated with this internal standard.
2. Non-detects associated with IS areas > 100% should not be qualified.

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YES NO N/A

3. If the IS area is below the lower limit (<50%), qualify all associated non-detects (U-values) "J". If extremely low area counts are reported (<25%) or if performance exhibits a major abrupt drop off, flag all associated non-detects as unusable (R) > .

- 14.2 Are the retention times of the internal standards within 30 seconds of the associated calibration standard?

☒ ☐ ☐

ACTION: Professional judgement should be used to qualify data if the retention times differ by more than 30 seconds.

15.0 Field Duplicates

- 15.1 Were any field duplicates submitted for BNA analysis?

☒ ☐ ☐

ACTION: Compare the reported results for field duplicates and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate results must be addressed in the reviewer narrative. However, if large differences exist, identification of field duplicates should be confirmed by contacting the sampler.

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YES NO N/A

PART C: PESTICIDE/PCB ANALYSIS

1.0 Traffic Reports and Laboratory Narrative

- 1.1 Are Traffic Report Forms present for all samples?

☐ ☐ ☐

ACTION: If no, contract lab for replacement of missing or illegible copies.

- 1.2 Do the Traffic Reports or SDG Narrative indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data?

☐ ☐ ☐

ACTION: If any sample analyzed as a soil, other than TCLP, contains 50%-90% water, all data should be qualified as estimated (J). If a soil sample, other than TCLP, contains more than 90% water, all data should be qualified as unusable (R).

ACTION: If samples were not iced upon receipt at the laboratory, flag all positive results "J" and non-detects "UJ".

2.0 Holding Times

- 2.1 Have any PEST/PCB technical holding times, determined from date of collection to date of extraction, been exceeded?

☐ ☐ ☐

Water and soil samples for PESTS/PCB analysis must be extracted within 7 days of the date of collection. Extracts must be analyzed within 40 days of the date extraction.

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YES NO N/A

ACTION: If technical holding times are exceeded, flag all positive results as estimated (J) and sample quantitation limits (UJ) and document in the narrative that holding times were exceeded. If analyses were done more than 14 days beyond holding time, either on the first analysis or upon re-analysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. At a minimum, all the data should at least be qualified "J", but the reviewer may determine that non-detects are unusable (R).

3.0 Surrogate Recovery (Form II)

3.1 Are the PEST/PCB Surrogate Recovery Summaries (Form II) present for each of the following matrices?

a. Low Water	☐	___	___
b. Soil	☐	___	___

3.2 Are all the PEST/PCB samples listed on the appropriate Surrogate Recovery Summary for each of the following matrices?

a. Low Water	☐	___	___
b. Soil	☐	___	___

ACTION: Call lab for explanation/resubmittals. If missing deliverables are unavailable, document effect in data assessments.

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-
	YES	NO	N/A
3.3 Were outliers marked correctly with an asterisk?	☐	___	___
ACTION: Circle all outliers in red.			
3.4 Were surrogate recoveries of TCX or DCB outside of the contract specification for any sample or blank? (60-150%)		___	☐ ___
ACTION: No qualification is done if surrogates are diluted out. If recovery for <u>both</u> surrogates is below the contract limit, but above 10%, flag all results for that sample "J". If recovery is < 10% for either surrogate, qualify positive results "J" and flag non-detects "R". If recovery is above the contract advisory limits for <u>both</u> surrogates qualify positive values "J".			
		☐	___
3.5 Were surrogate retention times (RT) within the windows established during the initial 3-point analysis of individual Standard Mixture A?		☐	___
ACTION: If the RT limits are not met, the analysis may be qualified unusable (R) for that sample on the basis of professional judgement.			
3.6 Are there any transcription/calculation errors between raw data and Form II?		___	☐ ___
ACTION: If large errors exist, call lab for explanation/resubmittal. Make any necessary corrections and document effect in data assessments.			

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	YES	NO	N/A
4.0			
<u>Matrix Spikes (Form III)</u>			
4.1 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form (Form III) present?	☐	___	___
4.2 Were matrix spikes analyzed at the required frequency for each of the following matrices? (1 MS/MSD must be performed for every 20 samples of similar matrix or concentration level)			
a. Low Water	☐	___	___
b. Soil	☐	___	___
<u>ACTION:</u> If any matrix spike data are missing, take the action specified in 3.2 above.			
4.3 How many PEST/PCB spike recoveries are outside QC limits?			
<u>Water</u>			
___ out of 12			
<u>Soil</u>			
___ out of 12			
4.4 How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits?			
<u>Water</u>			
___ out of 6			
<u>Soil</u>			
___ out of 6			

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YES NO N/A

ACTION: No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer may use the matrix spike and matrix spike duplicate results in conjunction with other QC criteria and determine the need for some qualification of the data.

5.0 Blanks (Form IV)

5.1 Is the Method Blank Summary (Form IV) present?

☐ ☐ ☐

5.2 Frequency of Analysis: For the analysis of Pesticide/PCB TCL compounds, has a reagent/method blank been analyzed for each SDG or every 20 samples of similar matrix or concentration or each extraction batch, whichever is more frequent?

☐ ☐ ☐

ACTION: If any blank data are missing, take the action specified above in 3.2. If blank data is not available, reject (R) all associated positive data. However, using professional judgement, the data reviewer may substitute field blank data for missing method blank data.

5.3 Has a PEST/PCB instrument blank been analyzed at the beginning of every 12 hr. period following the initial calibration sequence? (minimum contract requirement).

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YES NO N/A

ACTION: If any blank data are missing, call lab for explanation/resubmittals. If missing deliverables are unavailable, document the effect in data assessments.

- 5.4 Chromatography: Review the blank raw data - chromatograms, quant reports or data system printouts.

Is the chromatographic performance (baseline stability) for each instrument acceptable for PEST/PCBs?

☐ ☐ ☐

ACTION: Use professional judgement to determine the effect on the data.

6.0 Contamination

NOTE: "Water blanks", "distilled water blanks" and "drilling water blanks" are validated like any other sample and are not used to qualify the data. Do not confuse them with the other QC blanks discussed below.

- 6.1 Do any method/instrument/reagent/cleanup blanks have positive results for PEST/PCBs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample Dilution Factor and corrected for % moisture when necessary.

☐ ☐ ☐

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YES NO N/A

- 6.2 Do any field/rinse blanks have positive PEST/PCB results? ☐ ☐ ☐

ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet)

NOTE: All field blank results associated to a particular group of samples (may exceed one per case or one per day) may be used to qualify data. Blanks may not be qualified because of contamination in another blank. Field blanks must be qualified for surrogate, or calibration QC problems.

ACTION: Follow the directions in the table below to qualify TCL results due to contamination. Use the largest value from all the associated blanks.

Sample conc > CRQL but < 5 x blank	Sample conc < CRQL & is < 5x blank value	Sample conc > CRQL & > 5 x blank value
Flag sample result with a "U"	Report CRQL & qualify "U"	No qualification is needed

NOTE: If gross blank contamination exists, all data in the associated samples should be qualified as unusable (R).

- 6.3 Are there field/rinse/equipment blanks associated with every sample? ☐ ☐ ☐

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YES NO N/A

ACTION: For low level samples, note in data assessment that there is no associated field/rinse/equipment blank. Exception: samples taken from a drinking water tap do not have associated field blanks.

7.0 Calibration and GC Performance

7.1 Are the following Gas Chromatograms and Data Systems Printouts for both columns present for all samples, blanks, MS/MSD?

a. peak resolution check	☐	___	___
b. performance evaluation mixtures	☐	___	___
c. aroclor 1016/1260	☐	___	___
d. aroclors 1221, 1232, 1242, 1248, 1254	☐	___	___
e. toxaphene	☐	___	___
f. low points individual mixtures A & B	☐	___	___
g. med points individual mixtures A & B	☐	___	___
h. high points individual mixtures A & B	☐	___	___
i. instrument blanks	☐	___	___

ACTION: If no, take action specified in 3.2 above.

7.2 Are Forms VI - PEST 1-4 present and complete for each column and each analytical sequence?

☐ ___ ___

7.3 Are there any transcription/calculation errors between raw data and Forms VI?

___ ☐ ___

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YES NO N/A

ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and document effect in data assessments.

- 7.4 Do all standard retention times, including each pesticide in each level of Individual Mixtures A & B, fall within the windows established during the initial calibration analytical sequence? (For Initial Calibration Standards, Form VI - PEST - 1).

☐ ☐ ☐

ACTION: If no, all samples in the entire analytical sequence are potentially affected. Check to see if the chromatograms contain peaks within an expanded window surrounding the expected retention times. If no peaks are found and the surrogates are visible, non-detects are valid. If peaks are present and cannot be identified through pattern recognition or using a revised RT window, qualify all positive results and non-detects as unusable (R). For aroclors, RT may be outside the RT window, but the aroclor may still be identified from the individual pattern.

- 7.5 Are the linearity criteria for the initial analyses of Individual Standards A & B within limits for both columns? (%RSD must be < 20.0% for all analytes except for the 2 surrogates, which must not exceed 30.0 % RSD). See Form VI PEST - 2.

☐ ☐ ☐

ACTION: If no, qualify all associated positive results generated during the entire analytical sequence "J" and all non-detects "UJ". When RSD > 90% flag all non-detect results for that analyte R (unusable).

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	YES	NO	N/A
7.6 Is the resolution between any two adjacent peaks in the Resolution Check Mixture > 60.0% for both columns? (Form VI-PEST-4).	☐	___	___
ACTION: If no, positive results for compounds that were not adequately resolved should be qualified "J". Use professional judgement to determine if non-detects which elute in areas affected by co-eluting peaks should be qualified "N" as presumptive evidence of presence or unusable (R).			
7.7 Is Form VII - Pest-1 present and complete for each Performance Evaluation Mixture analyzed during the analytical sequence for both columns?	☐	___	___
ACTION: If no, take action as specified in 3.2 above.			
7.8 Has the individual % breakdown exceeded 20.0% on either column.	___	☐	___
- for 4,4' - DDT?	___	☐	___
- for endrin?	___	☐	___
Has the combined % breakdown for 4,4' - DDT/ Endrin exceeded 30.0% on either column? (required in all instances)	___	☐	___

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YES NO N/A

ACTION:

1. If any % breakdown has failed the QC criteria in either PEM in steps 2 and 17 in the initial calibration sequence (p. D-38/Pest SOW 3/90), qualify all sample analyses in the entire analytical sequence as described below.
2. If any % breakdown has failed the QC criteria in a PEM Verification calibration, review data beginning with the samples which followed the last in-control standard until the next acceptable PEM & qualify the data as described below.
 - a. 4,4' - DDT Breakdown: If 4,4' - DDT breakdown is greater than 20. %:
 - i. Qualify all positive results for DDT with "J". If DDT was not detected, but DDD and DDE are positive, then qualify the quantitation limit for DDT as unusable (R).
 - ii. Qualify positive results for DDD and/or DDE as presumptively present at an approximated quantity (NJ).
 - b. Endrin Breakdown: If endrin breakdown is greater than 20.0%:

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YES NO N/A

- i. Qualify all positive results for endrin with "J". If endrin was not detected, but endrin aldehyde and endrin ketone are positive, then qualify the quantitation limit for endrin as unusable (R).
- ii. Qualify positive results for endrin ketone and endrin aldehyde as presumptively present at an approximated quantity (NJ).
- c. Combined Breakdown: If the combined 4,4' - DDT and endrin breakdown is greater then 30.0%.
 - i. Qualify all positive results for DDT and endrin with "J". If endrin was not detected, but positive aldehyde and endrin ketone are positive, then qualify the quantitation limit for endrin as unusable (R). If DDT was not detected, but DDD and DDE are positive, then qualify the quantitation limit for DDT as unusable (R).
 - ii. Qualify positive results for endrin ketone and endrin aldehyde as presumptively present at an approximated quantity (NJ). Qualify positive results for DDD and/or DDE as presumptively present at an approximated quantity (NJ).

7.9 Are the relative percent difference (RPD) values for all PEM analytes <25.0% (Form VII-PEST-1)

☐ — —

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YES NO N/A

ACTION: If no, qualify all associated positive results generated during the analytical sequence "J" and sample quantitation limits "UJ".

NOTE: If the failing PEM is part of the initial calibration. All samples are potentially affected. If the offending standard is a verification calibration, the associated samples are those which followed the last in-control standard until the next passing standard.

7.10 Have all samples been injected within a 12 hour period beginning with the injection of an instrument Blank?

☐ — —

7.11 Is Form VII - Pest-2 present and complete for INDA and INDB Verification Calibration analyzed?

☐ — —

7.12 Are there any transcription/calculation errors between raw data and Form VII - Pest - 2?

— ☐ —

ACTION: If large errors exists, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments. Under "Conclusions".

7.13 Do all standard retention times for each INDA and INDB Verification Calibration fall within the windows established by the initial calibration sequence?

☐ — —

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	YES	NO	N/A
7.14 Are RPD values for all verification calibration standard compounds < 25.0%?	☐	___	___
<u>ACTION:</u> If the RPD is >25.0% for the compound being quantitated, qualify all associated positive results "J" and non-detects "UJ". The "associated samples" are those which followed the last in-control standard up to the next passing standard containing the analyte which failed the criteria. If the RPD is >90%, flag all non-detects for that analyte R (unusable).			
8.0 <u>Analytical Sequence Check (Form VIII-PEST)</u>			
8.1 Is Form VIII present and complete for each column and each period of analyses?	☐	___	___
<u>ACTION:</u> If no, take action specified in 3.2 above.			
8.2 Was the proper analytical sequence followed for each initial calibration and subsequent analyses? (See CLP SOW p. D-39 & D-41/PEST)	☐	___	___
<u>ACTION:</u> If no, use professional judgement to determine the severity of the effect on the data and qualify it accordingly. Generally, the effect is negligible unless the sequence was grossly altered or the calibration was also out of limits.			
9.0 <u>Cleanup Efficiency Verification (Form IX)</u>			
9.1 Is From IX - Pest-1 Pest-1 present and complete for each lot of Florisil Cartridges used? (Florisil Cleanup is required for <u>all</u> Pest/PCB extracts.)	☐	___	___

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YES NO N/A

ACTION: If no, take action specified in 3.2 above.
If data suggests that florisol cleanup was not performed, make note in "Contract Problems/Non-Compliance".

- 9.2 Are all samples listed on the Pesticide Florisol Cartridge Check Form?

☐ ☐ ☐

- 9.3 If GPC Cleanup was performed, (mandatory for all soil sample extracts) is Form IX - Pest-2 present?

☐ ☐ ☐

ACTION: If no, take action specified in 3.2 above.

ACTION: If GPC was not performed when required, make note in "Contract Problems/Non-Compliance" section of data assessment.

- 9.4 Are percent recoveries (% R) of the pesticide and surrogate compounds used to check the efficiency of the cleanup procedures within QC limits:

80-120% for florisol cartridge check?

☐ ☐ ☐

80-110% for GPC calibration?

☐ ☐ ☐

Qualify only the analyte(s) which fail the recovery criteria as follows:

ACTION: If a R are < 80%, qualify positive results "J" and quantitation limits "UJ". Non-detects should be qualified "R" if zero %R was obtained for pesticide compounds. Use professional judgement to qualify positive results if recoveries are greater than the upper limit.

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YES NO N/A

NOTE: Sample data should be evaluated for potential interferences if recovery 2,4,5-trichlorophenol was > 5% in the Florisil Cartridge Performance Check analysis. Make note in Contract Problems/Non-Compliance section of reviewer narrative.

NOTE: The raw data of the GPC Calibration Check analysis is evaluated for pattern similarity with previously run Aroclor standards.

10.0 Pesticide/PCB Identification

10.1 Is Form X complete for every sample in which a pesticide or PCB was detected?

☐ ☐ ☐

10.2 Are there any transcription/calculation errors between raw data and Forms 6E, 6G, 7E, 7D, 8D, 9A, B, 10A.

☐ ☐ ☐

ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and not error under "Conclusions".

10.3 Are retention times (RT) of sample compounds within the established RT windows for both analyses?

☐ ☐ ☐

Was GC/MS confirmation provided when required (when compound concentration is > 10 ug/ml in final extract)?

☐ ☐ ☐

ACTION: Use professional judgement to qualify positive results which were not confirmed by GC/MS. Qualify as unusable (R) all positive results which were not confirmed by second

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YES NO N/A

GC column analysis. Also qualify as unusable (R) all positive results not meeting RT window unless associated standard compounds are similarly biased. (See Functional Guidelines). The reviewer should use professional judgement to assign an appropriate quantitation limit.

- 10.4 Is the percent difference (% D) calculated for the positive sample results on the two GC columns < 25.0%?

☐ ☐ ☐

ACTION: If the reviewer finds neither column shows interference for the positive hits, the data should be fagged as follows:

% Difference Qualifier

25-50 %	J
50-90 %	JN
> 90 %	R

NOTE: The lower of the two values is reported on Form I. If using professional judgement, the reviewer determines that the higher results was more acceptable, the reviewer should replace the value and indicate the reason for the change in the data assessment.

- 10.5 Check chromatograms for false negatives, especially the multiple peak compounds toxaphene and PCBs. Were there any false negatives?

☐ ☐ ☐

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YES NO N/A

ACTION: Use professional judgement to decide if the compound should be reported. If the appropriate PCB standards were not analyzed, qualify the data unusable (R).

11.0 Compound Quantitation and Reported Detection Limits

- 11.1 Are there any transcription/calculation errors in Form I results? Check at least two positive values. Were any errors found?

— ☐ —

NOTE: Single-peak pesticide results can be checked for rough agreement between quantitative results obtained on the two GC columns. The reviewer should use professional judgement to decide whether a much larger concentration obtained on one column versus the other indicates the presence of an interfering compound. If an interfering compound is indicated, the lower of the two values should be reported and qualified as presumptively present at an approximated quantity (NJ). This necessitates a determination of an estimated concentration on the confirmation column. The narrative should indicate that the presence of interferences has interfered with the evaluation of the second column confirmation.

- 11.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, % moisture?

☐ — —

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments.

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YES NO N/A

ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" value on the original Form I and substituting it with data from the analysis of diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.

ACTION: Quantitation limits effected by large, off-scale peaks should be qualified as unusable (R). If the interference is on-scale, the reviewer can provide an approximated quantitation limit (UJ) for each affected compound.

12.0 Chromatogram Quality

- 12.1 Were baselines stable? ☐ ☐ ☐
- 12.2 Were any electropositive displacement (negative peaks) or unusual peaks seen? ☐ ☐ ☐

ACTION: Address comments under System Performance of data assessment.

13.0 Field Duplicates

- 13.1 Were any field duplicates submitted for PEST/PCB analysis? ☐ ☐ ☐

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YES NO N/A

ACTION: Compare the reported results for field duplicates and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate results must be addressed in the reviewer narrative. However, if large differences exist, identification of field duplicates should be confirmed by contacting the sampler.

PR01301-D3/1022org.dta

TOTAL REVIEW

CLP DATA ASSESSMENT

Functional Guidelines for Evaluating Organics Analysis

Case No. - SDG No. 22507, 22570, 22595, 22688, 22712, 22793, 22932, 23021, 23024, 23144, 23396, 23421, 23448, 23506, 23622, 23623, 23663, 23697, 23750, 23799, 23833, 23938, 24008, 24122

LABORATORY Enseco - East SITE Tutu Service Station Investigation

DATA ASSESSMENT:

The current functional guidelines (USEPA February 1988) for evaluating organic data have been applied.

All data are valid and acceptable except those analytes which have been qualified with a "J" (estimated), "U" (undetected), "R" (unusable), or "JN" (presumptive evidence for the presence of the material at an estimated value). All action is detailed on the attached sheets.

Two facts should be noted by all data users. First, the "R" flag means that the associated value is unusable and rejected. In other words, due to significant QC problems the analysis is invalid and provides no information as to whether the compound is present or not. "R" values should not appear on data tables because they cannot be relied upon, even as a last resort. The second fact to keep in mind is that no compound concentration, even if it has passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data but any value potentially contains some error.

Reviewer's
Signature:

Lidya Gulizia / U.P.

Date: 5/21/1993

Verified by:

Thomas V. Danahy

Date: 5/21/1993

1. HOLDING TIME

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded are qualified as estimated (J). The non-detects (sample quantitation limits) are qualified as estimated (J), unless the holding times are grossly exceeded (over one week beyond maximum holding time), in which case the associated data are unusable and rejected (R).

The following action was taken in the samples and analytes shown due to excessive holding time:

Volatile Organic Compounds

The volatile organic compound (VOC) analysis of soil sample MW-4D was performed one day outside of the required 10-day holding time. All detected VOC analytes were qualified as estimated (J). Any VOC analyte not detected in this sample was qualified as unusable and rejected (R).

Semivolatile Organic Compounds

The extraction of soil sample MW-5 was initiated one day outside of the prescribed seven-day holding time for solid matrices. Since the preparation holding time was minimally exceeded, the base neutral and acid-extractable (BNA) compounds in the sample were qualified as estimated if detected (J) or qualified as estimated at the quantitation limit (UJ) if not detected.

The holding times for the initial extraction (preparation) of surface soils SS-3, SS-4, and SS-6 were exceeded by greater than 21 days. Additionally, sample SS-3 was re-extracted 35 days after sample collection; data for the reanalysis (RE) of this sample was reported under sample identification (ID) SS-3 RE in accordance with the organic statement of work (SOW). Since the preparation holding times for samples SS-3, SS-3 RE, SS-4, and SS-6 were grossly exceeded, all BNA data for these samples were qualified unusable and rejected.

All other extractions and instrumental analyses were performed within the prescribed holding times. A summary of holding time outliers is provided in Table I3-2.

2. BLANK CONTAMINATION

Quality assurance (QA) blanks, i.e., method, trip, field, rinse and water blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field blanks measure cross-

contamination of samples during field operations. If the concentration of the analyte is less than five times the blank contaminant level (ten times for the common contaminants), the analytes are negated and qualified as undetected, "U".

A summary of all contaminants detected in the method, field, and trip blanks associated with the VOC, BNA, and total petroleum hydrocarbon (TPH) analyses of the soil samples is presented in Table I3-3. Additionally, the table summarizes the sample delivery groups (SDGs) and the soil samples that are associated and would be qualified, if appropriate, using the U.S. Environmental Protection Agency (USEPA) Region II validation guidelines. Sample qualifications were assessed using the following guidelines:

- *If the sample concentration was less than five times ($<5x$) the blank contaminant level (or less than ten times [$<10x$] for the common laboratory contaminants) and less than the quantitation limit, the analyte was negated, the sample result was raised to the quantitation limit, and qualified as not detected (U).*
- *If the sample concentration was $<5x$ the blank contaminant level (or $<10x$ for the common laboratory contaminants), but greater than the quantitation limit, the analyte was negated and qualified as not detected (U) at the reported concentration level.*
- *If the sample concentration was greater than five times ($5x$ [or ten times ($10x$) for the common laboratory contaminants]) and greater than the quantitation limit, no qualification for blank contamination was assessed. In this instance, the B qualifier, applied by the laboratory for concurrent method blank contamination, was retained.*
- *Method blanks were evaluated and the contaminants detected in them were used to assess all associated samples with the exception of the trip and/or field blanks. Trip and/or field blanks were used in the assessment of associated soil samples and were not used in the evaluation of each other. The highest contaminant level for an analyte from all of the associated blanks (method, trip, or field) was used in the determination of the $5x$ (or $10x$) window for blank negation.*
- *Tentatively-identified compounds (TICs) and unknowns of similar retention times (RT) were evaluated using the $5x$ multiplier of the highest-concentration, associated blank contaminant. In those instances where blank contamination was determined to be present, the TIC or unknown were rejected, qualified "R", and subsequently, not reported on the data summaries.*

Table I3-4 summarizes all analyte sample-result qualifications for each soil sample for which the sample result and sample qualifier were changed due to suspected blank contamination. Only those samples and analytes that were qualified in some manner due to this criterion are summarized.

With the exception of two volatile organic unknowns detected and subsequently rejected, in samples B-4 and B-6, only acetone and methylene chloride were negated in any volatile sample analysis due to contamination detected in one or more of the associated method, trip, or field blanks. Most blanks were reported to primarily contain estimated concentrations of these two common laboratory and field solvents. Carbon disulfide was detected in several field blanks and one trip blank, however, the source of this contamination was not determined. In addition to the contaminants noted above, the following were detected in one or more of the associated blanks: chloroform, methyl acetate and, two VOC unknowns at approximate retention times of 27.3 and 32.1 minutes.

The aqueous sample identified as WAPA was collected from the water source used by the sampling team to decontaminate field and sampling equipment. The WAPA blank was collected from a tap originating from the local water utility company and contained low-level, estimated concentrations of the typical volatile disinfection by-products present in water that has been chlorinated. These include the trihalomethanes, such as chloroform, bromodichloromethane, and dibromochloromethane all of which were detected at low levels in the WAPA sample. As none of these contaminants were found in any other sample, the presence of these contaminants in the field decontamination water is considered inconsequential to the remainder of the samples.

In the analysis of semivolatile compounds, several target compound list (TCL) phthalate compounds were reported in the method and field blanks. Similar phthalate compounds were reported in many of the soil samples, but their presence was attributed in almost all instances due to contamination introduced in the laboratory environment.

Aldol-condensation products, generated by the laboratory during the sample preparation process, were reported as semivolatile TICs in several method and field blanks and most, if not all, soil samples. These compounds were rejected in the TIC results and will not be reported as semivolatile TICs.

One volatile target compound, 1,1,2,2-tetrachloroethane, was reported as a TIC in the semivolatiles analysis of several samples. Since this VOC was analyzed and quantitated in the volatiles analysis, the estimated sample results for this VOC was rejected in the semivolatiles TIC analysis, qualified "R", and will not be reported as a semivolatile TIC. Tetrachloroethene was rejected from the semivolatiles analysis in the following samples: B-10, B-11, B-12, B-13, and MW-4.

Several occurrences of unknowns and unknown amides were detected in the blanks and subsequently, negated in many of the soil samples. The origin of these, particularly in laboratory semivolatile method blanks, was not determined.

In the evaluation of TPH data in the soil samples, all method and field blanks with the exception of the field blank collected on June 30, 1992 (FB063092), were reported to be free of contamination. Sample MW-1 was associated with FB063092, however, qualification of the MW-

1 sample result was not required since the TPH level detected in the sample was significantly greater than that reported in the associated field blank.

3. MASS SPECTROMETER TUNING

Tuning and performance criteria are established to ensure adequate mass resolution, proper compound identification, and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for VOCs is bromofluorobenzene (BFB).

If the mass calibration is in error, all associated data will be classified as unusable, "R".

All mass calibrations associated with the VOC and BNA analyses for these SDGs have met the quality control (QC) criteria to ensure adequate mass resolution, proper compound identification, and instrument response.

4. CALIBRATION

Satisfactory instrument calibration is established to ensure that the instrument is capable of producing acceptable quantitative data. An initial calibration demonstrates that the instrument is capable of giving acceptable performance at the beginning of an analytical sequence. The continuing calibrations document that the instrument is giving satisfactory daily performance.

A) RESPONSE FACTOR:

The response factor measures the instrument's response to specific chemical compounds. The response factor for the TCL must be ≥ 0.05 (a ratio of areas) in both the initial and continuing calibrations. A value < 0.05 indicates a serious detection and quantitation problem (poor sensitivity). Analytes detected in the sample will be qualified as estimated, "J". All non-detects for that compound will be rejected ("R").

In the analysis of VOCs for all SDGs, the response factors for all of the TCL and site-specific VOCs in the initial calibration verifications (ICVs) and continuing calibration verifications (CCVs) were greater than the 0.05 minimum limit. The VOC calibration checks demonstrated that the instruments displayed sufficient sensitivity in order to accurately quantitate VOCs in all samples. Subsequently, no sample qualifications to VOC sample data were required on the basis of this criteria.

With the exception of one analyte in the BNA CCV (File ID P9675) analyzed on October 7, 1992 on the semivolatiles instrument identified as HP-S2, the response factors for all other

CCVs and ICVs associated with semivolatile analyses were greater than 0.05. In the CCV analyzed on October 7, 1992 noted above, 2,4-dinitrophenol was reported with a response factor of 0.044 which is below 0.05 based on a ratio of peak areas. The data for 2,4-dinitrophenol in sample SS-6 and the soil method blank SMB-25SEP92A associated with this CCV were rejected.

Since all of the BNA data for sample SS-6 were previously rejected on the basis of exceeded holding time, only the method blank SMB-25SEP92A data for 2,4-dinitrophenol was rejected and qualified (R).

Two individual gas chromatographic/mass spectrometric (GC/MS) instruments were utilized for the VOC analyses of the SDGs. All soil samples were analyzed using the protocols required for analysis of low-level concentration samples. Separate initial calibrations were performed for the aqueous field and trip blank analyses and the low-concentration soil samples. With the exception of two initial calibration curves established on June 11, 1992 and July 9, 1992 for the quantitation of the site-specific VOCs, all other low-level soil CCV standards, blanks, and soil samples were analyzed on the GC/MS using the heated-purge mode on the purging apparatus. Since the response factors and other calibration QC criteria of the site-specific CCVs associated with these ICVs were acceptable aside from some minor QC deficiencies for precision (i.e., percent difference [%D]), no sample qualifications were assessed for this contractual non-compliance.

Three GC/MS instruments were used for the analysis of BNAs in the SDGs. In total, 11 ICVs and 37 CCV standard analyses were required during the period of analysis for the SDGs. With the exception of one analyte in the BNA CCV previously discussed, all of the instruments utilized displayed the required minimum sensitivity determined from the calculated response factor for each standard and TCL constituent.

5. CALIBRATION

A) PERCENT RELATIVE STANDARD DEVIATION AND PERCENT DIFFERENCE:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the average response factor (RRF) from the initial calibration. Percent D is a measure of the instrument's daily performance. Percent RSD must be < 30% and %D must be < 25%. A value outside of these limits indicates potential detection and quantitation errors. For these reasons, all positive results are flagged as estimated, "J", and non-detects are flagged "UJ" (if %D or RSD > 50%). If there is a gross deviation (i.e. > 90%) of %RSD and %D, the non-detects may be rejected (R).

Volatile Organic Compounds

In the review of VOC calibration data, precision outliers were found for both percent relative standard deviation (%RSD) in the ICVs and for percent difference (%D) for associated CCVs.

A complete summary of all outlier ICVs and CCVs for VOC analyses and the associated samples qualified due to the QC exceedances are summarized in Table I3-5. Positive sample results for those analytes for which the %RSD exceeded plus or minus ($\pm$) 30 percent or in which the %D in the associated CCV exceeded $\pm$ 25 percent were qualified as estimated (J). Non-detect sample results for analytes in CCVs with %D greater than 25 percent, but less than 90 percent were qualified as estimated at the quantitation limit (UJ). For those analytes with %D greater than 90 percent, non-detect sample results were rejected. When appropriate, qualifications were applied to all blanks (method, field, and trip); other QC samples, such as matrix spikes (MS) and matrix spike duplicates (MSD); and to all associated soil samples, their dilution analyses, and reanalyses.

Qualifications to VOC sample results due to calibration issues were as follows;

- *Three ICVs for site-specific VOCs were analyzed and were associated with all sample analyses for the SDGs. The %RSD for n-propylbenzene in two of the three ICVs and for methyl tertiary butyl ether in one ICV were greater than $\pm$ 30 percent, but less than $\pm$ 90 percent. Since most of the soil and QC sample data for these two analytes were associated with these ICVs, most of the sample results for positive and non-detects for these two compounds were qualified as estimated due to calibration. All ICVs for TCL constituents were reported with %RSD less than or equal to $\pm$ 30 percent.*
- *A total of 19 CCVs for TCL analysis and eight CCVs for analysis of site-specific VOCs out of a total of 33 CCV standard analyses were found to have calibration outliers outside the $\pm$ 25 %D limit. The compounds that were found to have %D exceedances were primarily either (1) an analyte from the class of ketones (2) an early-eluting VOC, such as chloromethane, chloroethane, bromomethane, and vinyl chloride, or (3) a common laboratory contaminant (acetone and methylene chloride). In all cases, %D was not exceeded by greater than 57.8 percent and was generally within $\pm$ 35 percent.*
- *The following VOCs were reported with exceeded %D in one or more of the CCVs: acetone, bromomethane, 2-butanone, carbon disulfide, carbon tetrachloride, chloroethane, chloromethane, 1,2-dichloroethane, 1,2-dichloroethane-d4, 2-hexanone, methylene chloride, methyl tertiary butyl ether, 4-methyl-2-pentanone, n-propylbenzene, and vinyl chloride.*

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- In a number of CCVs, a volatile system monitoring compound (SMC [1,2-dichloroethane-d4]) was reported with %D greater than $\pm$ percent. SMCs are added to volatile samples to monitor the analytical efficiency of the method in the sample matrix.

Semivolatile Organic Compounds

Calibration criteria for %RSD and %D was exceeded in seven of the eight ICVs and 36 of the 37 associated BNA CCVs. A summary of all BNA calibration outliers and associated samples is provided in Table I3-6.

Qualifications to BNA sample results due to calibration issues were as follows:

- In seven of the BNA ICVs associated with the SDGs for the soil investigation that had exceeded criteria, %RSD was exceeded for hexachlorocyclopentadiene in four ICVs, 3,3'-dichlorobenzidine in two ICVs; benzo(k)fluoranthene in three ICVs; and 2,4-dinitrophenol and 3-nitroaniline in one ICV each. In all cases, %RSD was no greater than 52.2 percent.
- For the majority of the analytes in the BNA ICVs and CCVs for which %RSD and %D were greater than 30 and 25 percent, respectively, the precision outliers deviated generally no greater than 50 percent. A total of six calibration outliers were reported to be greater than 50 percent and less than 90 percent. In all of these instances, both positive and non-detect sample data were estimated and qualified (J).
- Two CCVs, analyzed on June 16 and 17, 1992 on instrument HP-S5, were reported with %D greater than 90 percent for 3,3'-dichlorobenzidine. In accordance with the validation guidelines, the non-detect data for 3,3'-dichlorobenzidine in the samples associated with these CCVs were qualified as unusable and rejected (R). The 3,3'-dichlorobenzidine results were rejected in the following samples: soil samples B-4, MW-1D, and MW-4D; field blanks FB060492, FB060592, and FB060992; water method blanks WB-10JUN92C and WB-11JUN92B; and soil method blanks SB-10JUN92C and SB-12JUN92B.
- In several BNA CCVs, the %D of 2,4,6-tribromophenol or 2-fluorophenol were greater than ± 25 percent. These compounds are BNA surrogates used to monitor the extraction efficiency of the method in the sample matrix. The %D for 2,4,6-tribromophenol in which the %D was outside of the required criteria (± 25 percent) ranged from -42.6 to 34.5 in ten individual CCVs. The %D for 2-fluorophenol was outside the required window in five CCVs and ranged from -25.9 to -35.8. Although the recovery values for these two surrogates were estimated in all samples associated with the CCVs, since most surrogate

recoveries in the soil and QC samples were within the acceptance windows, no additional sample result qualifications were assessed based on the surrogate calibration outliers.

Total Petroleum Hydrocarbons

The CCVs in the TPH analyses were evaluated to determine if the precision of calibration was adequate for accurate, quantitative analysis of the samples. Most of the CCVs were reported with less than 10%D calculated from the initial calibration curve and all were less than 15%D. Although no strict criteria was established for the evaluation of this criterion for TPH analyses, it is the data reviewer's determination that an acceptable level of calibration precision was exhibited for the analyses associated with this parameter.

6. SURROGATES

All samples are spiked with surrogate compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate concentrations were outside contract specifications, qualifications were applied to the samples and analytes as shown below.

Volatile Organic Compounds

In the initial analysis of sample WAPA, the SMC recovery of toluene-d8 was below the QC Unit (88 percent), but above 10 percent. The sample was reanalyzed and in the reanalysis the toluene-d8 was again found to be below the QC limit, but above 10 percent. Additionally, in the reanalysis, 1,2-dichloroethane -d4 was found to be minimally above the limit for this SMC (114 percent), however, this outlier was regarded as an isolated occurrence since the initial recovery was within the prescribed acceptance window. The constituents detected in WAPA were already qualified by the laboratory as estimated (J) concentrations since they were detected below the sample quantitation limit. The non-detects in this sample were qualified as estimated detection limits (UJ) based on the low SMC recovery in accordance with the validation guidelines.

The recovery values for 1,2-dichloromethane-d4 and bromofluorobenzene in the initial analysis of samples B-11 were above the QC limits for both SMCs. The sample was reanalyzed and similar recovery values were calculated for both SMCs again. Since the SMC recoveries were above the upper limit for each SMC, qualifications of the sample results for B-11 were not required.

Semivolatile Organic Compounds

The surrogate recovery value for 2-fluorophenol was below the lower acceptance limit (25 percent), but greater than 10 percent, in sample B-6. The sample was not reanalyzed and/or qualified during data review since only one surrogate in the acid-extractable fraction was outside of the acceptance window.

In SDG 24122, the laboratory documented out-of-limit initial surrogate recoveries in the sample data package narrative for sample SS-6. This sample was re-extracted and although acceptable surrogate recovery results were achieved in the reanalysis, the sample data has been rejected as previously noted on the basis of exceeded holding time in the second extraction.

Both the initial extraction of sample SS-3 and the re-extraction of this sample resulted in poor surrogate recoveries for 2-fluorophenol. However, since both of the BNA extractions were performed at a minimum of 29 days past sample collection, and the sample data was rejected already on this basis, no additional discussion of sample qualification based on outlier surrogate recoveries is provided.

7. INTERNAL STANDARDS PERFORMANCE

Internal standard (IS) performance criteria ensure that the GC/MS sensitivity and response are stable during every analytical run. The internal standard area count must not vary by more than a factor of two (-50% to +100%) from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ± 30 seconds from the associated continuing calibration standard. If the area count is outside the (-50% to +100%) range of the associated standard, all of the positive results for compounds quantitated using that IS are qualified as estimated (J), and all non-detects as estimated at the reporting limit (UJ), or unusable and rejected (R), if there is a severe loss of sensitivity.

If an internal standard retention time varies by more than 30 seconds, the reviewer will use professional judgement to determine either partial or total rejection of the data for that sample fraction.

The IS performance criteria were within the QC limits established for peak area counts and retention time for all VOC and BNA analyses. Sample qualifications were not required for any soil or QC sample on the basis of these criteria not being satisfied.

8. COMPOUND IDENTIFICATION

A) VOLATILE AND SEMI-VOLATILE FRACTIONS

TCL compounds are identified on the GC/MS by using the analyte's relative retention time (RRT) and by comparison to the ion spectra obtained from known standards. For the results to be a positive hit, the sample peak must be within ± 0.06 RRT units of the standard compound and have an ion spectra which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. For the tentatively identified compounds (TICs), the ion spectra must match accurately. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

Xylenes (total) were detected in samples MW-14 and SS-3. The retention time of this target analyte in the quantitation reports did not match the retention time in the associated standard quantitation reports because the isomer used in the standard solution was a different isomer than that detected in the samples. Sample data for xylenes were not qualified based on retention time in these samples.

9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE

The matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD may be used in conjunction with other QC criteria for some additional qualification of the data.

Matrix precision and accuracy of the VOC, BNA, and TPH methodologies for these SDGs were determined by performing MS and matrix spike duplicate MSD analyses on samples B-8 and B-16. With the exception of the pentachlorophenol (PCP) recoveries in the BNA MS and MSD analyses of sample B-16, all other recoveries for these samples in the noted parameters recovered within the required method acceptance limits and/or those that were established in the site quality assurance project plan. No action was taken based on the recoveries of the PCP in the MS and MSD analyses of sample B-16 since (1) the recoveries for this spike compound were both slightly higher than the established upper control limit, and (2) PCP was not detected in any of the soil or QC samples of these SDGs.

10. OTHER QC DATA OUT OF SPECIFICATION

A) Sample Disposition

All of the volatile organic analysis (VOA) vials for the field blanks collected on July 21,, 1992 (FB072192) and August 14, 1992 (FB081492), and the trip blank collected on August 14, 1992 (TB081492) were received by the laboratory containing air bubbles and headspace. All

positive results for these samples were qualified as estimated (J) and all non-detects were qualified as unusable and rejected (R).

Based on the review of SDG case narratives and chain-of-custody records, no other apparent sample-disposition anomalies were found that could not be resolved immediately. Although other aqueous QC samples were received with headspace, at least one intact VOA vial was received for each sample by the laboratory free of headspace.

B) Field Replicates

Five soil sample/field-replicate pairs were collected and evaluated to determine overall field and sample precision for the SDGs. A summary of field-replicate sample pair results is provided in Table 13-7 for each of the samples in which an analyte was detected in at least one sample of the sample pair. The field-replicate sample pairs collected for the SDGs were identified as follows:

<u>Sample ID</u>	<u>Corresponding Field Replicate ID</u>	<u>Field Replicate (FR) Report Identifier</u>
B-8	MW-101	B-8 FR (MW-101)
B-14	MW-103	B-14 FR (MW-103)
MW-2	MW-102	MW-2 FR (MW-102)
MW-7	MW-100	MW-7 FR (MW-100)
SS-6	SS-7	SS-6 FR

Relative percent difference (RPD) was calculated for analytes of field-replicate sample pairs when detectable results above the contract required detection limit (CRDL) in both samples were reported. An evaluation of RPD was not provided if (1) one sample of the field-replicate pair reported estimated concentrations for an analyte, or (2) if no reportable quantity was found. RPD was evaluated against a limit of 20 percent, and RPDs less than and equal to 20 percent demonstrated reasonable precision between sample results.

In sample/field-replicate pair B-8/MW-101, all detected constituents were reported at either estimated concentrations below the CRDL in one or both samples, or above the CRDL in one sample only. The sample matrix for B-8 appears to be free of significant contamination and homogeneous.

In the volatile analyses of sample/field-replicate pair B-14 and MW-103, tetrachloroethene (PCE) was detected in both samples at 72 and 100 micrograms per kilogram (ug/kg), respectively. The calculated RPD for PCE was 32.5 percent. Since the RPD was greater than 20 percent, the results PCE in both these samples were qualified as estimated (J). In this same sample/field-replicate pair, the calculated RPD for the TPH parameter was 127 percent. Since the RPD indicates that the sample results are disparate and may not accurately reflect the true TPH concentration, both TPH results were estimated in the samples.

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The RPD for replicate analysis of TPH in sample/field-replicate pair MW-2/MW-102 was 26 percent, which is above 20 percent. The TPH sample results were estimated (J) to indicate that variable precision exists between sample results.

Methylene chloride was detected in sample/field-replicate pair MW-7/MW-100 with an RPD of 40 percent. Although these results were not negated following the validation guidelines for blank contamination, the sample results remain as reported since methylene chloride is not a site-specific analyte of concern and it is believed that their presence in these samples was still a result of contamination with commonly-used laboratory solvents. No qualification based on the assessment of replicate precision was made for this reason.

In sample/field-replicate pair SS-6/SS-7 (SS-6FR), methylene chloride was detected in both samples at 22 and 20 ug/kg, respectively. The calculated RPD was 9.5 percent, and therefore, adequate precision was achieved. BNA results for sample SS-6 were rejected due to holding time exceedances. Therefore, no RPDs were calculated for the BNA fraction for this sample/field-replicate pair.

11. SYSTEM PERFORMANCE AND OVERALL ASSESSMENT

Overall, the data submitted by Enseco-East are of good quality and demonstrate acceptable precision, accuracy, and completeness. There are no indications that the instrument performance has degraded to a point that would affect the quality of the data for these SDGs. No abrupt shifts occurred in the chromatographic baselines in the VOC and BNA analyses and minimal baseline drift was observed. The majority of the data for the VOC and BNA analyses and all of the data for the TPH analyses are valid with the following qualifications.

- *In the analysis of VOCs in MW-4D and the BNA analysis of MW-5, the holding times were exceeded by one day. The respective data in each of these was flagged as estimated (J or UJ) on the basis of holding time.*
- *The BNA holding times were grossly exceeded in the analysis of samples SS-3 and its reanalysis, SS-4, and SS-6. The BNA data for each of these were rejected in total.*
- *Data derived from dilution analyses for VOC or BNA analytes found to be above the linear range in the initial analysis were incorporated into the Form I data summary forms from the initial analysis or the more concentrated analysis (i.e., less diluted). The data from the dilution analyses for all parameters were flagged "D" to indicate data originating from a secondary dilution.*
- *Most volatile organic SMC recoveries and the surrogate recoveries for BNA analyses were all within the appropriate acceptance windows for most soil and QC samples. Exceptions to the above were noted in the volatiles analysis of*

samples WAPA and B-11, and the BNA analyses of B-6, SS-6, and SS-3 (and its reanalysis). The sample data for these analytical fractions were qualified, when appropriate, based on the SMC and/or surrogate recoveries with the exception of the BNA analyses of SS-3 (and its reanalysis) and SS-6. Qualification of the BNA data in samples SS-3, SS-3RE, and SS-6 based on surrogate recovery was not performed since the BNA analysis holding times for these samples had previously required the rejection of the BNA data in the samples.

- *With one exception, the recovery values of the MS and MSD analyses of samples B-8 and B-16 were all within the prescribed organic protocol acceptance limits. The two outlier PCP recoveries in sample B-16 did not adversely affect the PCP data in this or any other SDG sample since the MS/MSD results for sample B-16 indicated that results for PCP would be biased high. Since PCP was not detected in any sample, no action was taken with regard to sample assessments based on matrix recovery. All RPD values calculated between the sample recovery values for each of the samples and sample fractions indicate good precision between spike results.*
- *Field-replicate analyses for VOCs, BNAs, and TPH were performed on sample B-8, B-14, MW-2, MW-7, and SS-6. In general most RPD values demonstrated reasonable precision between sample pairs although RPD in some instances was greater than 20 percent. In analyses where estimated and/or low-level sample concentrations were reported, greater variability was noted due to the overall poorer method precision and sensitivity at low concentrations, in addition to the heterogeneity that naturally exists in a soil sample matrix.*

In sample analyses where it was demonstrated that sufficient analyte levels were present to make an accurate assessment, sample results were qualified accordingly to reflect variability in results.

- *Some TCL data were negated and some TICs rejected due to associated blank contamination.*
- *Some TCL data were qualified as estimated (J) due to exceeded ICV and CCV criteria. One exception to the above was made for sample qualification based on a deficient calibration response for 2,4-dinitrophenol in which associated compound data were rejected in SS-6 and the associated method blank. Additionally, 3,3'-dichlorobenzidine was rejected in several samples in which the %D was greater than 90 percent in the CCVs and for those samples in which 3,3'-dichlorobenzidine was not detected. These included samples B-4, MW-1D, MW-4D, FB060492, FB060592, FB060992, and method blanks WB-10JUN92C, WB-11JUN92B, SB-10JUN92C, and SB-12JUN92B. No other instances of sample result rejection based on deficient calibration criteria were noted.*

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- *There were no TCL or site-specific data rejected due to deficient internal standard recoveries or tuning accuracy.*

CONTRACT NON-COMPLIANCE

The following section presents a non-compliance summary for general issues associated with all of the SDGs in this investigation.

- *One volatile TCL analyte (tetrachloroethene) was rejected from the semivolatile TIC fraction for several samples since it was quantitated as a volatile target compound.*
- *In the documentation of the tuning standards for VOCs and BNAs, greater than two significant figures were used when reporting the tune information.*
- *The response factors were not shown in the quantitation reports.*
- *TICs for which presumptive evidence in the sample existed and were identified by the laboratory with a chemical abstracts services (CAS) number were not reported with the "N" qualifier. The "N" qualifier was applied to these TICs by the data reviewer.*
- *Samples SS-3 and SS-4 were initially analyzed (out of holding time) using the medium-concentration protocols for BNA analysis although the rationale for this approach could not be determined. Sample SS-3 was subsequently reanalyzed as a low-concentration sample due to poor surrogate recovery of 2-fluorophenol in the medium-level preparation. Both sets of BNA for SS-3 and the data for SS-4 were ultimately rejected due to grossly exceeded holding time in these samples.*
- *The initial calibration curves established for the quantitation of site-specific VOCs in low level soil samples were not analyzed using the heated purge made on the GC/MS. All subsequent soil, CCV standard; and QC sample analyses were analyzed using treated purge.*

lutari-wp DV/SOIL4-27.rpt/kj:lcb:ar

TU1 002 1522

ATTACHMENT 12

INORGANICS DATA VALIDATION REPORT

TUT 002 1583

Evaluation of Metals Data for the Contract Laboratory Program (CLP)
based on

SOW. 3/90

(SOP Revision XI)

PREPARED BY: Hanif Sheikh DATE: 1-30-92
Hanif Sheikh, Quality Assurance Chemist
Toxic and Hazardous Waste Section

APPROVED BY: Kevin W. Kubik DATE: 1-30-92
Kevin Kubik, Chief
Toxic and Hazardous Waste Section

APPROVED BY: Robert Runyon DATE: 1/30/92
Robert Runyon, Chief
Monitoring Management Branch

TUT 002 1584

Title: Evaluation of Metals Data for the
Contract Laboratory Program

Date: Jan. 1992
Number: HW-2
Revision: 11

1.0 Scope

1.1 This procedure is applicable to inorganic data obtained from contractor laboratories working for Hazardous Waste Site Contract Laboratory Program (CLP).

1.2 The data validation is based upon analytical and quality assurance requirements specified in Statement of Work (SOW) 3/90 .

2.0 Responsibilities - Data reviewers will complete the following tasks as assigned by the Data Review Coordinator:

2.1. For a total review:

2.1.1 Data Assessment - "Total Review-Inorganics" Checklist Appendix (A.1).
The reviewer must answer every question on the checklist.

2.1.2 Data Assessment - Data Assessment Narrative (Appendix A.2)
The answer on the checklist must match the action in the narrative (appendix A.2) and on Form I's. Do not use pencil to write the narrative.

2.1.3 Contract Non-Compliance - SMO Report (Appendix A.3)
This report is to be completed only when a serious contract violation is encountered, or upon the request of the Data Validation Task Monitor, or Technical Project Officer (TPO). Forward 5 copies: one each for internal files, appropriate Regional TPO, Sample Management Office (SMO) and last two addresses of Mailing List for Data Reviewers (Appendix A.4). In other cases, all contract violations should be appended to the end of the Data Assessment Narrative (Sec. A.2.2).

2.1.4 CLP Data Assessment Summary Forms

2.1.4.1 Appendix A.5
Fill in the total number of analytes analyzed by different analyses and the number of analytes rejected or flagged as estimated due to corresponding quality control criteria. Place an "X" in boxes where analyses were not performed, or criteria do not apply.

2.1.4.2 Appendix A.6
Data reviewer is also required to fill out Inorganic Regional Data Assessment form (Appendix A.7) provided by EPA Headquarters. Codes listed on the form will be used to describe the Data Assessment Summary.

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2.1.5 Data Review Log: It is recommended that each data reviewer should maintain a log of the reviews completed to include: a. date of start of case review

- b. date of completion of case review
- c. site
- d. case number
- e. contract laboratory
- f. number of samples
- g. matrix
- h. hours worked
- i. reviewer's initials

2.1.6 Telephone Record Log - the data reviewer should enter the bare facts of inquiry, before initiating any phone conversation with CLP laboratory. After the case review has been completed, mail white copy of Telephone Record Log to the laboratory and pink copy to SMO. File yellow copy in the Telephone Record Log folder, and attach a xerox copy of the Telephone Record Log to the completed Data Assessment Narrative (Appendix A.2).

2.1.7 Forwarded Paperwork

2.1.7.1 Upon completion of review, the following are to be forwarded to the Regional Sample Control Center (RSOC) located in the Surveillance and Monitoring Branch:

- a. data package
- b. completed data assessment checklist (Appendix A.1, original)
- c. SMO Contract Compliance Screening (CCS)
- d. Record of Communication (copy)
- e. CLP Reanalysis Request/Approval Record (original + 3 copies)
- f. Appendix A.6 (original).

2.1.7.2 Forward 2 copies of completed Data Assessment Narrative (Appendix A.2) along with 2 copies of the Inorganic Data Assessment Form (Appendix A.6) and Telephone Record Log, if any, : one each for appropriate Regional TPO, and the other one to EPA EMSL office in Las Vegas. The addresses of TPOs and EPA office in Las Vegas are given in Appendix A-4.

2.1.8 Filed Paperwork - Upon completion of review, the following are to be filed within MMB files:

- a. Two copies of completed Data Assessment Narrative (Appendix A.2) each carrying Appendix A.6.
- b. Telephone Record Log (copy)
- c. SMO Report (copy Appendix A-3)
- d. CLP Reanalysis Request/Approval Record (copy)

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3.0 Data Completeness

Each data package is checked by a Regional Sample Control Coordinator (RSSC) for completeness. A data package is assumed to be complete when all the deliverables required under the contract are present. If a data package is incomplete, the RSSC would call the laboratory for missing document(s). If the laboratory does not respond within a week, SMO and MMB coordinator of Region II will be notified.

4.0 Rejection of Data - All values determined to be unacceptable on the Inorganic Analysis Data Sheet (Form I) must be lined over with a red pencil. As soon as any review criteria causes data to be rejected, that data can be eliminated from any further review or consideration.

5.0 Acceptance Criteria - In order that reviews be consistent among reviewers, acceptance criteria as stated in Appendix A.1 (pages 4-25) should be used. Additional guidance can be found in the National Inorganic Functional Guidelines of October 1, 1989.

6.0 SMO Contract Compliance Screening (CCS) - This is intended to aid reviewer in locating any problems, both corrected and uncorrected. However, the validation should be carried out even if CCS is not present. Resubmittals received from laboratory in response to CCS must be used by the reviewer.

7.0 Request for Reanalysis - Data reviewers must note all items of contract non-compliance within Data Assessment Narrative. If holding times and sample storage times have not been exceeded, TPO may request reanalysis if items of non-compliance are critical to data assessment. Requests are to be made on "CLP Re-Analysis Request/Approval Record".

8.0 Record of Communication - Provided by the Regional Sample Control Center (RSCC) to indicate which data packages have been received and are ready to be reviewed.

9.0 Rounding off numbers - The data reviewer will follow the standard practice.

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STANDARD OPERATING PROCEDURE

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Title: Evaluation of Metals Data for the
Contract Laboratory Program
Appendix A.1: Data Assessment - Contract
Compliance (Total Review)

Date: Jan. 1992
Number: HW-2
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	YES	NO	N/A
A.1.1 <u>Contract Compliance Screening Report (CCS)</u> - Present?	☐	☐	<u>X</u>
<u>ACTION:</u> If no, contact RSOC.			
A.1.2 <u>Record of Communication (from RSOC)</u> - Present?	☐	☐	<u>X</u>
<u>ACTION:</u> If no, request from RSOC.			
A.1.3 <u>Trip Report</u> - Present and complete?	☐	☐	<u>X</u>
<u>ACTION:</u> If no, contact RSOC for trip report.			
A.1.4 <u>Sample Traffic Report</u> - Present?	☒	☐	☐
Legible?	☒	☐	☐
<u>ACTION:</u> If no, request from Regional Sample Control Center (RSOC).			
A.1.5 <u>Cover Page</u> - Present?	☒	☐	☐
Is cover page properly filled in and signed by the lab manager or the manager's designee?	☒	☐	☐
<u>ACTION:</u> If no, prepare Telephone Record Log, and contact laboratory.			
Do numbers of samples correspond to numbers on Record of Communication?	☒	☐	☐
Do sample numbers on cover page agree with sample numbers on:			
(a) Traffic Report Sheet?	☒	☐	☐
(b) Form I's?	☒	☐	☐
<u>ACTION:</u> If no for any of the above, contact RSOC for clarification.			

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GERAGHTY & MILLER, INC.

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Title: Evaluation of Metals Data for the
Contract Laboratory Program
Appendix A.1: Data Assessment - Contract
Compliance (Total Review)

Date: Jan. 1992
Number: HJ-2
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A.1.6 Form I to IX Yes No N/A

A.1.6.1 Are all the Form I through Form IX labeled with:

Laboratory name?	☒	—	—
Case/SAS number?	☐	—	☒
EPA sample No.?	☒	—	—
SDG No.?	☒	—	—
Contract No.?	☒	—	—
Correct units?	☒	—	—
Matrix?	☒	—	—

ACTION: If no for any of the above, note under
Contract Problem/Non-Compliance section
of the "Data Assessment Narrative".

A.1.6.2 Do any computation/transcription errors exceed 10% of
reported values on Forms I-IX for:

(NOTE: Check all forms against raw data.)

(a) all analytes analyzed by ICP?	☐	☒	—
(b) all analytes analyzed by GFAA?	☐	☒	—
(c) all analytes analyzed by AA Flame?	☐	—	☒
(d) Mercury?	☐	☒	—
(e) Cyanide?	☒	—	—

ACTION: If yes, prepare Telephone Log, contact
laboratory for corrected data and
correct errors with red pencil and initial.

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Title: Evaluation of Metals Data for the
Contract Laboratory Program
Appendix A.1: Data Assessment - Contract
Compliance (Total Review)

Date: Jan. 1992
Number: HW-2
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	YES	NO	N/A
A.1.7 <u>Raw Data</u>			
A.1.7.1 Digestion Log* for flame AA/ICP (Form XIII) present?	☒	___	___
Digestion Log for furnace AA Form XIII present?	☒	___	___
Distillation Log for mercury Form XIII present?	☒	___	___
Distillation Log for cyanides Form XIII present?	☒	___	___
Are pH values (pH<2 for all metals, pH>12 for cyanide) present?	☐	☒	___
*Weights, dilutions and volumes used to obtain values.			
Percent solids calculation present for soils/sediments?	☒	___	___
Are preparation dates present on sample preparation logs/bench sheets?	☒	___	___
A.1.7.2 Measurement read out record present?			
ICP	☒	___	___
Flame AA	☐	___	☒
Furnace AA	☒	___	___
Mercury	☒	___	___
Cyanides	☒	___	___
A.1.7.3 Are all raw data to support all sample analyses and QC operations present?	☐	☒	___
Legible?	☒	___	___
Properly Labeled?	☒	___	___

ACTION: If no for any of the above questions in sections A.1.7.1 through A.1.7.3, write Telephone Record Log and contact laboratory for resubmittals.

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Title: Evaluation of Metals for the Contract
Laboratory Program
Appendix A.1: Data Assessment - Contract

Date: Jan. 1992
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Compliance (Total Review)

		YES	NO	N/A
A.1.8	<u>Holding Times</u> - (aqueous and soil samples)			
	(Examine sample traffic reports and digestion/distillation logs.)			
	Mercury analysis (28 days) exceeded?	—	☒	—
	Cyanide distillation (14 days) exceeded?	—	☒	—
	Other Metals analysis (6 months) exceeded?	—	☒	—
	NOTE: Prepare a list of all samples and analytes for which holding times have been exceeded. Specify the number of days from date of collection to the date of preparation (from raw data). Attach to checklist. ACTION: If yes, reject (red-line) values less than Instrument Detection Limit (IDL) and flag as estimated (J) the values above IDL even though sample(s) was preserved properly.			
A.1.8.2	Is pH of aqueous samples for:			
	Metals Analysis >2?	—	☒	—
	Cyanides Analysis <12?	☒	☐	—
	Action: If yes, flag the associated metals and cyanides data as estimated.			
A.1.9	<u>Form I (Final Data)</u>			
A.1.9.1	Are all Form I's present and complete?	☐	☒	—
	ACTION: If no, prepare telephone record log and contact laboratory for submittal.			
A.1.9.2	Are correct units (ug/l for waters and mg/kg for soils) indicated on Form I's?	☒	—	—
	Are soil sample results for each parameter corrected for percent solids?	☒	—	—
	Are all "less than IDL" values properly coded with "U"?	☐	☒	—

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	YES	NO	N/A
Are the correct concentration qualifiers used with final data?	☐	☒	☐
ACTION: If no for any of the above, prepare Telephone Record Log, and contact laboratory for corrected data.			
A.1.9.3 Are EPA sample # s and corresponding laboratory sample ID # s the same as on the Cover Page, Form I's and in the raw data?	☒	☐	☐
Was a brief physical description of samples given on Form I's?	☒	☐	☐
Was the dilution of any sample diluted beyond the requirements of the contract noted on Form I or Form XIV?	☒	☐	☐
ACTION: If no for any of the above, note under Contract-Problem/Non-Compliance of the "Data Assessment Narrative".			
A.1.10 <u>Calibration</u>			
A.1.10.1 Is record of at least 2 point calibration present for ICP analysis?	☒	☐	☐
Is record of 5 point calibration present for Hg analysis?	☒	☐	☐
Is record of 4 point calibration present for:			
Flame AA?	☐	☐	☒
Furnace AA?	☒	☐	☐
Cyanides?	☒	☐	☐
Is one calibration standard at the CRDL level for all AA (except Hg) and cyanides analyses?	☒	☐	☐
ACTION: If no for any of the above, write in the Contract Problem/Non-Compliance section of the "Data Assessment Narrative".			

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	YES	NO	N/A
A.1.10.2 Is correlation coefficient less than 0.995 for:			
Mercury Analysis?	—	☒	—
Cyanide Analysis?	—	☒	—
Atomic Absorption Analysis?	—	☒	—

ACTION: If yes, flag the associated data as estimated.

NOTE: The data validator shall calculate the correlation coefficient using concentrations of the standards and the corresponding instrument response (e.g. absorbance, peak area, peak height, etc.).

A.1.10.3 In the instance where less than 4 standards are measured in absorbance (or peak area, peak height, etc.) mode, are the remaining standards analyzed in concentration mode immediately after calibration within $\pm 10\%$ of the true values? ☐ ☒ —

ACTION: If no, flag the associated data as estimated if standards are not within $\pm 10\%$ of true values. Do not flag the data as estimated in linear range indicated by good recovery of standard(s).

A.1.11 Form II A (Initial and Continuing Calibration Verification)-

A.1.11.1 Present and complete for every metal and cyanide? ☒ — —

Present and complete for AA and ICP when both are used for the same analyte? ☒ — —

ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory.

A.1.11.2 Circle on each Form IIA all percent recoveries that are outside the contract windows.
Are all calibration standards (initial and continuing) within control limits:

Metals- 90-110%R?	☒	—	—
Hg - 80-120%R?	☒	—	—
Cyanides- 85-115%R?	☒	—	—

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ACTION: Flag as estimated (J) all positive data (not flagged with a "U") analyzed between a calibration standard with %R between 75-89% (65-79% for Hg; 70-84% for CN) or 111-125% (121-135% for Hg; 116-130% for CN) recovery and nearest good calibration standard. Qualify results <IDL as estimated (U) if the ICV or CCV %R is 75-89% (CN, 70-84% ; HG, 65-79%). Reject (red-line) as unacceptable data if recovery of the ICV or CCV is outside the range 75-125% (CN, 70-130%; Hg, 65-135%). Qualify five samples on either side of verification standard out of control limits.			
A.1.11.3 Was continuing calibration performed every 10 samples or every 2 hours?	☐	☒	—
Was ICV for cyanides distilled?	☒	—	—
ACTION: If no for any of the above, write in the Contract-Problem/Non-Compliance section of the "Data Assessment Narrative".			
A.1.12 <u>Form II B (CRDL Standards for AA and ICP) -</u>			
A.1.12.1 Was a CRDL standard (CRA) analyzed after initial calibration for all AA metals (<u>except Hg</u>)?	☒	—	—
Was a mid-range calib. verification standard distilled and analyzed for cyanide analysis?	☒	—	—
Was a 2xCRDL (or 2xIDL when IDL>CRDL) analyzed (CRI) for each ICP run? (Note: CRI for AL,Ba,Ca,Fe,Mg,Na,or K is not required.)	☒	—	—
ACTION: If no for any of the above, flag as estimated all data falling within the affected ranges. The affected ranges are: AA Analysis - **True Value $\pm$ CRDL ICP Analysis - **True Value $\pm$ 2CRDL CN Analysis - **True Value $\pm$ 0.5 x True Value.			

**True value of CRA, CRI or mid-range standard. Substitute IDL for CRDL when IDL > CRDL.
Compute the concentration of the missing mid-range standard from the calibration range.

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	YES	NO	N/A
A.1.12.2 Was CRI analyzed after ICV/ICB and before the final OCV/OCB, and twice every eight hours of ICP run?	☒	—	—

ACTION: If no, write in Contract Problem/Non-Compliance Section of the "Data Assessment Narrative".

A.1.12.3 Circle on each Form IIB all the percent recoveries that are outside the acceptance windows.

Are CRA and CRI standards within control limits:

Metals 80 - 120%R?	☐	☒	—

Is mid-range standard within control limits:

Cyanide 80 - 120%R?	☒	—	—

ACTION: Flag as estimated all sample results within the affected range if the recovery of the standard is between 50-79%; flag only positive data within the affected range if the recovery is between 121-150%; reject all data within the affected range if the recovery is less than 50%; reject only positive data within the affected range if the recovery is greater than 150%. Qualify 50% of the samples on either side of CRI standard outside the control limits.

Note: Flag or reject the final results only when sample raw data are within the affected ranges and the CRDL standards are outside the acceptance windows.

A.1.13 Form III (Initial and Continuing Calibration Blanks)

A.1.13.1 Present and complete?	☐	☒	—
For both AA and ICP when both are used for the same analyte?	☒	—	—
Was an initial calibration blank analyzed?	☒	—	—
Was a continuing calibration blank analyzed after every 10 samples or every 2 hours (which ever is more frequent)?	☒	—	—

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	YES	NO	N/A
ACTION: If no, prepare Telephone Record Log, contact laboratory and write in the Contract-Problems/Non-Compliance section of the "Data Assessment Narrative".			
A.1.13.2 Circle on each Form III all calibration blank values that are above CRDL (or 2 x IDL when IDL > CRDL).			
Are all calibration blanks (when IDL < CRDL) less than or equal to the Contract Required Detection Limits (CRDLs)?	[X]	—	—
Are all calibration blanks less than two times Instrument Detection Limit (when IDL > CRDL)?	[X]	—	—
ACTION: If no for any of the above, flag as estimated (J) positive sample results when <u>raw sample value</u> is less than or equal to calibration blank value analyzed between calibration blank with value over CRDL (or 2xIDL) and nearest good calibration blank. Flag five samples on either side of the calibration blank outside the control limits.			
A.1.14 FORM III (Preparation Blank) - (Note: The preparation blank for mercury is the same as the calibration blank.)			
A.1.14.1 Was one prep. blank analyzed for:			
each Sample Delivery Group (SDG)?	[X]	—	—
each batch of digested samples?	[X]	—	—
each matrix type?	[X]	—	—
both AA and ICP when both are used for the same analyte?	[X]	—	—
ACTION: If no for any of the above, flag as estimated (J) all the associated positive data < 10 x IDLs for which prep. blank was not analyzed.			
NOTE: If only one blank was analyzed for more than 20 samples, then first 20 samples analyzed do not have to be flagged as estimated (J).			

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	YES	NO	N/A
A.1.14.2 Is concentration of prep. blank value greater than the CRDL when IDL is less than or equal to CRDL?	☐	☒	☐
If yes, is the concentration of the sample with the least concentrated analyte less than 10 times the prep. blank?	☐	☐	☒
ACTION: If yes, reject (red-line) all associated data greater than CRDL concentration but less than ten times the prep. blank value.			
A.1.14.3 Is concentration of prep. blank value (Form III) less than two times IDL, when IDL is greater than CRDL?	☒	☐	☐
ACTION: If no, reject (red-line) all positive sample results when sample raw data are less than 10 times the prep. blank value.			
A.1.14.4 Is concentration of prep. blank below the negative CRDL?	☐	☒	☐
ACTION: If yes, reject (red-line) all associated sample results less than 10xCRDL.			
A.1.15 <u>Form IV (ICP Interference Check Sample)</u>			
A.1.15.1 Present and complete?	☒	☐	☐
(NOTE: Not required for furnace AA, flame AA, mercury, cyanide and Ca, Mg, K and Na.)			
Was ICS analyzed at beginning and end of run (or at least twice every 8 hours)?	☒	☐	☐
ACTION: If no, flag as estimated (J) all the samples for which AL, Ca, Fe, or Mg is higher than in ICS.			
A.1.15.2 Circle all values on each Form IV that are more than $\pm 20\%$ of true or established mean value.			
Are all Interference Check Sample results inside the control limits ($\pm 20\%$)?	☐	☒	☐
If no, is concentration of Al, Ca, Fe, or Mg lower than the respective concentration in ICS?	☒	☐	☐

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		YES	NO	N/A
ACTION: If no, flag as estimated (J) those positive results for which ICS recovery is between 121-150%; flag all sample results as estimated if ICS recovery falls within 50-79%; reject (red-line) those sample results for which ICS recovery is less than 50%; if ICS recovery is above 150%, reject positive results only (not flagged with a "U").				
A.1.16	<u>Form V A (Spiked Sample Recovery - Pre-Digestion/Pre-Distillation)-</u> (Note: Not required for Ca, Mg, K, and Na (both matrices), Al, and Fe (soil only).)			
A.1.16.1	Present and complete for:			
	each SDG?	☐	☒	☐
	each matrix type?	☐	☐	☒
	each conc. range (i.e. low, med., high)?	☐	☐	☒
	For both AA and ICP when both are used for the same analyte?	☐	☒	☐
ACTION: If no for any of the above, flag as estimated (J) all the positive data less than four times the spiking levels specified in SOW for which spiked sample was not analyzed.				
NOTE: If one spiked sample was analyzed for more than 20 samples, then first 20 samples analyzed do not have to be flagged as estimated (J).				
A.1.16.2	Was field blank used for spiked sample?	☐	☒	☐
ACTION: If yes, flag all positive data less than 4 x spike added as estimated (J) for which field blank was used as spiked sample.				
A.1.16.3	Circle on each Form VA all spike recoveries that are outside control limits (75% to 125%).			
	Are all recoveries within control limits?	☐	☒	☐
	If no, is sample concentration greater than or equal to four times spike concentration?	☒	☒	☐

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YES NO N/A

ACTION: If yes, disregard spike recoveries for analytes whose concentrations are greater than or equal to four times spike added. If no, circle those analytes on Form V for which sample concentration is less than four times the spike concentration.

Are results outside the control limits (75-125%)
flagged with "N" on Form I's and Form VA?

☐

☒

☐

ACTION: If no, write in the Contract - Problem/Non -
Compliance section of "Data Assessment Narrative".

A.1.16.4

Aqueous

Are any spike recoveries:

(a) less than 30%?

☐

☐

☒

(b) between 30-74%?

☐

☐

☒

(c) between 126-150%?

☐

☐

☒

(d) greater than 150%?

☐

☐

☒

ACTION: If less than 30%, reject all associated aqueous data; if between 30-74%, flag all associated aqueous data as estimated (J); if between 126-150%, flag as estimated (J) all associated aqueous data not flagged with a "U"; if greater than 150%, reject (red-line) all associated aqueous data not flagged with a "U".

A.1.16.5

Soil/Sediment

Are any spike recoveries:

(a) less than 10%?

☒

☐

☐

(b) between 10-74%?

☒

☐

☐

(c) between 126-200%?

☒

☐

☐

(d) greater than 200%?

☐

☒

☐

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		YES	NO	N/A
ACTION:	If less than 10%, reject all associated data; if between 10-74%, flag all associated data as estimated; if between 126-200%, flag as estimated all associated data was not flagged with a "U"; if greater than 200%, reject all associated data not flagged with a "U".			
A.1.17	<u>Form VI (Lab Duplicates)</u>			
A.1.17.1	Present and complete for: each SDG?	☐	☒	☐
	each matrix type?	☐	☐	☒
	each concentration range (i.e. low, med., high)?	☐	☐	☒
	both AA and ICP when both are used for the same analyte?	☐	☐	☒
ACTION:	If no for any the above, flag as estimated (J) all the data $\geq$ CRDL* for which duplicate sample was not analyzed.			
Note:	1. If one duplicate sample was analyzed for more than 20 samples, then first 20 samples do not have to be flagged as estimated. 2. If percent solids for soil sample and its duplicate differ by more than 1%, prepare a Form VI for each duplicate pair, report concentrations in ug/L on wet weight basis and calculate RPD or Difference for each analyte.			
A.1.17.2	Was field blank used for duplicate analysis?	☐	☒	☐
ACTION:	If yes, flag all data $\geq$ CRDL* as estimated (J) for which field blank was used as duplicate.			
A.1.17.3	Are all values within control limits (RPD 20% or difference $\leq \pm$ CRDL)?	☐	☒	☐
	If no, are all results outside the control limits flagged with an * on Form I's and VI?	☐	☒	☐
ACTION:	If no, write in the Contract - Problems/Non-Compliance section of "Data Assessment Narrative".			

* Substitute IDL for CRDL when IDL > CRDL.

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- NOTE:** 1. RPD is not calculable for an analyte of the sample - duplicate pair when both values are less than IDL.
2. If the result of lab duplicate analyzed by GFAA is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, do not apply precision criteria to metals analyzed by GFAA.

YES NO N/A

A.1.17.4 Aqueous

Circle on each Form VI all values that are:

RPD > 50%, or
Difference > CRDL*

Is any RPD greater than 50% where sample and duplicate are both greater than or equal to 5 times *CRDL?

— ☐ ☒

Is any difference** between sample and duplicate greater than *CRDL where sample and/or duplicate is less than 5 times *CRDL?

— ☐ ☒

ACTION: If yes, flag the associated data as estimated.

A.1.17.5 Soil/Sediment

Circle on each Form VI all values that are:

RPD > 100%, or
Difference > 2 x CRDL*

Is any RPD (where sample and duplicate are both greater than or equal to 5 times *CRDL) :

> 100%? — ☒ —

Is any **difference between sample and duplicate (where sample and/or duplicate is less than 5x*CRDL) :

> 2x*CRDL? — ☒ —

* Substitute IDL for CRDL when IDL > CRDL.

** Use absolute values of sample and duplicate to calculate the difference.

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YES NO N/A

ACTION: If yes, flag the associated data as estimated.

A.1.18 Field Duplicates

A.1.18.1 Were field duplicates analyzed?

☒

—

—

ACTION: If yes, prepare a Form VI for each aqueous field duplicate pair. Prepare a Form VI for each soil duplicate pair, if percent solids for sample and its duplicate differ by more than 1%; report concentrations of soils in ug/l on wet weight basis and calculate RPDs or Difference for each analyte.

NOTE: 1. Do not calculate RPD when both values are less than IDL.
2. Flag all associated data only for field duplicate pair.

A.1.18.2 Aqueous

Circle all values on self prepared Form VI for field duplicates that are:

RPD > 50%, or
Difference > CRDL*

Is any RPD greater than 50% where sample and duplicate are both greater than or equal to 5 times *CRDL?

—

☐

☒

Is any **difference between sample and duplicate greater than *CRDL where sample and/or duplicate is less than 5 times *CRDL?

—

☐

☒

ACTION: If yes, flag the associated data as estimated.

* Substitute IDL for CRDL when IDL > CRDL.

** Use absolute values of sample and duplicate to calculate the difference.

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YES NO N/A

A.1.18.3 Soil/Sediment

Circle all values on self prepared Form VI for
field duplicates that are:

RPD >100%, or

Difference > 2 x CRDL*

Is any RPD (where sample and duplicate are both
greater than 5 times *CRDL) :

>100%?

☒

☐

Is any **difference between sample and duplicate
(where sample and/or duplicate is less than 5x *CRDL) :

>2x *CRDL?

☒

☐

ACTION: If yes, flag the associated data as estimated.

A.1.19 Form VII (Laboratory Control Sample) (Note: LCS - not
required for aqueous Hg and cyanide analyses.)

A.1.19.1 Was one LCS prepared and analyzed for:

each SDG?

☒

☐

☐

each batch samples digested/distilled?

☒

☐

☐

both AA and ICP when both are used for the same
analyte?

☒

☐

☐

ACTION: If no for any of the above, prepare Telephone
Record Log and contact laboratory for submittal
of results of LCS. Flag as estimated (J) all
the data for which LCS was not analyzed.

NOTE: If only one LCS was analyzed for more than 20
samples, then first 20 samples close to LCS
do not have to be flagged as estimated.

* Substitute IDL for CRDL when IDL > CRDL.

** Use absolute values of sample and duplicate to calculate the difference.

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Aqueous LCS

greater than 150%?

Solid LCS

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		YES	NO	N/A
A.1.20	<u>Form IX (ICP Serial Dilution) -</u>			
	<u>NOTE:</u> Serial dilution analysis is required only for initial concentrations equal to or greater than 10 x IDL.			
A.1.20.1	Was Serial Dilution analysis performed for:			
	each SDG?	☒	—	—
	each matrix type?	☐	—	☒
	each concentration range (i.e. low, med.)?	☐	—	☒
	<u>ACTION:</u> If no for any of the above, flag as estimated all the positive data $\geq 10 \times \text{IDL}$ or $\geq \text{CRDL}$ when $10 \times \text{IDL} \leq \text{CRDL}$ for which Serial Dilution Analysis was not performed.			
A.1.20.2	Was field blank(s) used for Serial Dilution Analysis?	—	☒	—
	<u>ACTION:</u> If yes, flag all associated data $\geq 10 \times \text{IDL}$ as estimated (J). If $10 \times \text{IDL} \leq \text{CRDL}$, flag all data $\geq \text{CRDL}$.			
A.1.20.3	Are results outside control limit flagged with an "E" on Form I's and Form IX when initial concentration on Form IX is equal to 50 times IDL or greater.	☒	—	—
	<u>ACTION:</u> If no, write in the Contract-Problem/Non- Compliance section of the "Data Assessment Narrative".			
A.1.20.4	Circle on each Form IX all percent difference that are outside the control limits for initial concentrations equal to or greater than 10 x IDLs only.			
	Are any % difference values:			
	> 10%?	☒	☐	—
	$\geq 100\%$?	—	☒	—

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		YES	NO	N/A
	<u>ACTION:</u> Flag as estimated (J) all the associated sample data $\geq 10 \times \text{IDLs}$ (or $\geq \text{CRDL}$ when $10 \times \text{IDL} \leq \text{CRDL}$) for which percent difference is greater than 10% but less than 100%. Reject (red-line) all the associated sample results equal to or greater than $10 \times \text{IDLs}$ (or $\geq \text{CRDL}$ when $10 \times \text{IDL} \leq \text{CRDL}$) for which PD is greater than or equal to 100%.			
	<u>Note:</u> Flag or reject on Form I's only the sample results whose associated raw data are $\geq 10 \times \text{IDL}$ (or $\geq \text{CRDL}$ when $10 \times \text{IDL} \leq \text{CRDL}$)			
A.1.21	<u>Furnace Atomic Absorption (AA) QC Analysis</u>			
A.1.21.1	Are duplicate injections present in furnace raw data (except during full Method of Standard Addition) for each sample analyzed by GFAA?	☒	—	—
	<u>ACTION:</u> If no, <u>reject</u> the data on Form I's for which duplicate injections were not performed.			
A.1.21.2	Do the duplicate injection readings agree within 20% Relative Standard Deviation (RSD) or Coefficient of Variation (CV) for concentration greater than CRDL?	☒	—	—
	Was a dilution analyzed for sample with analytical spike recovery less than 40%?	☒	—	—
	<u>ACTION:</u> If no for any of the above, flag all the associated data as estimated.			
A.1.21.3	Is *analytical spike recovery outside the control limits (85-115%) for any sample?	☒	☐	—
	<u>ACTION:</u> If yes, flag as estimated the affected sample results if the recovery is between 10-84%; if the recovery is between 115-200%, flag the associated positive sample results as estimated; reject the associated sample results if the recovery is less than 10%; reject positive sample results if the recovery is greater than 200%.			

* Analytical spike is not required on the pre-digestion spiked sample.

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YES NO N/A

NOTE: Reject or flag the data only when the affected sample(s) was not subsequently analyzed by Method of Standard Addition.

A.1.22 Form VIII (Method of Standard Addition Results)

A.1.22.1 Present?

☒ ☐ ☐

If no, is any Form I result coded with "S" or a "+"?

☒ ☐ ☐

ACTION: If yes, write request on Telephone Record Log and contact laboratory for submittal of Form VIII.

A.1.22.2 Is coefficient of correlation for MSA less than 0.990 for any sample?

☐ ☒ ☐

ACTION: If yes, reject (red-line) the affected data.

A.1.22.3 Was *MSA required for any sample but not performed?

☐ ☒ ☐

Is coefficient of correlation for MSA less than 0.995?

☐ ☒ ☐

Are MSA calculations outside the linear range of the calibration curve generated at the beginning of the analytical run?

☐ ☒ ☐

ACTION: If yes for any of the above, flag all the associated data as estimated (J).

A.1.22.4 Was proper quantitation procedure followed correctly as outlined in the SOW on page E-23?

☒ ☐ ☐

ACTION: If no, note exception under Contract Problem/ Non-Compliance section of the "Data Assessment Narrative", and prepare a separate list.

* MSA is not required on LCS and prep. blank.

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	YES	NO	N/A
A.1.23 <u>Dissolved/Total or Inorganic/Total Analytes -</u>			
A.1.23.1 Were any analyses performed for dissolved as well as total analytes on the same sample(s).	—	☒	—
Were any analyses performed for inorganic as well as total (organic + inorganic) analytes on the same sample(s)?	—	☒	—
NOTE: 1. If yes, prepare a list comparing differences between all dissolved (or inorganic) and total analytes. Compute the differences as a percent of the total analyte only when dissolved concentration is greater than CRDL as well as total concentration. 2. Apply the following questions only if inorganic (or dissolved) results are (i) above CRDL, and (ii) greater than total constituents. 3. At least one preparation blank, ICS, and LCS should be analyzed in each analytical run.			
A.1.23.2 Is the concentration of any dissolved (or inorganic) analyte greater than its total concentration by more than 10%?	—	☐	☒
A.1.23.3 Is the concentration of any dissolved (or inorganic) analyte greater than its total concentration by more than 50%?	—	☐	☒
ACTION: If more than 10%, flag both dissolved (or inorganic) and total values as estimated (J); if more than 50%, reject (red-line) the data for both values.			
A.1.24 <u>Form I (Field Blank) -</u>			
(Note: Designate "Field Blank" as such on Form I.)			
A.1.24.1 Circle all field blank values on Form I that are greater than CRDL, (or 2 x IDL when IDL > CRDL).			
Is field blank concentration less than CRDL (or 2 x IDL when IDL > CRDL) for all parameters of associated aqueous and soil samples?	☐	☒	—

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Contract Laboratory Program
Appendix A.1: Data Assessment - Contract
Compliance (Total Review)

Date: Jan. 1992
Number: HW-2
Revision: 11

	YES	NO	N/A
If no, was field blank value already rejected due to other QC criteria?	☐	☒	—
ACTION: If no, reject (except field blank results) all associated positive sample data less than or equal to five times the field blank value. Reject on Form I's the soil sample results that when converted to ug/L on wet basis are less than or equal to five times the field blank value in ug/L.			
A.1.25 <u>Form X, XI, XII (Verification of Instrumental Parameters).</u>			
A.1.25.1 Is verification report present for:			
Instrument Detection Limits (quarterly)?	☒	—	—
ICP Interelement Correction Factors (annually)?	☒	—	—
ICP Linear Ranges (quarterly)?	☒	—	—
ACTION: If no, contact TPO of the lab.			
A.1.25.2 <u>Form X (Instrument Detection Limits)</u> - (Note: IDL is not required for Cyanide.)			
A.1.25.2.1 Are IDLs present for:			
all the analytes?	☐	☒	—
all the instruments used?	☒	—	—
For both AA and ICP when both are used for the same analyte?	☒	—	—
ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory.			
A.1.25.2.2 Is IDL greater than CRDL for any analyte?	☒	☐	—
If yes, is the concentration on Form I of the sample analyzed on the instrument whose IDL exceeds CRDL, greater than 5 x IDL.	☒	—	—

TUT 002 1609

Title: Evaluation of Metals Data for the
Contract Laboratory Program
Appendix A.1: Data Assessment - Contract
Compliance (Total Review)

Date: Jan. 1992
Number: HW-2
Revision: 11

YES NO N/A

Action : If no, flag as estimated all values less than five times IDL of the instrument whose IDL exceeds CRDL.

A.1.25.3 Form XI (Linear Ranges)

A.1.25.3.1 Was any sample result higher than high linear range of ICP.

— ☒ —

Was any sample result higher than the highest calibration standard for non-ICP parameters?

☒ — ☐ —

If yes for any of the above, was the sample diluted to obtain the result on Form I?

☒ — —

ACTION: If no, flag the result reported on Form I as estimated(J).

A.1.26 Percent Solids of Sediments

A.1.26.1 Are percent solids in sediment(s):

< 50%?

— ☒ —

< 10%?

— ☒ —

ACTION: If yes, qualify as estimated all the results of a sample that has per cent solids between 10%-50% (i.e. moisture content between 50%-90%). Reject all the results of a sample that has per cent solids less than 10% (i.e. moisture content greater than 90%).

NOTE: Reject or flag(J) only the sample results that were not previously rejected or flagged due to other QC criteria.

TUT 002 1610

STANDARD OPERATING PROCEDURE

Title: Evaluation of Metals Data for the
Contract Laboratory Program
Attachment I.2: Data Assessment Narrative

Date: January 1992
Number: HW-2
Revision: 11

Case# <u>N/A</u>	Site <u>Tutu Wells</u>	Matrix: Soil <u>X</u>
SDG# <u>(All Project #'s)</u>	Lab <u>Enseco East</u>	Water <u>X</u>
Contractor <u>Geraghty & Miller</u>	Reviewer <u>C.W. Loydaik and</u> <u>M.E. Radecke</u>	Other <u> </u>

I.2.1. Validation Flags -

The following flags have been applied in red by the data validator and must be considered by the data user.

J -

This flag indicates the results qualified as estimated.

Red-Line -

A red-line drawn through a sample result indicates unusable value. The red-line data are known to contain significant errors based on documented information and must not be used by the data user.

Fully Usable Data-

The results that do not carry "J" or "red-line" are fully usable.

Contractual Qualifiers -

The legend of contractual qualifiers applied by the lab on Form I's is found on page B-20 of Statement of Work (SOW) ILM01.0.

I.2.2 The data assessment is given below and on the attached sheets.

Total metals and cyanide were analyzed according to the March 1990 U.S. Environmental Protection Agency (USEPA) Contract Laboratory Program (CLP) SOW for target analyte list (TAL) parameters. This validation was performed according to the USEPA Region II checklist for the evaluation of metals data for the CLP, January 1992. For each sample delivery group (SDG) discussed below, are those criteria that did not meet the requirements of the Region II checklist are discussed along with the appropriate qualifiers that were applied to the data.

Two of the samples sent to the laboratory (B-8 and B-16) were also analyzed as the matrix spike and laboratory duplicate samples. The matrix spike and laboratory duplicate data

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for B-8 and B-16 are contained in SDGs 23938 and 24008, respectively. The following samples are associated with the B-8 matrix spike and duplicate results:

B-1	B-13
B-2	B-13A
B-3	MW-5
B-6	MW-6D
B-7	MW-10
B-10	MW-10D
B-11	MW-101 (B-8 FR; a blind field replicate of B-8)
B-12	

The lead matrix spike and duplicate analyses were performed by inductively coupled plasma (ICP) and not by graphite furnace atomic absorption (GFAA). The arsenic matrix spike and duplicate analyses were performed by GFAA and not by ICP. The reported data are not complete since both ICP and GFAA were used to analyze the samples for lead and arsenic. The positive lead sample results analyzed by GFAA for which the lead GFAA matrix spike and duplicate analyses were not performed were qualified as estimated (J). The positive arsenic sample results analyzed by ICP for which the arsenic ICP matrix spike and duplicate analyses were not performed were qualified as estimated (J). Therefore, lead results for samples B-1, B-6, B-2, B-3, B-7, B-10, B-13, B-11, B-12, MW-6D, MW-10, MW-10D, B-13A and MW-101 (B-8 FR) and the arsenic results for samples B-13 and MW-101 (B-8 FR) were qualified as estimated (J).

The B-8 matrix spike recoveries for antimony (35.2%) and silver (132.4%) were outside the quality control (QC) limits of 75 to 125%. All of the antimony results for B-8 and the samples listed above were qualified as estimated (J) if detected and estimated (UJ) if not detected. The positive silver results for samples B-6, B-2, B-3, B-10, B-13, B-11, B-12, MW-6D, MW-10, MW-10D, B-13A, B-8, MW-101 (B-8 FR) and MW-5 were qualified as estimated (J). Further qualification of the data was not necessary based on the other B-8 matrix spike results and all B-8 duplicate results.

The following samples are associated with the B-16 matrix spike and duplicate results:

B-5	B-14
B-15	MW-103 (B-14 FR; a blind field replicate of B-14)
MW-2	MW-102 (MW-2 FR; a blind field replicate of MW-2)
SS-1	SS-2
SS-3	SS-4
SS-5	SS-6
SS-6 FR	SS-8

The lead matrix spike and duplicate analyses were performed by ICP and not by GFAA. The reported data are not complete since both ICP and GFAA were used to analyze the samples

TUT 002 1612

for lead. The positive lead sample results analyzed by GFAA for which the lead GFAA matrix spike and duplicate analyses were not performed were qualified as estimated (J). Therefore, lead results for all the samples listed above were qualified as estimated (J).

The B-16 matrix spike recoveries for antimony (58%), chromium (60.9%), lead (71.5% sample B-16 only), vanadium (62%), and copper (182.3%) were outside the QC limits of 75 to 125%. The positive antimony, chromium, vanadium and lead (B-16 ICP only) results were qualified as estimated (J) for the samples listed above. The non-detect antimony, chromium and vanadium results were qualified as estimated (UJ) for the samples listed above.

The B-16 matrix spike recoveries for zinc (- 18.2%) and manganese (- 42.2%) were outside the QC limits. However, since the sample concentrations were greater than or equal to four times the spike concentration for these two analytes, no action was required. Further qualification of the data was not necessary based on the other B-16 matrix spike results and all the B-16 duplicate results.

There are no site-specific matrix spike and laboratory duplicate samples associated with the following samples:

B-4	MW-7
B-9	MW-100 (MW-7 FR; a blind field replicate of MW-7)
MW-1	MW-8
MW-1D	MW-9
MW-3	MW-11D
MW-4	MW-12D
MW-4D	MW-13D
MW-6	MW-14

Because there is no site-specific matrix spike sample associated with the samples listed above, all positive data less than four times the spiking level specified by the method are qualified as estimated (J). In addition, because there is no site-specific laboratory duplicate sample associated with the samples listed above, all data greater than or equal to the contract required detection limit (CRDL) are qualified as estimated (J).

For all the arsenic, lead, thallium and selenium results, the data reviewers could not confirm the correlation coefficients (r) reported by the laboratory. The r values were calculated using a non-linear regression formula. Except where noted below, the calibration curves associated with the data were acceptable for the appropriate sample concentration ranges.

TUT 002 1613

SDG# 22507:

This SDG contained three reports: 22570, 22507, and 22595. Results were reported for 7 samples: 4 solid (B-4, MW-1D, MW-3, and MW-4D), and 3 aqueous (FB060492, FB060592, FB060992).

The ICP serial dilution was performed on sample B-4. The serial dilution result for sodium did not meet the QC criteria. The positive sodium result for sample B-4 was qualified as estimated (J).

Iron was detected in field blank FB060992 at a concentration of 165 micrograms per liter (ug/L), exceeding the CRDL of 100 ug/L. However, the associated sample results were not affected because the sample iron concentrations were greater than five times the field blank iron concentration.

Several post-digestion spike recoveries for arsenic, thallium and selenium were outside the control limits of 85-115%. For sample B-4, the positive arsenic result was qualified as estimated (J) because spike recovery was 74%. For sample MW-3, the non-detect selenium result was qualified as estimated (UJ) because the recovery for the post-digestion spike was 84%. For sample MW-4D, the positive selenium result was qualified as estimated (J) because the recovery for the post-digestion spike was 84%. Arsenic was also qualified as estimated (UJ) for sample FB060992 because of a spike recovery of 82%. All other arsenic, thallium and selenium results which were qualified with a "W" by the laboratory did not meet the criteria for qualifying.

Arsenic was analyzed by the method of standard additions (MSA) for sample MW-3. The arsenic result for this sample was rejected (R) because the correlation coefficient was <0.990 for both runs.

The incorrect reporting limit for cyanide was used. The cyanide data were corrected on Form I. The initial calibration blank (ICB)/continuing calibration blank (CCB) data for cyanide, however, were not corrected on Form III.

SDG# 22712:

The incorrect reporting limit for cyanide was used. The cyanide data were corrected on Form I. The ICB/CCB data for cyanide, however, were not corrected on Form III.

Sodium was originally reported as not detected in sample MW-4. However, sodium was detected in this sample at a concentration of 274 milligrams per kilograms (mg/kg). The sample MW-4 sodium result on Forms I and IX were corrected by the data reviewer.

The selenium post-digestion spike recovery for MW-4 (81%) was outside the QC limits of 85-115%. The selenium result for sample MW-4 was qualified as estimated (J).

The ICP serial dilution was performed on sample MW-4. The serial dilution results for chromium, cobalt, copper, iron, magnesium, manganese, potassium, vanadium, and zinc did not meet the QC criteria. Sample MW-4 results for these analytes were qualified as estimated (J).

SDG# 22793:

The lead post-digestion spike recovery for FB061992 was less than 85% for two runs. Therefore, the non-detect lead result for FB061992 was qualified as estimated (UJ).

An ICP serial dilution analysis was performed on sample MW-13D. The serial dilution results for aluminum, calcium, cobalt, copper, iron, magnesium, manganese, vanadium and zinc did not meet QC criteria. The results for these analytes in sample MW-13D were qualified as estimated (J).

The incorrect reporting limit for cyanide was used. The cyanide data were corrected on Form I. The ICB/CCB data for cyanide, however, were not corrected on Form III.

SDG# 22932:

The incorrect reporting limit for cyanide was used. The cyanide data were corrected on Form I. The ICB/CCB data for cyanide, however, were not corrected on Form III.

The ICP serial dilution was performed on sample MW-11D. The serial dilution results for iron and zinc did not meet QC criteria. The positive zinc and iron results for sample MW-11D were qualified as estimated (J).

SDG# 23021:

The incorrect reporting limit for cyanide was used. The cyanide data were corrected on Form I. The ICB/CCB data for cyanide, however, were not corrected on Form III.

The ICP serial dilution was performed on sample MW-1. The serial dilution results for iron and zinc did not meet QC criteria. The positive zinc and iron results for sample MW-1 were qualified as estimated (J).

TU1 002 1615

SDG# 23024:

The ICP serial dilution was performed on sample MW-14. The serial dilution results for aluminum, barium, chromium, copper, iron, magnesium, manganese, vanadium, and zinc did not meet QC criteria. The positive aluminum, barium, chromium, copper, iron, magnesium, manganese, vanadium, and zinc results for sample MW-14 were qualified as estimated (J).

The incorrect reporting limit for cyanide was used. The cyanide data were corrected on Form I. The ICB/CCB data for cyanide, however, were not corrected on Form III.

SDG# 23144:

The incorrect reporting limit for cyanide was used. The cyanide data were corrected on Form I. The ICB/CCB data for cyanide, however, were not corrected on Form III.

The ICP serial dilution was performed on sample MW-12D. The serial dilution result for zinc did not meet QC criteria, therefore, the zinc result for sample MW-12D was qualified as estimated (J).

SDG# 23396:

The incorrect reporting limit for cyanide was used. The cyanide data were corrected on Form I. The ICB/CCB data for cyanide, however, were not corrected on Form III.

The soil reporting limit for sodium was changed by the data reviewer on the soil Form I's using the standard laboratory sodium ICP wavelength since the laboratory reported the sodium results using an ICP wavelength not typically used when analyzing soils.

The lead recovery for the CRDL standard was 76.6%, which was outside the QC limits of 80-120%. As a result, the positive lead results for associated samples MW-7 and MW-100 (MW-7 FR) were qualified as estimated (J).

The ICP serial dilution was performed on sample MW-100 (MW-7 FR). The serial dilution results for nickel and potassium did not meet QC criteria. The positive nickel and potassium results for samples MW-7 and MW-100 (MW-7 FR) were qualified as estimated (J). It should be noted that the sodium data were corrected on Form IX to reflect the typical sodium ICP wavelength used for soils.

TUT 002 1616

The selenium post-digestion spike recoveries were outside the QC limits of 85 to 115% for MW-7 (81%) and MW-100 (MW-7 FR) (72%). The non-detect selenium results for MW-7 and MW-100 (MW-7 FR) were qualified as estimated (UJ).

SDG# 23421/23448:

The incorrect reporting limit for cyanide was used. The cyanide data were corrected on Form I. The ICB/CCB data for cyanide, however, were not corrected on Form III.

The soil reporting limit for sodium was changed by the data reviewer on the soil Form I's using the standard laboratory sodium ICP wavelength since the laboratory reported the sodium results using ICP wavelength not typically used when analyzing soils.

The lead recoveries for the CRDL standards analyzed were 76.7% and 66.7%, which were outside the QC limits of 80-120%. The positive lead results for associated samples MW-8 and MW-6D were qualified as estimated (J).

The cadmium recovery for the CRDL standard was outside of QC limits. However, since this CRDL standard was not associated with any of the samples in this SDG, no qualification of the data was necessary.

The ICP serial dilutions were performed on samples MW-8 and MW-6D. All serial dilution results for sample MW-6D were acceptable. The MW-8 serial dilution result for chromium did not meet the QC criteria. The positive chromium result for sample MW-8 was qualified as estimated (J). It should be noted that the sodium data were corrected on Form IX by the data reviewer to reflect the typical sodium ICP wavelength used for soils by the laboratory and present in the raw data.

The selenium post-digestion spike recoveries were outside the QC limits of 85 to 115% for samples MW-8 (83%) and MW-6D (78%). The non-detect selenium results for MW-8 and MW-6D were qualified as estimated (UJ).

SDG# 23506:

The incorrect reporting limit for cyanide was used. The cyanide data were corrected on Form I. The ICB/CCB data for cyanide, however, were not corrected on Form III.

The soil reporting limit for sodium was changed by the data reviewer on the soil Form I using the standard laboratory sodium ICP wavelength since the laboratory reported the sodium result using ICP wavelength not typically used when analyzing soils.

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The lead recoveries for two of the three CRDL standards analyzed were 76.7% and 66.7%, which were outside the QC limits of 80-120%. No qualification of the lead data was necessary based on the CRDL standard results since no samples were associated with the one CRDL standard and a high lead concentration was detected in the only sample associated with the other CRDL standard.

The cadmium recovery for the CRDL standard was reported above the QC limits of 80-120% with a recovery of 123.6%. Since cadmium was not detected in any of the samples associated with this CRDL standard, no qualification of the data was necessary.

The non-detect arsenic and selenium results were qualified as estimated (UJ) for FB072492 because the spike recoveries for the associated laboratory control sample (LCS) were outside the control limits.

SDG# 23622/23623/23663:

The incorrect reporting limit was used for cyanide. The cyanide data were corrected on Form I. The ICB/CCB data for cyanide, however, were not corrected on Form III.

The soil reporting limit for sodium was changed by the data reviewer on the soil Form I's using the standard laboratory sodium ICP wavelength since the laboratory reported the sodium results using an ICP wavelength not typically used when analyzing soils.

The instrument detection limits (IDLs) are determined on a quarterly basis. When reporting the data, the laboratory used the IDLs from May 20, 1992 instead of the IDLs from August 20, 1992 for all the TAL parameters except for cyanide, mercury and thallium. The cyanide, mercury and thallium data were not affected since these parameters were analyzed prior to August 20, 1992. The affected data were corrected by the data reviewer on the Forms I's.

The laboratory duplicate and matrix spike sample data included in this package were not associated with this sampling program and should have not been provided. Therefore, the qualifiers assigned to the samples by the laboratory based on the laboratory duplicate and matrix spike sample results do not apply.

The aqueous LCS spike recovery for lead reported as 104% on Form VII was actually 127.3%. This recovery was outside the QC limits of 80 to 120%. Therefore, the positive results for FB072992, FB073092, and FB073192 were qualified as estimated (J).

ICP serial dilutions were performed on samples B-6, B-7 and B-9. The ICP serial dilution results for samples B-6 and B-7 were acceptable. The B-9 serial dilution result for nickel did not meet QC criteria. The positive nickel result for B-9 was qualified as estimated (J). It

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should be noted that the sodium data were corrected by the data reviewer on Form IX to reflect the typical sodium ICP wavelength used for soils.

The selenium post-digestion spike recovery was outside the QC limits of 85 to 115% for sample B-7 (83%). The non-detect selenium result for sample B-7 was qualified as estimated (J).

The thallium post-digestion spike recoveries for outside the QC limits of 85 to 115% for samples FB072992 (83.5%), FB073092 (83.5%) and FB073192 (72.5%). The non-detect thallium results for these three samples were qualified as estimated (UJ).

SDG# 23697:

The incorrect reporting limit was used for cyanide. The cyanide data were corrected on Form I. The ICB/CCB data for cyanide, however, were not corrected on Form III.

Mercury result for sample B-2 was reported to be 0.53 mg/kg on the Form I. This was a transcription error. The actual result based on a review of the raw data was 0.06 U.

The thallium post-digestion spike recovery for FB080392 was 83%. Therefore, the non-detect thallium result for FB080392 was qualified as estimated (UJ).

The IDLs are determined on a quarterly basis. When reporting the data, the laboratory used the IDLs from May 20, 1992 instead of the IDLs from August 20, 1992 for all the TAL metals. The affected data were corrected by the data reviewer on the Forms I's.

SDG# 23750/23833:

The incorrect reporting limit was used for cyanide. The cyanide data were corrected on Form I. The ICB/CCB data for cyanide, however, were not corrected on Form III.

The lead percent recovery for the CRDL standard was 76.7% which was outside the QC limits of 80 to 120%. The non-detect lead result for FB080492 and the positive lead result for FB080692 were qualified as estimated (UJ and J, respectively).

The ICP serial dilution analyses were performed on samples MW-10 and MW-6D. The MW-10 serial dilution result for sodium did not meet QC criteria. The MW-6D serial dilution results for chromium and zinc did not meet QC criteria. The sodium results for samples MW-10 and MW-10D and the chromium and zinc results for sample MW-6D were qualified as estimated (J).

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SDG# 23799:

The serial dilution results for iron, zinc and chromium did not meet QC criteria. The positive iron, zinc and chromium results for the soil samples in this SDG were qualified as estimated (J).

The non-detect lead result for sample FB081092 was qualified as estimated (UJ) because the spike recovery for the associated CRDL standard was low (76.7%).

Sample B-10 was diluted five times and analyzed for arsenic. Arsenic was not detected in the sample and the sample was not reanalyzed undiluted.

SDG# 23938:

The ICP CRDL standard spike recoveries for lead (initial-155%, final-151.2%) were outside the QC limits of 80 to 120%. The lead results for associated samples B-8 and MW-5, analyzed by ICP, were qualified as unusable (R).

The GFAA CRDL standard spike recovery for lead (130%) was outside the QC limits of 80 to 120%. The lead data for associated samples B-13A and MW-101 were qualified as estimated (J).

The CRDL standard spike recovery for selenium (126%) was outside the QC limits of 80 to 120%. The selenium results were not qualified because selenium was not detected in any of the associated sample data.

Sample B-8 was collected in duplicate in the field and labeled MW-101 (B-8 FR). The results for arsenic and lead could not be compared since these analytes were not analyzed by the same instrument for both samples. The copper and potassium results for samples B-8 and MW-101 (B-8 FR) were qualified as estimated (J) based on the field duplicate results.

The ICP serial dilution was performed on sample B-8. The serial dilution result for lead did not meet QC criteria. The positive lead result for sample B-8 was qualified as estimated (J).

The selenium post-digestion spike recovery for sample MW-5 (140%) exceeded the QC limits of 85 to 115%. Since selenium was not detected in this sample, no qualification of this result was necessary.

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SDG# 24008:

The lead spike recovery for both the initial and final ICP CRDL standard were outside the QC limits of 80 to 120% with recoveries of 142% and 123%, respectively. Sample B-16 was associated with this CRDL standard, therefore, the lead result for this sample was qualified as estimated (J).

Sample MW-2 was collected in duplicate in the field and labeled MW-102 (MW-2 FR). The calcium, chromium, and lead for these samples were qualified as estimated (J) based on the field duplicate result.

The ICP serial dilution was performed on sample B-15. The serial dilution result for chromium did not meet the QC criteria. The positive chromium results were qualified as estimated (J) for associated samples B-15, MW-2, B-5, B-14, B-16, and MW-103 (B-14 FR).

The selenium post-digestion spike recovery for samples B-5 (84%), B-14 (83%), B-15 (79%), and B-16 (83%) were outside the QC limits (85-115%). The selenium results for these samples were qualified as estimated (J) if detected and estimated (UJ) if not detected.

The pH of samples FB081392 and FB081492 to be used for metals and cyanide analyses were not recorded on the sample logs. The proper preservatives were used when collecting these samples and are noted on the chain of custody. It is this data reviewer's opinion that the data was not compromised.

SDG# 24122:

The solid LCS sample was associated with more than twenty samples. These samples are SS-6, SS-6 FR and SS-8. The results for these three samples were qualified as estimated (J) if detected and estimated (UJ) if not detected.

Sample SS-1 was used for the ICP serial dilution analysis. The serial dilution result for cobalt did not meet the QC criteria. All positive solid sample cobalt results were qualified as estimated (J).

The arsenic post-digestion spike recovery (70%) for sample SS-4 was out of QC limits. The positive arsenic result for SS-4 was qualified as estimated (J).

TUT 002 1621

I.2.3 Contract-Problem/Non-Compliance

For several samples, site-specific matrix spike and laboratory duplicate data was not provided by the laboratory since these analyses were not requested.

For SDGs 23396 and 23421/23448, occasionally a lead continuing calibration standard was analyzed after more than ten samples had been analyzed. However, none of the samples in these SDGs were effected.

For SDG 23506, the lead GFAA run containing the solid LCS had over ten samples between continuing calibration standards. Because the initial calibration verification standard (ICV) and initial calibration blank were accidentally analyzed with this group, the solid LCS lead result is considered acceptable by the data reviewer. It should be noted that the ICV was in control and effectively served the same purpose as the continuing calibration standard.

For SDG 23622/23623/23663, the letter "L" was omitted on Form IX in the EPA sample number box. Also the cyanide preparation log indicates that the sample pH was < 2 for FB072992 and FB073092. This appears to be an entry error because the ammonia/phenol analysis was indicated for this sample on the log and was not requested. In addition, no indication of the pH of sample FB073192 was given on the preparation log for cyanide analysis. It should be noted that the proper preservation is listed on the chain of custody for the cyanide bottles. In addition, the wrong IDLs were used for sample analytes analyzed after August 20, 1992. Refer to the data assessment section.

For SDG 23697, the GFAA lead run performed on August 25, 1992, containing the MSA analysis of sample B-2, had 14 analyses between continuing calibration standards. However, since this MSA analysis was run immediately following the standard, in this data reviewer's opinion, no data was compromised. In addition, the wrong IDLs were used for sample analytes analyzed after August 20, 1992. Refer to the data assessment section.

The B-8 lead and arsenic data from the matrix spike and laboratory duplicate analyses were not applicable to all associated samples. These samples were only analyzed for lead by ICP and arsenic by GFAA when the associated samples were also analyzed for lead by ICP and GFAA and arsenic by GFAA and ICP.

For SDG 24008, the pH values for the aqueous samples were not reported. Refer to the data assessment section. The B-16 matrix spike and laboratory duplicate were not analyzed by both ICP and GFAA for lead. Samples associated with the matrix spike were analyzed by both methods. Samples exceeded 20 for a preparation batch. Refer to the data assessment section for SDG 24122. The analytical spike qualifier "W" was not listed on Form I for sample B-16. The letter "L" was not listed following the identity of the sample used for the ICP serial dilution analysis on Form IX.

TUT 002 1622

For SDG 24122, the pH values for the aqueous samples were not reported. Refer to the data assessment section.

MMB/ESAT Reviewer: _____
Signature

Date: _____

Contractor Reviewer: Lauren Sjogren / VP
Signature

Date: 5-21-93

Verified by: Thomas V. Donahy

Date: 5-21-93

PR01301/INORSOIL.TMP/d&icb:mr

TUT 002 1623

U.S. EPA - CLP

6

DUPLICATES

EPA SAMPLE NO.

B-8

Lab Name: Enseco East

Contract: _____

Lab Code: Enseco

Case No.: _____

SAS No.: _____

SDG No.: 23938Matrix (soil/water): SoilLevel (low/med): Low% Solids for Sample: 86.6% Solids for Duplicate: 90.9Concentration Units (ug/L or mg/kg dry weight): ug/L

Analyte	Control Limit	B-8 Sample (S)	C	MW-101 Duplicate (D)	C	RPD	Q	M
Aluminum		102050		89600		13.0		P
Antimony		20	U	22.61	B	200.0		P
Arsenic		GFAA 18.6		ICP 427.35				
Barium	200	426.2		240.85		55.5		P
Beryllium		1.59	B	1.58	B	0.8		P
Cadmium		3	U	3	U			P
Calcium		315400		296450		6.2		P
Chromium		128.45		101.2		23.7		P
Cobalt	50	88.9		73.9		18.4		P
Copper		681.5		226.15		100.3		P
Iron		136200		132400		2.8		P
Lead		ICP 431.5		GFAA 50				
Magnesium		77750		73300		5.9		P
Manganese		3030		3597		17.1		P
Mercury	0.2	0.2087		0.1	U	200.0		CV
Nickel	40	64.45		64.1		0.5		P
Potassium	5000	14360		3953.5	B	113.6		P
Selenium		2	U	2	U			F
Silver		16.9		7.1	B	81.3		P
Sodium		2015		2057.5	B	2.1		P
Thallium		3	U	3	U			F
Vanadium		342.65		346.2		1.0		P
Zinc		646		290		76.0		P
Cyanide		10	U	49		200.0		AS

#TUTU/EPACLPB8.WK3

TUT 002 1624

GERAGHTY & MILLER, INC.

U.S. EPA - CLP

6

DUPLICATES

EPA SAMPLE NO.

B-14

Lab Name: Enseco EastContract: Geraghty & MillerLab Code: Enseco

Case No.: _____

SAS No.: _____

SDG No.: 24008Matrix (soil/water): SoilLevel (low/med): Low% Solids for Sample: 86.2% Solids for Duplicate: 86.8Concentration Units (ug/L or mg/kg dry weight): mg/kg

Analyte	Control Limit	B-14 Sample (S)	C	MW-103 Duplicate (D)	C	RPD	Q	M
Aluminum		25255.2		19032.25		28.1		P
Antimony		7.3	B	4.6	U	200.0		P
Arsenic		0.46	U	0.46	U			F
Barium		34.4	B	33.5	B	2.7		P
Beryllium		0.2	U	0.23	U			P
Cadmium		0.6	U	0.6	U			P
Calcium		120301.6		73018.4		48.9		P
Chromium		13.7		17.3		23.3		P
Cobalt	11.6	19.9		18.1		9.3		P
Copper		48.3		77.5		46.5		P
Iron		27958.2		23110.5		19.0		P
Lead	0.69	2.85		2.0		34.9		F
Magnesium		26194.8		17845.6		31.9		P
Manganese		757.4		640.3		16.7		P
Mercury		0.06	U	0.06	U			CV
Nickel	9.28	11.1		13.1		16.5		P
Potassium		160.5	B	201.3	B	22.6		P
Selenium		0.46	U	0.4	U			F
Silver		0.92	B	0.92	U	200.0		P
Sodium		181.20	B	191.1	B	5.3		P
Thallium		0.69	U	0.6	U			F
Vanadium		95.7		69.2		38.1		P
Zinc		50.9		60.1		16.6		P
Cyanide		0.5800	U	0.5800	U			AS

#TUTU/EPACB-14.WK3

TUT 002 1625

GERAGHTY & MILLER, INC.

U.S. EPA - CLP

6
DUPLICATES

EPA SAMPLE NO.

MW-2

Lab Name: Enseco EastContract: Geraghty & MillerLab Code: Enseco

Case No.: _____

SAS No.: _____

SDG No.: 24008Matrix (soil/water): SoilLevel (low/med): Low% Solids for Sample: 89.7% Solids for Duplicate: 87.3Concentration Units (ug/L or mg/kg dry weight): ug/L

Analyte	Control Limit	MW-2		MW-102		RPD	Q	M
		Sample (S)	C	Duplicate (D)	C			
Aluminum		59600		68400		13.7		P
Antimony		20	U	20	U			P
Arsenic	10	13.6		5.1	B	90.9		F
Barium	200	363.45		198.9	B	29.3		P
Beryllium		1	U	1	U			P
Cadmium		3	U	3	U			P
Calcium		307300		38075		155.9		P
Chromium	10	72.1		33.37		73.4		P
Cobalt	50	50.7		56.1		10.1		P
Copper		179.3		253.2		34.1		P
Iron		97250		134250		32.0		P
Lead	3	25.2		8.3		100.9		F
Magnesium		41095		42070		0.02		P
Manganese		2611		4852.5		60.1		P
Mercury		0.1	U	0.1	U			CV
Nickel	40	56.9		24.6	B	79.3		P
Potassium		2496.5	B	1305	B	62.7		P
Selenium		2	U	2	U			F
Silver		4	U	5.1	B	200.0		P
Sodium		3214.5	B	2340	B	31.5		P
Thallium		3	U	3	U			F
Vanadium	50	260.35		230.55		12.1		P
Zinc		297.05		518.5		54.3		P
Cyanide		10	U	10	U			AS

#TUTU/EPACPMW2.WK3

TUT 002 1626

U.S. EPA - CLP

6

DUPLICATES

EPA SAMPLE NO.

MW-7

Lab Name: Enseco EastContract: Geraghty & MillerLab Code: Enseco

Case No.: _____

SAS No.: _____

SDG No.: 23396Matrix (soil/water): SoilLevel (low/med): Low% Solids for Sample: 93.6% Solids for Duplicate: 94.4Concentration Units (ug/L or mg/kg dry weight): mg/kg

Analyte	Control Limit	MW-7 Sample (S)	C	MW-100 Duplicate (D)	C	RPD	Q	M
Aluminum		26004.2		29777.5420		13.5		P
Antimony		6.69	B	8.4923	B	23.7		P
Arsenic		0.70	B	0.5297	B	28.4		F
Barium		42.4	B	25.1377	B	51.3		P
Beryllium		0.2	U	0.2119	U			P
Cadmium		0.64	U	0.8153	B	200.0		P
Calcium		28194.4		47658.8980		51.3		P
Chromium		16.2		19.5763		18.5		P
Cobalt	10.68	30.8		32.8284		6.4		P
Copper		60.5		60.9428		0.6		P
Iron		38098.2		43072		12.2		P
Lead	0.64	0.96		1.75		58.6		F
Magnesium		28012.8		32044.4		13.4		P
Manganese		940.5		861		8.8		P
Mercury		0.05	U	0.053	U			CV
Nickel	8.55	16.2		19.3		17.1		P
Potassium	1068	1516.0		1398.3		8.1		P
Selenium		0.42	U	0.42	U			F
Silver		0.64	U	0.63	U			P
Sodium		262.7	B	255.1	B	2.9		P
Thallium		0.64	U	0.63	U			F
Vanadium		107.1		110.2		2.9		P
Zinc		51.6		54.5		5.3		P
Cyanide		0.530	U	0.53	U			AS

#TUTU/EPACBMW7.WK3

TUT 002 1627

GERAGHTY & MILLER, INC.

U.S. EPA - CLP

6
DUPLICATES

EPA SAMPLE NO.

SS-6

Lab Name: Enseco East

Contract: _____

Lab Code: Enseco

Case No.: _____

SAS No.: _____

SDG No.: 24122Matrix (soil/water): SoilLevel (low/med): Low% Solids for Sample: 87.8% Solids for Duplicate: 86.0Concentration Units (ug/L or mg/kg dry weight): mg/kg

Analyte	Control Limit	SS-6 Sample (S) C		SS-6 FR Duplicate (D) C		RPD	Q	M
Aluminum		14300	J	13800	J	3.5		P
Antimony		7.4	BNJ	6	BNJ	20.8		P
Arsenic		17.3	J	19.1	J	9.8		F
Barium		89	J	90.9	J	2.1		P
Beryllium		0.23	UJ	0.23	UJ			P
Cadmium		0.68	UJ	0.7	UJ			P
Calcium		59200	J	30700	J	63.4		P
Chromium		23.3	NJ	18.8	NJ	21.3		P
Cobalt		14	J	13.8	J	1.43		P
Copper		55.4	NJ	54.8	NJ	1.08		P
Iron		39500	J	23800	J	49.6		P
Lead		14.4	J	11.4	J	23.2		F
Magnesium		9960	J	9670	J	2.9		P
Manganese		662	J	672	J	1.4		P
Mercury		0.06	U	0.06	U			CV
Nickel		14.1	J	10.7	J	27.4		P
Potassium		1910	J	2070	J	8.0		P
Selenium		0.46	UJ	0.47	UJ			F
Silver		1.6	BJ	0.93	UJ			P
Sodium		340	BJ	251	BJ	30.1		P
Thallium		0.68	UJ	0.7	UJ			F
Vanadium		71.3	NJ	73.1	NJ	2.49		P
Zinc		91.7	J	97.1	J	5.7		P
Cyanide		0.57	U	1.3				AS

PRO13.01/USEPA-CLP.FRMS.DSK/EPACSS&WK3

TUT 002 1628

GERAGHTY & MILLER, INC.

ATTACHMENT B

TABLES

TUT 002 1629

GERAGHTY & MILLER, INC.

Table I3-1. Soil Sample Delivery Groups for June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Sample Delivery Group	Sample Identification	Laboratory Identification	Collection Date
22507	MW-4D	22507-1	6/4/92
22507	FB060492	22507-2	6/4/92
22507	MW-1D	22507-3	6/5/92
22507	FB060592	22507-4	6/5/92
22507	TB060592	22507-5	6/5/92
22570	B-4	22570-1	6/9/92
22570	TB060992	22570-2	6/9/92
22570	FB060992	22570-3	6/9/92
22595	MW-3	22595-1	6/10/92
22595	TB061092	22595-2	6/10/92
22688	WAPA	22688-1	6/15/92
22688	TB061592	22688-2	6/15/92
22712	MW-4	22712-1	6/16/92
22712	FB061692	22712-2	6/16/92
22712	TB061692	22712-3	6/16/92
22793	FB061992	22793-1	6/19/92
22793	TB061992	22793-2	6/19/92
22793	MW-13D	22793-3	6/19/92
22932	FB062692	22932-1	6/26/92
22932	TB062692	22932-2	6/26/92
22932	MW-11D	22932-3	6/26/92
23021	FB063092	23021-1	6/30/92
23021	TB063092	23021-2	6/30/92
23021	MW-1	23021-3	6/30/92
23024	FB070192	23024-1	7/1/92
23024	TB070192	23024-2	7/1/92
23024	MW-14	23024-3	7/1/92
23144	FB070692	23144-1	7/6/92
23144	TB070692	23144-2	7/6/92
23144	MW-12D	23144-3	7/6/92
23396	FB071692	23396-1	7/16/92
23396	TB071792	23396-2	7/16/92
23396	MW-7	23396-3	7/16/92
23396	MW-7 FR (MW-100)	23396-4	7/16/92

See last page for notes.

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TUT 002 1630

Table I3-1. Soil Sample Delivery Groups for June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Sample Delivery Group	Sample Identification	Laboratory Identification	Collection Date
23421	FB072092	23421-1	7/20/92
23421	TB072092	23421-2	7/20/92
23421	MW-8	23421-3	7/20/92
23448	FB072192	23448-1	7/21/92
23448	TB072192	23448-2	7/21/92
23448	MW-6D	23448-3	7/21/92
23506	FB072492	23506-1	7/24/92
23506	TB072492	23506-2	7/24/92
23506	MW-9	23506-3	7/24/92
23622	FB072992	23622-1	7/29/92
23622	TB072992-B	23622-2	7/29/92
23622	B-9	23622-3	7/29/92
23623	FB073092	23623-1	7/30/92
23623	TB073092A	23623-2	7/30/92
23623	B-6	23623-3	7/30/92
23623	B-1	23623-4	7/30/92
23663	FB073192	23663-1	7/31/92
23663	TB073192	23663-2	7/31/92
23663	B-7	23663-3	7/31/92
23697	B-2	23697-1	8/3/92
23697	B-3	23697-2	8/3/92
23697	FB080392	23697-3	8/3/92
23697	TB080392	23697-4	8/3/92
23750	FB080492	23750-1	8/4/92
23750	MW-10	23750-2	8/4/92
23750	MW-10D	23750-3	8/4/92
23750	TB080492	23750-4	8/4/92
23799	FB081092	23799-1	8/10/92
23799	TB081092	23799-2	8/10/92
23799	B-13	23799-3	8/10/92
23799	B-10	23799-4	8/10/92
23799	B-11	23799-5	8/10/92
23799	FB081192	23799-6	8/10/92
23799	TB081192	23799-7	8/10/92
23799	B-12	23799-8	8/10/92

See last page for notes.

PR013.01-T1/TableH3.wk3

TUT 002 1651

Table I3-1. Soil Sample Delivery Groups for June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Sample Delivery Group	Sample Identification	Laboratory Identification	Collection Date
23833	FB080692	23833-1	8/6/92
23833	TB080692	23833-2	8/6/92
23833	MW-6D	23833-3	8/6/92
23938	FB081292	23938-1	8/12/92
23938	TB081292	23938-2	8/12/92
23938	B-13A	23938-3	8/12/92
23938	B-8	23938-4	8/12/92
23938	B-8 FR (MW-101)	23938-5	8/12/92
23938	MW-5	23938-6	8/11/92
23938	B-8 MS	23938-4 MS	8/11/92
23938	B-8 MSD	23938-4 MSD	8/11/92
24008	FB081392	24008-1	8/13/92
24008	TB081392	24008-2	8/13/92
24008	MW-2	24008-3	8/13/92
24008	B-5	24008-4	8/13/92
24008	MW-2 FR (MW-102)	24008-5	8/13/92
24008	FB081492	24008-6	8/14/92
24008	TB081492	24008-7	8/14/92
24008	B-14	24008-8	8/14/92
24008	B-15	24008-9	8/14/92
24008	B-16	24008-10	8/14/92
24008	B-14 FR (MW-103)	24008-11	8/14/92
24008	B-16 MS	24008-10 MS	8/14/92
24008	B-16 MSD	24008-10 MSD	8/14/92
24122	FB081992	24122-1	8/19/92
24122	TB081992	24122-2	8/19/92
24122	SS-1	24122-3	8/19/92
24122	SS-2	24122-4	8/19/92
24122	SS-3	24122-5	8/19/92
24122	SS-4	24122-6	8/19/92
24122	SS-5	24122-7	8/19/92
24122	SS-6	24122-8	8/19/92
24122	SS-6 FR	24122-9	8/19/92
24122	SS-8	24122-10	8/19/92

FB Field blank.
 TB Trip blank.
 MS Matrix spike.
 MSD Matrix spike duplicate.
 FR Field replicate.

PR013.01-T1/TabHeH3.wk3

TUT 002 1632

GERAGHTY & MILLER, INC.

Table I3-2. Summary of Volatile and Semivolatile Holding Time Outliers Associated with Soil Samples Collected from June through August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Sample ID	Matrix	Collection Date	Preparation or Analysis Date	Days Holding Time Exceeded	Action
Volatiles	MW-4D	Soil	June 4, 1992	June 15, 1992 (analysis)	1	Estimated positive detects and rejected all non-detected analysis.
Semivolatiles	MW-5	Soil	August 11, 1992	August 19, 1992 (preparation)	1	Estimated all BNA analytes.
	SS-3	Soil	August 19, 1992	September 17, 1992 (preparation)	22	Rejected all BNA analytes.
	SS-3RE	Soil	August 19, 1992	September 30, 1992 (preparation)	35	Rejected all BNA analytes.
	SS-4	Soil	August 19, 1992	September 17, 1992 (preparation)	22	Rejected all BNA analytes.
	SS-6	Soil	August 19, 1992	September 25, 1992 (preparation)	30	Rejected all BNA analytes.
ID	Identification.					
BNA	Base neutral and acid-extractable compounds.					
RE	Reanalysis.					

PR01301-T1/042299.wt3/Ab

Table 13-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/kg) ¹	Associated Samples
Volatiles			
22570	Method (16JUN92 - A/A2590)	Unknown (27.39)/11J	FB060992, TB060992, TB061092
22688	Method (24JUN92 - B/A2795)	Chloroform/2J	WAPA-RE, FB061692, TB061692
22712, 22793	Method (23JUN92 - A/A2762)	Acetone/5J	MW-4, MW-13D
23024, 23144	Method (11JUL92 - A/C9847)	Methylene chloride/2J Acetone/8J	MW-14, MW-12D
23396, 23421, 23448	Method (24JUL92 - A/A3375)	Acetone/16	MW-7, MW-7 FR (MW-100), MW-8, MW-6D
23396, 23421, 23448	Method (24JUL92 - B/C0132)	Methylene chloride/2J Acetone/6J	FB071692, TB071692, FB072092, TB072092, FB072192, TB072192
23506	Method (31JUL92 - B/C0217)	Methylene chloride/4J Acetone/4J	FB072492, TB072492
506	Method (01AUG92 - A/C0235)	Acetone/3J	MW-9
523	Method (03AUG92 - C/C0289)	Methylene chloride/5J	FB073092, TB073092

▶ last page for footnotes.

13.01.T1/T02.v03

GERAGHTY & MILLER, INC.

TUT 002 1634

Table I3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/kg) ¹	Associated Samples
Volatiles (continued)			
23623	Method (05AUG92 - A/A3610)	Unknown (27.41)/6J	B-6
23799, 23938	Method (17AUG92 - A/A3846)	Acetone/7J	B-10, B-11, B-12, B-13, B-13A, B-8, B-8 FR (MW-101), MW-5
24122	Method (27AUG92 - A/A4119)	Unknown (27.28)/7J	SS-3, SS-6, SS-7, SS-6 FR (SS-7)
24122	Method (27AUG92-B/A4131)	Acetone/2J	SS-4, SS-5
22507	Field (FB060592)	Carbon disulfide/7J Methylene chloride/1J	MW-1D
22570	Field (FB060992)	Unknown (32.13)/10J	B-4
22712	Field (FB061692)	Carbon disulfide/7J	MW-4
22793	Field (FB061992)	Carbon disulfide/6J	MW-13D
22932	Field (FB062692)	Carbon disulfide/3J	MW-11D

See last page for footnotes.

Table I3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/kg) ¹	Associated Samples
<u>Volatiles (continued)</u>			
23021	Field (FB063092)	Methyl acetate (4.91)/6J Carbon disulfide/16	MW-1
23024	Field (FB070192)	Carbon disulfide/25	MW-14
23144	Field (FB070692)	Carbon disulfide/4J	MW-12D
23396	Field (FB071692)	Methylene chloride/1BJ	MW-7, MW-7 FR (MW-100)
23421	Field (FB072092)	Carbon disulfide/4J Methylene chloride/1BJ	MW-8
23448	Field (FB072192)	Acetone/5BJ Methylene chloride/2BJ	MW-6
23506	Field (FB072492)	Acetone/10B Carbon disulfide/4J Methylene chloride/4BJ	MW-9
23622	Field (FB072992)	Carbon disulfide/5J Methylene chloride/1J	B-9
23623	Field (FB073092)	Carbon disulfide/3J Methylene chloride/2BJ	B-1, B-6

See last page for footnotes.

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GERAGHTY & MILLER, INC.

Table I3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/kg) ¹	Associated Samples
<u>Volatiles (continued)</u>			
23663	Field (FB073192)	Carbon disulfide/2J Methylene chloride/2J	B-7
22570	Trip (TB060992)	Unknown (32.14)/11J	B-4
22595	Trip (TB061092)	Unknown (32.19)/6J	MW-3
22688	Trip (TB061592)	Chloromethane/1J	WAPA
22712	Trip (TB061692)	Acetone/8J	MW-4
22793	Trip (TB061992)	Acetone/5J Carbon disulfide/1J Methylene chloride/1J	MW-13D
22932	Trip (TB062692)	Acetone/4J	MW-11D
23024	Trip (TB070192)	Methylene chloride/2J	MW-14
23396	Trip (TB071792)	Methylene chloride/1BJ	MW-7, MW-7 FR (MW-100)

See last page for footnotes.

PR013.01.T1/T02.wk3

GERAGHTY & MILLER, INC.

Table I3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/kg) ¹	Associated Samples
<u>Volatiles (continued)</u>			
23421	Trip (TB072092)	Methylene chloride/1BJ	MW-8
23506	Trip (TB072492)	Acetone/4BJ Methylene chloride/5BJ	MW-9
23622	Trip (TB072992)	Methylene chloride/3J	B-9
23623	Trip (TB073092)	Methylene chloride/4BJ	B-1, B-6
23663	Trip (TB073192)	Acetone/16	B-7
23799	Trip (TB081192)	Methylene chloride/1J	B-11, B-10, B-12, B-13
24008	Trip (TB081492)	Methylene chloride/2J	B-14, B-14 FR (MW-103), B-15, B-16

See last page for footnotes.

Table 13-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/kg) ¹	Associated Samples
Semivolatiles			
22507	Method (WB-10JUN92C/G7204)	bis(2-Ethylhexyl)phthalate/5J Unknown amide (29.82)/4J	FB060492, FB060592
22507	Method (SB-10JUN92C/G7220)	Substituted hexanedioic acid (30.12)/100J	MW-1D, MW-4D
22570	Method (WB-11JUN92B/G7217)	bis(2-Ethylhexyl)phthalate/2J Unknown amide (29.85)/14J Unknown amide (29.90)/5J Unknown amide (34.02)/6J	FB060992
22712	Method (WB-18JUN92C/G7261)	bis(2-Ethylhexyl)phthalate/22 Unknown amide (29.88)/6J Unknown amide (29.94)/3J Unknown amide (34.07)/3J	FB061692, FB061692 DL
22712	Method (SB-18JUN92B/G7259)	Di-n-butyl phthalate/1,800 Butyl benzyl phthalate/42J	MW-4
22793	Method (SB-22JUN92B/G7309)	bis(2-Ethylhexyl)phthalate/43J Unknown amide (29.81)/330J Unknown amide (29.85)/100J Unknown amide (33.98)/130J	MW-13D
22793	Method (WB-22JUN92C/G7300)	bis(2-Ethylhexyl)phthalate/4J	FB061992

See last page for footnotes.

Table I3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/kg) ¹	Associated Samples
<u>Semivolatiles (continued)</u>			
22932	Method (WB-30JUN92D/G7361)	bis(2-Ethylhexyl)phthalate/49 Unknown amide (27.51)/2J Unknown amide (27.74)/3J Unknown amide (29.84)/40J Unknown amide (29.89)/11J Unknown(30.45)/3J Unknown (33.33)/2J 1,2-Benzenedicarboxylic acid (33.40)/3JN Unknown amide (34.00)/29J Unknown (39.49)/31J	FB062692
22932	Method (SB-30JUN92B/G7397)	Unknown (27.70)/100J Unknown acid ester (29.94)/130J Hydrocarbon (30.08)/67J	MW-11D
23021	Method (WB-04JUL92A/G7383)	bis(2-Ethylhexyl)phthalate/4J Unknown amide (33.79)/2J	FB063092
23024	Method (WB-06JUL92C/G7402)	bis(2-Ethylhexyl)phthalate/9J Unknown amide (29.65)/4J Unknown amide (33.83)/3J	FB070192
23024	Method (SB-06JUL92B/G7400)	Di-n-butyl phthalate/950	MW-14
23144	Method (WB-09JUL92B/G7459)	bis(2-Ethylhexyl)phthalate/14	FB070692

See last page for footnotes.

Table I3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/kg) ¹	Associated Samples
<u>Semivolatiles (continued)</u>			
23144	Method (SB-09JUL92B/G7488)	Di-n-butyl phthalate/76J	MW-12D
23396	Method (WB-21JUL92C/G7665)	bis(2-Ethylhexyl)phthalate/7J Unknown (6.82)/2J	FB071692
23396	Method (SB-21JUL92B/G7683)	Unknown (5.11)/130J Unknown (28.34)/130J Unknown (29.43)/1,000J Unknown (31.68)/970J Unknown (38.67)/67J	MW-7, MW-7 FR (MW-100)
23421	Method (SB-23JUL92B/G7685)	Di-n-butyl phthalate/430 Unknown (4.41)/100J Unknown (5.82)/2,000J 4-Hydroxy-4-methyl-2-pentanone (7.16)/87,000AJ	MW-8
23448, 2	Method (SB-27JUL92A/G7688)	2-Hydroxy-4-methyl-pentanone (7.18)/93,000AJ	MW-6, MW-6D, MW-9
23506	Method (WB-27JUL92A/G7697)	bis(2-Ethylhexyl)phthalate/95 Unknown (4.92)/4J	FB072492

See last page for footnotes.

Table I3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/kg) ¹	Associated Samples
<u>Semivolatiles (continued)</u>			
23506	Method (WB-06AUG92B/G7800)	bis(2-Ethylhexyl)phthalate/11 Unknown (4.50)/9J Unknown (6.56)/3J Unknown amide (30.76)/14J Unknown amide (30.81)/4J Unknown amide (34.95)/8J	FB072492 RE
23622, 23663	Method (WB-04AUG92F/F0871)	Unknown (4.13)/2J Unknown (4.78)/15J Unknown (6.65)/4J Unknown amide (31.26)/3J	FB072992, FB073192
23622, 23	Method (SB-04AUG92A/F0874)	Unknown (4.78)/470J Unknown (5.16)/100J 4-Hydroxy-4-methyl-2-pentanone/29,000AJ	B-9, B-7
23623	Method (WB-03AUG92-A/G7796)	Unknown (4.55)/11J Unknown (6.57)/2J	FB073092
23623	Method (SB-03AUG92A/F0868)	Unknown (4.79)/430J 4-Hydroxy-4-methyl-2-pentanone/2,500AJ Unknown (6.67)/67J Unknown (25.16)/100J Substituted hexanedioic acid/4,700J	B-1, B-6

See last page for footnotes.

Table I3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/kg) ¹	Associated Samples
<u>Semivolatiles (continued)</u>			
23697	Method (SB-06AUG92B/G7910)	Unknown (4.41)/110J C-6 H-10 O Isomer (4.67)/78J 4-Hydroxy-4-methyl-2-pentanone/50,000AJ Unknown (28.55)/110J Unknown (30.79)/130J	B-2, B-3
23697	Method (WB-06AUG92B/G7800)	bis(2-Ethylhexyl)phthalate/11 Unknown (4.50)/9J Unknown (6.56)/3J Unknown amide (30.76)/14J Unknown amide (30.81)/4J Unknown amide (34.95)/8J	FB080392
23750, 2	Method (SB-11AUG92A/G7922)	Di-n-butyl phthalate/120J bis(2-Ethylhexyl)phthalate/62J Unknown (4.58)/1,800J Unknown (4.66)/230J 4-Hydroxy-4-methyl-2-pentanone/60,000AJ Unknown (20.51)/100J Unknown (28.54)/200J Substituted octadecanoic acid/170J Hydrocarbon (30.93)/67J Hydrocarbon (32.98)/67J	MW-10, MW-10D, MW-6D

See last page for footnotes.

Table I3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/kg) ¹	Associated Samples
<u>Semivolatiles (continued)</u>			
23750	Method (WB-07AUG92C/G7872)	Unknown (4.46)/5J Unknown (6.20)/2J Unknown (28.56)/4J Unknown amide (30.56)/2J Unknown (30.81)/4J Unknown amide (34.76)/2J	FB080492
23799	Method (SB-13AUG92B/G7924)	Unknown (4.38)/430J 4-Hydroxy-4-methyl-2-pentanone/33,000AJ 1,1,2,2-Tetrachlorobenzene/200J Unknown (28.53)/500J Substituted hexanedioic acid/8,700J Hydrocarbon (30.94)/100J Unknown (31.03)/67J Hydrocarbon (34.88)/67J	B-10, B-11, B-12, B-13
23799	Method WB-13AUG92B/G7892)	Unknown (4.45)/6J 4-Hydroxy-4-methyl-2-pentanone/2J Unknown amide (30.55)/3J	FB081092, FB081192
23833	Method (WB-10AUG92-C/F0889)	Unknown (4.79)/7J	FB080692
23938	Method (WB-15AUG92B/G7908)	bis(2-Ethylhexyl)phthalate/2J Unknown (4.36)/4J	FB081292

See last page for footnotes.

Table I3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/kg) ¹	Associated Samples
<u>Semivolatiles (continued)</u>			
23938	Method (SB-19AUG92B/G7923)	Unknown (4.39)/100J C6 H-10 O Isomer (4.65)/100J 4-Hydroxy-4 methyl-2-pentanone (6.33)/90,000AJ Unknown amide (30.53)/100J Unknown (31.01)/67J Unknown amide (34.73)/130J	B-13A, B-8, B-8 FR (MW-101), MW-5, B-8 MS, B-8 MSD
24008	Method (SB-20AUG92A/G8022)	Di-n-butyl phthalate/41J 4-Hydroxy-4-methyl-2-pentanone/43,000AJ Substituted hexanedioic acid (30.47)/130J	B-14, B-15, B-16, B-5, MW-2 FR (MW-102), MW-2, B-14 FR (MW-103), B-16 MS, B-16 MSD
24008	Method (WB-18AUG92C/G7956)	bis(2-Ethylhexyl)phthalate/3J	FB081392, FB081492
2411	Method (WB-24AUG92B/G8038)	bis(2-Ethylhexyl)phthalate/1J Unknown amide (30.17)/2J Unknown (38.17)/13J	FB081992
2412	Method (SB-30SEP92-A/P9757)	2-Hydroxy-4-methyl-4-pentanone/86,000AJ Unknown (12.94)/67J Unknown (27.90)/67J Unknown (30.16)/130J Unknown amide (34.11)/130J	SS-3 RE
24122	Method (SB-25AUG92B/G8050)	2-Hydroxy-4-methyl-4-pentanone/37,000AJ Unknown (28.19)/230J Unknown (30.41)/270J	SS-5, SS-6 FR (SS-7)

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Table I3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/kg) ¹	Associated Samples
<u>Seemivolatiles (continued)</u>			
24122	Method (SB-25SEP92A/P9681)	2-Hydroxy-4-methyl-4-pentanone/93,000AJ Benzaldehyde/83JN Unknown (34.17)/170J	SS-6
22507	Field (FB060492)	bis(2-Ethylhexyl)phthalate/3 BJ Hydrocarbon (34.18)/2J Hydrocarbon (30.24)/4J Hydrocarbon (32.28)/3J Hydrocarbon (33.25)/2J Unknown amide (29.84)/12BJ Unknown amide (29.89)/3J Unknown amide (34.00)/3J Unknown (27.85)/6J Unknown (30.09)/6J Unknown (38.71)/3J	MW-4D
22507	Field (FB060592)	bis(2-Ethylhexyl)phthalate/2BJ Unknown amide (29.83)/12BJ Unknown amide (29.89)/4J Unknown amide (34.02)/7J Unknown (39.61)/110J	MW-1D
22570	Field (FB060992)	bis(2-Ethylhexyl)phthalate/7BJ Unknown amide (29.84)/7BJ Unknown amide (29.89)/2BJ Unknown (42.59)/33J	B-4

See last page for footnotes.

Table I3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/kg) ¹	Associated Samples
<u>Semivolatiles (continued)</u>			
22712	Field (FB061692)	bis(2-Ethylhexyl)phthalate/150BD	MW-4
22793	Field (FB061992)	Unknown amide (29.82)/2J	MW-13D
22932	Field (FB062692)	bis(2-Ethylhexyl)phthalate/5BJ Unknown amide (29.89)/8BJ Unknown amide (34.00)/23BJ Unknown amide (27.50)/2BJ Unknown amide (27.75)/3BJ Unknown amide (29.85)/30BJ	MW-11D
23024	Field (FB070192)	bis(2-Ethylhexyl)phthalate/1BJ Unknown amide (29.68)/5BJ Unknown amide (33.87)/2BJ	MW-14
23144	Field (FB070692)	bis(2-Ethylhexyl)phthalate/23B Unknown amide (29.30)/3BJ	MW-12D
23396	Field (FB071692)	bis(2-Ethylhexyl)phthalate/19B	MW-7, MW-7 FR (MW-100)
23448	Field (FB072192)	bis(2-Ethylhexyl)phthalate/6J	MW-6

See last page for footnotes.

Table I3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/kg) ¹	Associated Samples
<u>Semivolatiles (continued)</u>			
23506	Field (FB072492)	bis(2-Ethylhexyl)phthalate/12B Unknown (4.93)/6BJ	MW-9
23622	Field (FB072992)	Unknown (4.76)/10BJ Unknown (6.66)/4BJ	B-9
23623	Field (FB073092)	Unknown (4.54)/6BJ Unknown (6.59)/2BJ	B-1, B-6
23663	Field (FB073192)	Unknown (4.75)/7BJ Unknown (6.66)/3BJ	B-7
23697	Field (FB080392)	bis(2-Ethylhexyl)phthalate/16B Unknown amide (30.77)/9BJ Unknown amide (30.82)/3BJ Unknown amide (34.96)/4BJ Unknown amide (4.52)/9BJ Unknown amide (6.57)/3BJ	B-2, B-3
23750	Field (FB080492)	Unknown (4.46)/4JB Unknown (6.48)/2J	MW-10, MW-10D
23795	Field (FB081092)	Unknown (4.34)/5BJ	B-10, B-11, B-13
2379	Field (FB081192)	Unknown (4.35)/6BJ	B-12

See last page for footnotes.

Table 13-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Samples Collected from June to August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/kg) ¹	Associated Samples
Semivolatiles (continued)			
23833	Field (FB080692)	bis(2-Ethylhexyl)phthalate/3.2J Unknown (4.78)/10BJ	MW-6D
23938	Field (FB081292)	bis(2-Ethylhexyl)phthalate/19B Unknown (4.37)/5BJ	B-13A, B-8, B-8 FR (MW-101), MW-5
24008	Field (FB081392)	bis(2-Ethylhexyl)phthalate/65B	MW-2, B-5, MW-2 FR (MW-102)
24008	Field (FB081492)	bis(2-Ethylhexyl)phthalate/47B	B-14, B-14 FR (MW-103), B-15, B-16
24122	Field (FB081992)	bis(2-Ethylhexyl)phthalate/16B Unknown (20.16)/6J Unknown (27.10)/12J	SS-3, SS-4, SS-5, SS-6, SS-6 FR (SS-7)

¹ All concentrations reported for method blanks are in micrograms per kilogram (ug/kg). The concentrations of analytes detected in trip blanks and field blanks are reported per liter (ug/L) on this table. The appropriate conversion factors were employed by the data reviewer to convert concentrations reported in ug/L to equivalent in ug/kg. This was made necessary in order to compare the contamination detected in the trip and field blanks to the associated soil samples.

SDG No.	Sample delivery group number.	B	Analyte or TIC is detected in the laboratory blank.
ID	Identification.	A	Aldol-condensation product.
TIC	Tentatively-identified compound.	D	Analyte or TIC identified at a secondary dilution.
RT	Retention time in minutes.	N	Presumptive evidence.
FB	Field blank.	FR	Field replicate.
TB	Trip blank.	RE	Reanalysis.
J	Result is detected below the reporting limit and/or is an estimated concentration.	DL	Dilution analysis.
		E	Concentration exceeds calibration range.

Table I3-4. Summary of Soil Samples Qualified for Associated Blank Contamination, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Sample ID	Target Compound or TIC (RT)	Reported Result (ug/kg)	Qualified Result (ug/kg)
<u>Volatiles</u>				
	B-4	Unknown (32.14)	17J	R
	B-6	Methylene chloride Unknown (27.41)	13J 15 BJ	29U R
	B-10	Acetone	9 BJ	12U
	B-11	Acetone	26 B	26 U
	B-12	Acetone	13 B	13 U
	B-13	Acetone	8 BJ	11 U
	B-13A	Acetone	7 BJ	11 U
	B-14	Methylene chloride	9 J	11 U
	B-14 FR (MW-103)	Methylene chloride	10 J	11 U
	B-15	Methylene chloride	9 J	12 U
	B-16	Methylene chloride	8 J	11 U
	MW-1D	Methylene chloride	2 J	11 U
	MW-6	Acetone	22 B	22 U
	MW-7	Acetone	17 B	17 U
	MW-7 FR (MW-100)	Acetone	16 B	16 U
	MW-8	Acetone	27 B	27 U
	MW-9	Methylene chloride Acetone	18 9 BJ	18 U 11 U
	MW-12D	Methylene chloride Acetone	18 B 12 B	18 U 12 U
	MW-13D	Methylene chloride Acetone	1 J 3 BJ	11 U 11 U
	MW-14	Acetone	16 B	16 U
	SS-4	Acetone	--	11 U

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Table I3-4. Summary of Soil Samples Qualified for Associated Blank Contamination, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Sample ID	Target Compound or TIC (RT)	Reported Result (ug/kg)	Qualified Result (ug/kg)
<u>Semivolatiles</u>				
	B-1	Unknown (4.78)	1,500 BJ	R
		4-Hydroxy-4-methyl-2-pentanone	61,000 ABJ	R
		Unknown (25.16)	380 BJ	R
		Substituted hexanedioic acid	18,000 BJ	R
	B-2	Unknown (4.17)	570 J	R
		4-Hydroxy-4-methyl-2-pentanone	84,000 AJ	R
	B-3	Unknown (4.41)	230 J	R
		C-6 H-10 O Isomer (4.61)	110 BJ	R
		4-Hydroxy-4-methyl-2-pentanone	61,000 ABJ	R
		Unknown amide (30.53)	76 J	R
		Unknown amide (34.73)	76 J	R
	B-5	4-Hydroxy-4-methyl-2-pentanone	65,000 ABJ	R
		Substituted hexanedioic acid	75 BJ	R
	B-6	Unknown (4.77)	660 BJ	R
		4-Hydroxy-4-methyl-2-pentanone	29,000 ABJ	R
		Substituted hexanedioic acid	12,000 BJ	R
		Unknown (25.18)	500 BJ	R
	B-7	Unknown (4.80)	520 BJ	R
		4-Hydroxy-4-methyl-2-pentanone	38,000 ABJ	R
	B-8	C-6 H-10 O Isomer (4.56)	110 BJ	R
		4-Hydroxy-4-methyl-2-pentanone	79,000 ABJ	R
	B-8 FR (MW-101)	Unknown (4.23)	71 J	R
		C-6 H-10 O Isomer (4.50)	140 BJ	R
		4-Hydroxy-4-methyl-2-pentanone	67,000 ABJ	R
		Unknown amide (30.37)	71 BJ	R
	B-9	Unknown (4.79)	600 BJ	R
		Unknown (5.16)	70 BJ	R
		4-Hydroxy-4-methyl-2-pentanone	35,000 ABJ	R
	B-10	4-Hydroxy-4-methyl-2-pentanone	34,000 ABJ	R
		Substituted hexanedioic acid	3,500 JB	R
		1,1,2,2-Tetrachloroethane	200 BJ	R
		Unknown (4.24)	350 ABJ	R
		Unknown (28.28)	510 BJ	R

See last page for footnotes.

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Table I3-4. Summary of Soil Samples Qualified for Associated Blank Contamination, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Sample ID	Target Compound or TIC (RT)	Reported Result (ug/kg)	Qualified Result (ug/kg)
Semivolatiles (continued)				
	B-11	4-Hydroxy-4-methyl-2-pentanone	41,000 ABJ	R
		Substituted hexanedioic acid	4,500 BJ	R
		1,1,2,2-Tetrachloroethane	160 BJ	R
		Unknown (4.23)	450 BJ	R
		Unknown (28.28)	610 BJ	R
	B-12	4-Hydroxy-4-methyl-2-pentanone	33,000 ABJ	R
		1,1,2,2-Tetrachloroethane	190 BJ	R
		Unknown (4.30)	460 BJ	R
		Unknown (28.39)	800 BJ	R
	B-13	4-Hydroxy-4-methyl-2-pentanone	30,000 ABJ	R
		Substituted hexanedioic acid	9,900 BJ	R
		1,1,2,2-Tetrachloroethane	190 BJ	R
		Unknown (4.42)	340 BJ	R
		Unknown (28.54)	420 BJ	R
	B-13A	4-Hydroxy-4-methyl-2-pentanone	30,000 ABJ	R
		C-6 H-10 O Isomer (4.51)	250 BJ	R
		Unknown amide (34.55)	250 BJ	R
	B-14	4-Hydroxy-4-methyl-2-pentanone	62,000 ABJ	R
	B-14 FR (MW-103)	4-Hydroxy-4-methyl-2-pentanone	55,000 ABJ	R
		Substituted hexanedioic acid	110 BJ	R
	B-15	4-Hydroxy-4-methyl-2-pentanone	66,000 ABJ	R
	B-16	bis(2-Ethylhexyl)phthalate	110 J	370 U
		4-Hydroxy-4-methyl-2-pentanone	59,000 ABJ	R
	MW-1D	bis(2-Ethylhexyl)phthalate	110 J	370 U
	MW-2	4-Hydroxy-4-methyl-2-pentanone	65,000 ABJ	R
		Substituted hexanedioic acid	150 BJ	R
	MW-2 FR (MW-102)	4-Hydroxy-4-methyl-2-pentanone	66,000 ABJ	R
	MW-4	Di-n-butyl phthalate	1900 B	1900 U
		1,1,2,2-Tetrachloroethane	84 J	R

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Table I3-4. Summary of Soil Samples Qualified for Associated Blank Contamination, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Sample ID	Target Compound or TIC (RT)	Reported Result (ug/kg)	Qualified Result (ug/kg)
<u>Semivolatiles (continued)</u>				
	MW-5	bis(2-Ethylhexyl)phthalate	45 J	350 U
		4-Hydroxy-4-methyl-2-pentanone	75,000 ABJ	R
		C-6 H-10 O Isomer	210 BJ	R
		Unknown amide (30.36)	110 BJ	R
	MW-6	4-Hydroxy-4-methyl-2-pentanone	74,000 ABJ	R
	MW-6D	bis(2-Ethylhexyl)phthalate	100 BJ	350 U
		Di-n-butyl phthalate	220 BJ	350 U
		4-Hydroxy-4-methyl-2-pentanone	60,000 ABJ	R
		Unknown (4.37)	1,400 BJ	R
		Unknown (4.66)	210 BJ	R
		Unknown (20.51)	110 BJ	R
	MW-7	4-Hydroxy-4-methyl-2-pentanone	83,000 ABJ	R
		Unknown (29.40)	170 BJ	R
		Unknown (31.66)	210 BJ	R
	MW-7 FR (MW-100)	4-Hydroxy-4-methyl-2-pentanone	66,000 ABJ	R
		Unknown (29.43)	210 BJ	R
		Unknown (31.69)	240 BJ	R
		4-Methyl-3-penten-2-one	100 BJ	R
	MW-8	Di-n-butylphthalate	730 B	730 U
		4-Hydroxy-4-methyl-2-pentanone	78,000 ABJ	R
		Unknown (4.40)	75 BJ	R
		Unknown (5.73)	4,000 BJ	R
	MW-9	bis(2-Ethylhexyl)phthalate	46 J	350 U
		4-Hydroxy-4-methyl-2-pentanone	61,000 ABJ	R
	MW-10	Di-n-butylphthalate	200 BJ	360 U
		bis(2-Ethylhexyl)phthalate	43 BJ	360 U
		4-Hydroxy-4-methyl-2-pentanone	62,000 ABJ	R
		Unknown (20.50)	150 BJ	R
	MW-10D	Di-n-butylphthalate	130 BJ	370 U
		4-Hydroxy-4-methyl-2-pentanone	74,000 ABJ	R
		Unknown (20.50)	110 BJ	R
	MW-11D	Unknown acid ester (29.94)	180 BJ	R
		Unknown amide (33.84)	110 J	R

See last page for footnotes.

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Table I3-4. Summary of Soil Samples Qualified for Associated Blank Contamination, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Sample ID	Target Compound or TIC (RT)	Reported Result (ug/kg)	Qualified Result (ug/kg)
<u>Semivolatiles (continued)</u>				
	MW-13D	Unknown amide (29.82)	390 BJ	R
		Unknown amide (29.88)	110 BJ	R
		Unknown amide (33.99)	250 BJ	R
	MW-14	bis(2-Ethylhexyl)phthalate	41 J	390 U
		Unknown amide (29.67)	120 J	R
		Unknown amide (33.85)	120 J	R
	SS-5	bis(2-Ethylhexyl)phthalate	430	430 U
		4-Hydroxy-4-methyl-2-pentanone	37,000 ABJ	R
	SS-6	bis(2-Ethylhexyl)phthalate	290 J	390 U
		4-Hydroxy-4-methyl-2-pentanone	110,000 ABJ	R
		Benzaldehyde	88 J	R
		Unknown (34.18)	240 J	R
	SS-6 FR (SS-7)	bis(2-Ethylhexyl)phthalate	270 J	370 U
		4-Hydroxy-4-methyl-2-pentanone	49,000 ABJ	R

ID Identification.
 TIC Tentatively-identified compound.
 RT Retention time in minutes.
 ug/kg Micrograms per kilogram.
 J Result is detected below the reporting limit and/or is an estimated concentration.
 B Analyte or TIC is detected in the laboratory blank.
 U Analyte analyzed for, but not detected at the corresponding reporting limit.
 A Aldol condensation product.
 FR Field replicate.
 R Sample results are rejected and will not be reported.

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Table I3-5. Summary of Volatile Calibration Outliers Associated with Soil and Quality Control Samples Collected from June through August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Instrument ID	Calibration				Outliers		Associated Samples
	ICV/CCV	File ID	Heated Purge (yes/no)	Date Analyzed	Criterion (RF/%RSD/%D)	Compound (calculated value)	
HP-V2	SSL ICV	A2499-A2500	No	06/11/92	%RSD>30%	n-Propylbenzene (38.24)	MB 15JUN92-A, MW-4D, MW-1D, B-4, MW-3, MB 23JUN92-A, MW-4, MB 01JUL92-A, MW-11D, MB 03JUL92-A, MW-1, MB 11JUN92-A, FB060492, FB060592, TB060592, MB 16JUN92-A, TB060992, FB060992, TB061092, MB 17JUN92-A, TB061592, WAPA, MB 24JUN92-B, WAPA-RE, FB061692, TB061692, MB 25JUN92-A, FB061992, MB 26JUN92-A, TB061992
	TCL CCV	A2579	Yes	06/15/92	%D>25%	Carbon disulfide (-25.1)	MB 15JUN92-A, MW-4D, MW-1D B-4, MW-3
	SSL CCV	A2578	Yes	06/15/92	%D>25%	Methyl tertiary butyl ether (28.78)	MB 15JUN92-A, MW-4D, MW-1D, B-4, MW-3
	SSL CCV	A2588	No	06/16/92	%D>25%	Methyl tertiary butyl ether (30.48)	MB 16JUN92-A, TB060992, FB060092, TB061092
	SSL CCV	A2608	No	06/17/92	%D>25%	Methyl tertiary butyl ether (33.04)	MB 17JUN92-B, TB061592, WAPA
	TCL CCV	A2760	Yes	06/23/92	%D>25%	Carbon disulfide (-27.1)	MB 23JUN92-A, MW-4
	TCL CCV	A2793	No	06/24/92	%D>25%	1,2-Dichloroethane (32.8), 1,2-Dichloroethane-d ₄ (35.8)	MB 24JUN92-B, WAPA-RE, FB061692, TB061692

See last page for footnotes.

Table 13-5. Summary of Volatile Calibration Outliers Associated with Soil and Quality Control Samples Collected from June through August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Instrument ID	Calibration				Outliers		Associated Samples
	ICV/CCV	File ID	Heated Purge (yes/no)	Date Analyzed	Criterion (RF/%RSD/%D)	Compound (calculated value)	
HP-V2 (continued)	TCL CCV	A2818	No	06/25/92	%D>25%	1,2-Dichloroethane (28.1), 1,2-Dichloroethane-d ₄ (31.3)	MB 25JUN92-A, FB061992
	TCL CCV	A2836	No	06/26/92	%D>25%	1,2-Dichloroethane (29.2), 1,2-Dichloroethane-d ₄ (29.1)	MB 26JUN92-A, TB061992
	SSL CCV	A2837	No	06/26/92	%D>25%	Methyl tertiary butyl ether (57.93) n-Propylbenzene (58.22)	MB 26JUN92-A, TB061992
	TCL CCV	A2950	Yes	07/01/92	%D>25%	Carbon disulfide (-29.8)	MB 01JUL92-A, MW-11D
	TCL CCV	A2999	Yes	07/03/92	%D>25%	Chloromethane (25.7), 2-Butanone (-38.3), 4-Methyl-2-pentanone (-27.8), 1,1,2,2-Tetrachloroethane (-35.3)	MB 03JUL92-A, MW-1
	SSL ICV	A3084-A3089	No	07/09/92	%RSD>30%	Methyl tertiary butyl ether (42), n-Propylbenzene (48.7)	MB 24JUL92-A, MW-6, MW-7, MW-7 FR (MW-100), MW-8 MB 04AUG92-A, B-9, B-1, B-7 MB 05AUG92-A, B-6, MB 07AUG92-B, B-2, B-3, MW-10, MW-10D, MB 12AUG92-B, MW-6D, MB 17AUG92-A, B-13, B-10, B-11, B-12, B-13A, B-8, B-8 FR (MW-101), MW-5, MB 18AUG92-A, B-13 DL, B-11 RE, B-8 MS, B-8 MSD, MB 20AUG92-B, B-16, B-16 MS,

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Table I3-5. Summary of Volatile Calibration Outliers Associated with Soil and Quality Control Samples Collected from June through August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

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Instrument ID	Calibration			Outliers		Associated Samples	
	ICV/CCV	File ID	Heated Purge (yes/no)	Date Analyzed	Criterion (RF/%RSD/%D)		Compound (calculated value)
HP-V2 (continued)							B-16 MSD, MW-2, B-5, MW-2 FR (MW-102), B-14, B-15, B-14 FR (MW-103), MB 27AUG92-A, SS-6, SS-6 FR (SS-7), SS-3, MB 27AUG92-B, SS-4, SS-5, MB 10JUL92-A, FB070192, TB070192, FB070692, TB070692, MB 10AUG92-A, FB080392, TB080392, FB080492, TB080492, FB080692, MB 11AUG92-A, TB080692, MB 18AUG92-B, FB081092, FB081192, TB081092, TB081192, TB081292, MB 19AUG92-A, FB081292, MB 21AUG92-A, FB081392, TB081392, FB081492, TB081492, MB 29AUG92-A, FB081992, TB081992
	TCL CCV	A3596	Yes	08/04/92	%D>25%	Chloroethane (27.8)	MB 04AUG92-A, B-9, B-1, B-7
	TCL CCV	A3652	Yes	08/07/92	%D>25%	Methylene chloride (31.6)	MB 07AUG92-B, B-2, B-3, MW-10, MW-10D
	TCL CCV	A3764	Yes	08/12/92	%D>25%	Methylene chloride (30.0)	MB 12AUG92-B, MW-6D
	TCL CCV	A3845	Yes	08/17/92	%D>25%	Methylene chloride (28.0), Acetone (57.8), 2-Butanone (51.9), 4-Methyl-2-pentanone (38.3), 2-Hexanone (50.5),	MB 17AUG92-A, B-13, B-10, B-11, B-12, B-13A, B-8, B-8 FR (MW-101), MW-5

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Table I3-5. Summary of Volatile Calibration Outliers Associated with Soil and Quality Control Samples Collected from June through August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Instrument ID	Calibration				Outliers		Associated Samples
	ICV/CCV	File ID	Heated Purge (yes/no)	Date Analyzed	Criterion (RF/%RSD/%D)	Compound (calculated value)	
HP-V2 (continued)	TCL CCV	A3865	Yes	08/18/92	%D>25%	Methylene chloride (26.0), Acetone (55.9), 2-Butanone (55.7), 4-Methyl-2-pentanone (46.7), 2-Hexanone (55.3)	MB 18AUG92-A, B-13 DL, B-11 RE, B-8 MS, B-8 MSD
	TCL CCV	A3929	Yes	08/20/92	%D>25%	Acetone (29.2)	MB 20AUG92-B, B-16, B-16 MS, B-16 MSD, MW-2, B-5, MW-2 FR (MW-102), B-14, B-15, B-14 FR (MW-103)
	TCL CCV	A4118	Yes	8/27/92	%D>25%	1,2-Dichloroethane-d ₄ (-32.5)	MB 27AUG92-A, SS-6, SS-6 FR (SS-7), SS-3
	SSL CCV	A4117	Yes	8/27/92	%D>25%	Methyl tertiary butyl ether (30.63)	MB 27AUG92-A, SS-6, SS-6 FR (SS-7), SS-3
	TCL CCV	A4129	Yes	08/27/92	%D>25%	Carbon tetrachloride (-25.8)	MB 27AUG92-B, SS-4, SS-5
	SSL CCV	A4130	Yes	08/27/92	%D>25%	1,2-Dichloroethane-d ₄ (-30.7), n-Propylbenzene (27.06)	MB 27AUG92-B, SS-4 SS-5
	SSL CCV	A4164	No	08/29/92	%D>25%	Methyl tertiary butyl ether (27.50), n-Propylbenzene (32.91)	MB 29AUG92-A, FB081992, TB081992
HP-V3	TCL CCV	C9727	No	07/03/92	%D>25%	Vinyl chloride (-28.6)	MB 03JUL92-A, FB062692, FB063092, TB063092

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Table 13-5. Summary of Volatile Calibration Outliers Associated with Soil and Quality Control Samples Collected from June through August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Instrument ID	Calibration				Outliers		Associated Samples
	ICV/CCV	File ID	Heated Purge (yes/no)	Date Analyzed	Criterion (RF/%RSD/%D)	Compound (calculated value)	
HP-V3 (continued)	TCL CCV	C0130	No	07/24/92	%D>25%	Bromomethane (-31.6), Chloroethane (-41.6), Methylene chloride (-33.3)	MB 24JUL92-B, TB071692, FB071692, FB072092, TB072092, FB072192, TB072192
	SSL CCV	C0131	No	07/24/92	%D>25%	n-Propylbenzene (45.62)	MB 24JUL92-B, FB071692, TB071692, FB072092, TB072092, FB072192, TB072192
	TCL CCV	C0215	No	07/31/92	%D>25%	Bromomethane (-28.1) Chloroethane (-32.5) Methylene chloride (-32.8)	MB 31JUL92-B, FB072492, TB072492
	SSL CCV	C0216	No	07/31/92	%D>25%	n-Propylbenzene	MB 31JUL92-B, FB072492, TB072492
	TCL CCV	C0314	No	08/05/92	%D>25%	Acetone (29.8)	MB 05AUG92-A, FB073192, TB073192 FB072992, TB072992
	SSL CCV	C0315	No	08/05/92	%D>25%	n-Propylbenzene (25.59)	MB 05AUG92-A, FB072992, TB072992 FB073192, TB073192

ID	Identification.	%	Percent
TCL	Target compound list.	MB	Method blank.
SSL	Site-specific volatile organic compound list which includes the following compounds: n-propylbenzene, methyl tertiary butyl ether (MTBE), and tertiary butyl alcohol (TBA)	RE	Reanalysis.
ICV	Initial calibration verification.	DL	Dilution analysis.
CCV	Continuing calibration verification.	MS	Matrix spike.
RF	Response factor.	MSD	Matrix spike duplicate.
%RSD	Percent relative standard deviation.	FB	Field blank.
%D	Percent difference.	TB	Trip blank.
		FR	Field replicate.

Table I3-6. Summary of Semivolatile Calibration Outliers Associated with Soil and Quality Control Samples Collected from June through August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG	Instrument ID	Calibration			Outlier		Associated Samples
		ICV/CCV	File ID	Date Analyzed	Criterion (RF/% RSD/% D)	Compound (Calculated Value)	
22570 22507	HP-S5	ICV	G7181-G7185	06/15/92	% RSD > 30%	Hexachlorocyclopentadiene (32.5) 3,3'-Dichlorobenzidine (50.4)	WB-10JUN92C, FB060492, FB060592, MW-4D, MW-1D, SB-10JUN92C, FB060992, WB-11JUN92B, B-4, SB-12JUN92B
22507	HP-S5	CCV	G7195	06/16/92	% D > 25%	3,3'-Dichlorobenzidine (-96.1)	WB-10JUN92C, FB060492, FB060592
22507 22570	HP-S5	CCV	G7213	06/17/92	% D > 25%	3,3'-Dichlorobenzidine (-97.0)	MW-4D, MW-1D, SB-10JUN92C, B-4, FB060992, WB-11JUN92B, SB-12JUN92B
23021 22932 22793 22712 22595	HP-S5	ICV	G7227-G7231	06/18/92	% RSD > 30%	Hexachlorocyclopentadiene (42.39) 3,3'-Dichlorobenzidine (52.17)	MW-3, MW-4, MW-4 RE, FB061692, FB061692 DL, FB061992, SB-15JUN92A, SB-18JUN92B, MW-13D, WB-18JUN92C, FB063092, WB-22JUN92C, FB062692, SB-22JUN92B, WB-30JUN92D, WMB-04JUL92A, SB-04JUL92A
22595 22717	HP-S5	CCV	G7258	06/23/92	% D > 25%	4-Nitroaniline (32.1) 3,3'-Dichlorobenzidine (-89.2)	MW-3, MW-4, SB-15JUN92A, FB061692, SB-18JUN92B, WB-18JUN92C
2271	HP-S5	CCV	G7278	06/25/92	% D > 25%	Hexachlorocyclopentadiene (-30.9) 2,4,6-Tribromophenol (31.4)	FB061692 DL
2279	HP-S5	CCV	G7295	06/26/92	% D > 25%	Hexachlorocyclopentadiene (-33.0) 4-Nitrophenol (27.5) 3,3'-Dichlorobenzidine (29.0) 2,4,6-Tribromophenol (34.5)	FB061992, WB-22JUN92C
2279	HP-S5	CCV	G7308	06/29/92	% D > 25%	4-Nitroaniline (-36.7) 2,4,6-Tribromophenol (28.8)	SB-22JUN92B, MW-13D

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Table I3-6. Summary of Semivolatile Calibration Outliers Associated with Soil and Quality Control Samples Collected from June through August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG	Instrument ID	Calibration			Outliers		Associated Samples
		ICV/CCV	File ID	Date Analyzed	Criterion (RF/% RSD/% D)	Compound (Calculated Value)	
22932	HP-S5	CCV	G7358	07/06/92	% D > 25%	4-Chloroaniline (27.6) 4-Nitrophenol (36.5) 4-Nitroaniline (-33.8) Pentachlorophenol (29.5)	FB062692, WB-30JUN92D
22712 23021	HP-S5	CCV	G7379	07/08/92	% D > 25%	Hexachlorocyclopentadiene (-33.0) 4-Nitrophenol (36.9) 4-Nitroaniline (-30.4) Pentachlorophenol (39.1)	MW-4 RE, SB-04JUL92A, WMB-04JUL92A, FB063092
23144 22932 23021 23024	HP-S5	ICV	G7392-G7396	07/09/92	% RSD > 30%	Hexachlorocyclopentadiene (32.28)	MW-11D, SMB-30JUN92B, MW-1, MW-14, SMB-06JUL92B, WMB-06JUL92C, WMB-09JUL92B, SMB-09JUL92B, FB070192, FB070692, MW-12D
23024 22932	HP-S5	CCV	G7392	07/09/92	% D > 25%	4-Nitrophenol (27.8)	MW-11D, SMB-30JUN92B, MW-1, MW-14, SMB-06JUL92B, WMB-06JUL92C
23024	HP-S5	CCV	G7411	07/10/92	% D > 25%	4-Nitroaniline (29.0)	FB070192
23144	HP-S5	CCV	G7458	07/13/92	% D > 25%	2,2'-oxybis (1-Chloropropane) (32.3)	WMB-09JUL92B, FB070692
23144	HP-S5	CCV	G7487	07/15/92	% D > 25%	Hexachlorocyclopentadiene (-26.5) 4-Nitroaniline (-38.5) Benzo(k)fluoranthene (-30.5) 2,4,6-Tribromophenol (-31.7)	MW-12D, SMB-09JUL92B

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Table 13-6. Summary of Semivolatile Calibration Outliers Associated with Soil and Quality Control Samples Collected from June through August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG	Instrument ID	Calibration		Outlier		Associated Samples
		ICV/CCV	File ID	Date Analyzed	Criterion (RF/% RSD/% D) Compound (Calculated Value)	
23421 23396	HP-S5	CCV	G7654	07/31/92	% D > 25% 3,3'-Dichlorobenzidine (32.26) Benzo(k)fluoranthene (26.30)	FB072092, FB071692, WMB-21JUL92C
23506 23448 23421 23396	HP-S5	CCV	G7675	08/03/92	% D > 25% Hexachlorocyclopentadiene (-41.1) 2,4-Dinitrophenol (-33.1) 4,6-Dinitro-2-methylphenol (-35.0) Pentachlorophenol (-34.4) 3,3'-Dichlorobenzidine (-26.2) 2,4,6-Tribromophenol (-37.9)	MW-7, MW-9, MW-8, SMB-27JUL92A, FB072192, WMB-25JUL92A, MW-6D, WMB-23JUL92B, SMB-23JUL92B, MW-7 FR (MW-100), SMB-21JUL92B
23506	HP-S5	CCV	G7695	08/04/92	% D > 25% 2,4-Dinitrophenol (-39.1) 4,6-Dinitro-2-methylphenol (-36.6) Pentachlorophenol (-27.9) 3,3'-Dichlorobenzidine (-31.5)	WMB-27JUL92A, FB072492
23697 23623 23506	HP-S5	CCV	G7792	08/12/92	% D > 25% 4-Nitroaniline (-26.0) 3,3'-Dichlorobenzidine (-26.1)	FB080392, FB073092, WMB-06AUG92B, FB072492 RE, WMB-03AUG92A
23750	HP-S5	CCV	G7862	08/19/92	% D > 25% bis(2-Chloroethyl)ether (-30.0) Nitrobenzene (-28.1) 2-Nitroaniline (-28.5) 2-Fluorophenol (-33.0)	FB080492, WMB-07AUG92C
23799	HP-S5	CCV	G7880	08/20/92	% D > 25% Phenol (-27.3) 4-Nitroaniline (28.2) Pentachlorophenol (-33.1) 2-Fluorophenol (-35.8)	FB081092, FB081192

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Table 13-6. Summary of Semivolatile Calibration Outliers Associated with Soil and Quality Control Samples Collected from June through August 1992, Tute Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG	Instrument ID	Calibration			Outliers		Associated Samples
		ICV/CCV	File ID	Date Analyzed	Criterion (RP/% RSD/% D)	Compound (Calculated Value)	
23799	HP-S5	CCV	G7889	08/21/92	% D > 25%	2,4,5-Trichlorophenol (-26.7) Pentachlorophenol (-25.8) Benzo(k)fluoranthene (-25.9) 2-Fluorophenol (-25.9)	WMB-13AUG92B
23697	HP-S5	CCV	G7904	08/22/92	% D > 25%	Hexachlorobenzene (-26.1) 2-Fluorophenol (-30.9)	SMB-06AUG92B, WMB-15AUG92B, FB081292
23938 23799 23750 23833 23697	HP-S5	CCV	G7921	08/23/92	% D > 25%	4-Nitroaniline (28.9) 4-Bromophenyl-phenylether (-25.4) Hexachlorobenzene (-27.5) Benzo(k)fluoranthene (-26.8) 2-Fluorophenol (-30.6)	SMB-19AUG92B, SMB-13AUG92B, B-13, MW-10, MW-10D, SMB-11AUG92A, MW-6D, B-3
23799 24008	HP-S5	CCV	G7945	08/24/92	% D > 25%	2,4-Dinitrophenol (34.9) Di-n-octyl phthalate (-33.3) Benzo(k)fluoranthene (-34.2)	B-10, B-11, FB081392, FB081492, WMB-18AUG92C
23938 23799	HP-S5	CCV	G7977	08/26/92	% D > 25%	Phenol (-30.6) 4-Methylphenol (-26.2) 4-Nitrophenol (36.7) Pyrene (-30.0) Butylbenzylphthalate (-29.6) bis(2-Ethylhexyl)phthalate (-29.9) Di-n-octylphthalate (-28.8)	MW-5, B-8 PR (MW-101), B-12
23938	HP-S5	CCV	G7962	08/25/92	% D > 25%	4-Nitrophenol (34.6) Pyrene (-26.7)	B-13A, B-8, B-8 MS, B-8 MSD

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Table I3-6. Summary of Semivolatile Calibration Outliers Associated with Soil and Quality Control Samples Collected from June through August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG	Instrument ID	Calibration			Outliers		Associated Samples
		ICV/CCV	File ID	Date Analyzed	Criterion (RF/% RSD/% D)	Compound (Calculated Value)	
24122 24008 23697	HP-S5	ICV	G7999-G8003	08/28/92	% RSD > 30%	3-Nitroaniline (30.1) Benzo(k)fluoranthene (37.3)	B-2, MW-2, B-5, B-14, B-15, B-16, B-16 MS, B-16 MSD, SMB-20AUG92A, MW-2 FR (MW-102), B-14 FR (MW-103), WMB-24AUG92B, FB081992, SMB-25AUG92B
23697	HP-S5	CCV	G8003	08/28/92	% D > 25%	4-Chloroaniline (-25.2) 3-Nitroaniline (-33.5) Benzo(k)fluoranthene (33.5)	B-2
24008	HP-S5	CCV	G8021	08/31/92	% D > 25%	4-Chloroaniline (-25.9) Hexachlorobutadiene (-31.0) Hexachlorocyclopentadiene (-32.2) 2,4,5-Trichlorophenol (-29.3) 3-Nitroaniline (-25.1) Hexachlorobenzene (-26.3) Benzo(k)fluoranthene (-30.6) 2,4,6-Tribromophenol (-29.0)	SMB-20AUG92A, MW-2, B-5, B-14, B-15, B-16, B-16 MS, B-16 MSD, MW-2 FR (MW-102), B-14 FR (MW-103)
24122	HP-S5	CCV	G8037	09/01/92	% D > 25%	2,2'-oxybis(1-Chloropropane) (-28.1) 1,2,4-Trichlorobenzene (-25.4) Hexachlorobutadiene (-33.8) 4-Chlorophenyl-phenylether (-26.0) Benzo(k)fluoranthene (-33.9) 2,4,6-Tribromophenol (-33.6)	WMB-24AUG92B

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Table I3-6. Summary of Semivolatile Calibration Outliers Associated with Soil and Quality Control Samples Collected from June through August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG	Instrument ID	Calibration			Outlier		Associated Samples
		ICV/CCV	File ID	Date Analyzed	Criterion (RP/% RSD/% D)	Compound (Calculated Value)	
24122	HP-S5	CCV	G8045	09/02/92	% D > 25%	2,2'-oxybis(1-Chloropropane) (-33.6) 1,2,4-Trichlorobenzene (-26.4) Hexachlorobutadiene (-31.7) 4-Nitrophenol (35.4) 4-Chlorophenyl-phenylether (-27.0) 4-Nitroaniline (40.7) Hexachlorobenzene (-28.7) 2,4,6-Tribromophenol (-40.0)	SMB-25AUG92B
24122	HP-S5	CCV	G8061	09/04/92	% D > 25%	2,2'-oxybis(1-Chloropropane) (-54.9) 1,2,4-Trichlorobenzene (-26.1) Hexachlorobutadiene (-30.3) Hexachlorocyclopentadiene (-28.7) 4-Chlorophenyl-phenylether (-25.1) 4-Nitroaniline (35.6) 4-Bromophenyl-phenylether (-25.1) Hexachlorobenzene (-28.3) 2,4,6-Tribromophenol (-42.6)	FB081992
24122	HP-S5	ICV	G8288-G8292	09/23/92	% RSD > 30%	Benzo(k)fluoranthene (35.5)	SS-5, SS-7, SS-3, SS-4, SMB-17SEP92A
24122	HP-S5	CCV	G8288	09/23/92	% D > 25%	Hexachlorocyclopentadiene (-36.1) Benzo(k)fluoranthene (-37.0)	SS-5, SS-6 FR (SS-7)

See notes on last page.

tuturi-wp DV/tbl3.wk3

Table 13-6. Summary of Semivolatile Calibration Outliers Associated with Soil and Quality Control Samples Collected from June through August 1992, Tata Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG	Instrument ID	Calibration			Outliers		Associated Samples
		ICV/CCV	File ID	Date Analyzed	Criterion (RF/% RSD/% D)	Compound (Calculated Value)	
24122	HP-S5	CCV	G8364	09/25/92	% D > 25%	2,2'-oxybis(1-Chloropropane) (-42.2) Hexachlorobutadiene (-26.5) 2,4,5-Trichlorophenol (-27.7) 4-Nitrophenol (-30.6) Diethylphthalate (-25.8) Di-n-octylphthalate (-54.5)	SS-3, SMB-17SEP92A
24122	HP-S5	CCV	G8421	09/28/92	% D > 25%	2,2'-oxybis(1-Chloropropane) (-34.3) 1,2,4-Trichlorobenzene (-26.5) Hexachlorobutadiene (-28.0) 2,4,5-Trichlorophenol (-29.0) 2,4-Dinitrophenol (-25.1) 4,6-Dinitro-2-methylphenol (-33.5)	SS-4
24122	HP-S2	ICV	P9675 - P9679	10/07/92	% RSD > 30%	Hexachlorocyclopentadiene (32.7) 2,4-Dinitrophenol (43.0)	SMB-25SEP92A, SS-6
24122	HP-S2	CCV	P9675	10/07/92	% D > 25% % D > 25% RF < 0.05	2,4-Dinitrophenol (62.1) 4,6-Dinitro-2-methylphenol (37.0) 2,4-Dinitrophenol (0.044)	SS-6, SMB-25SEP92A
24122	HP-S2	ICV	P9718 - P9722	10/10/92	% RSD > 30%	Benzo(k)fluoranthene (32.9)	SMB-30SEP92A, SS-3 RE
24122	HP-S2	CCV	P9772	10/13/92	% D > 25%	2,2'-oxybis(1-Chloropropane) (-34.8) 4-Chloroaniline (30.1) 3-Nitroaniline (34.6) 2,4-Dinitrophenol (35.6) 4-Nitroaniline (33.2)	SS-3 RE

Table 13-6. Summary of Semivolatile Calibration Outliers Associated with Soil and Quality Control Samples Collected from June through August 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG	Instrument ID	Calibration			Outliers		Associated Samples
		ICV/CCV	File ID	Date Analyzed	Criterion (RF/% RSD/% D)	Compound (Calculated Value)	
23622 23663 23623	HP-S4	CCV	P0865	08/18/92	% D > 25%	Benzo(k)fluoranthene (-29.8)	FB072992, B-9, WMB-04AUG92F, SMB-04AUG92A, FB073192, B-7, B-1, B-6, SMB-03AUG92A,
23833	HP-S4	CCV	P0888	08/19/92	% D > 25%	Hexachlorobutadiene (-32.8) Hexachlorocyclopentadiene (-26.6) Hexachlorobenzene (-34.2) 2,4,6-Tribromophenol (-39.0)	WMB-10AUG92C, FB080692

SDG Sample delivery group.
 ID Identification.
 ICV Initial calibration verification.
 CCV Continuing calibration verification.
 RF Response factor.
 %R Percent relative standard deviation.
 %I Percent difference.
 WI Water blank; the numerical suffix denotes the batch date and lot.

FB Field blank.
 SB Soil blank; the numerical suffix denotes the batch date and lot.
 WMB Same as water blank.
 SMB Same as soil blank.
 FR Field replicate.
 RE Reanalysis.
 DL Dilution analysis.

tu DV/tbl3.wk3

Table I3-7. Summary of Soil Field—Replicate Sample Pair Results, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Analyte or TIC (RT)	Concentration (ug/kg)		RPD (%)
		B-8	B-8 FR (MW-101)	
Volatiles	Tetrachloroethene	2 J	5 J	NC
	Toluene	4 J	4 J	NC
	Ethylbenzene	2 J	3 J	NC
	Octamethyl cyclotetrasiloxane	23 JN	48 JN	NC
Semivolatiles	Benzo (a) anthracene	180 J	350 U	NC
	Benzo (a) pyrene	200 J	350 U	NC
	Benzo (b) fluoranthene	250 J	350 U	NC
	Benzo (g,h,i) perylene	84 J	350 U	NC
	Benzo (k) fluoranthene	96 J	350 U	NC
	Chrysene	210 J	350 U	NC
	Fluoranthene	290 J	350 U	NC
	Indeno (1,2,3-cd) pyrene	87 J	350 U	NC
	Phenanthrene	160 J	350 U	NC
	Pyrene	300 J	350 U	NC
	Benzaldehyde	38 JN	NR	NC
	Unknown (28.88)	110 J	NR	NC
	C-20 H-12 Isomer (35.51)	150 J	NR	NC
	Hydrocarbon (37.32)	230 J	NR	NC
	Unknown (39.22)	75 J	NR	NC
	Unknown (33.79)	NR	180 J	NC
TPH *		23 U	77	NC
		B-14	B-14 FR (MW-103)	
Volatiles	Tetrachloroethene	72	100	32.5
	Toluene	2 J	3 J	NC
	Unknown (20.48)	50 J	NR	NC
	Hydrocarbon (22.25)	44 J	NR	NC
	Unknown (23.05)	87 J	NR	NC
	Unknown (24.66)	37 J	NR	NC
	Hydrocarbon (26.23)	56 J	NR	NC
	Unknown (29.61)	56 J	NR	NC
	Hydrocarbon (23.83)	44 J	NR	NC
	Hydrocarbon (25.29)	72 J	NR	NC
	Unknown (27.15)	33 J	NR	NC
	Unknown (27.75)	41 J	NR	NC
	Trichlorofluoromethane	NR	11 JN	NC
	Unknown (5.18)	NR	48 J	NC
Semivolatiles	Unknown (25.74)	260 J	NR	NC
	Unknown (26.10)	380 J	NR	NC
	Unknown (28.79)	150 J	NR	NC
	Unknown (29.01)	110 J	NR	NC
	Unknown (30.48)	150 J	NR	NC
	Unknown (41.09)	NR	1500 J	NC
TPH *		250 D	56	127

See notes on Page 2.

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Table I3-7. Summary of Soil Field—Replicate Sample Pair Results, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Analyte or TIC (RT)	Concentration (ug/kg)		RPD (%)
		MW-2	MW-2 FR (MW-102)	
Volatiles	Methylene chloride	10 J	10 J	NC
	Acetone	58 J	130 J	NC
	2-Butanone	11 U	25	NC
	Unknown (27.45)	10 J	NR	NC
	Unknown (5.33)	NR	16 J	NC
TPH *		66	86	26
		MW-7	MW-7 FR (MW-100)	
Volatiles	Methylene chloride	12	18	40
	C-12 H-12 Isomer	NR	13 J	NC
Semivolatiles	Unknown (15.57)	69 J	NR	NC
	Unknown (5.02)	NR	69 J	NC
TPH *		27	21 U	NC
		SS-6	SS-6 FR (SS-7)	
Volatiles	Methylene Chloride	22	20	9.5

TIC Tentatively—identified compound.
 RT Retention time in minutes.
 ug/kg Micrograms per kilogram.
 RPD Relative percent difference.
 FR Field replicate.
 J Estimated concentration.
 NC Not calculated.
 U Analyte analyzed for, but not detected at the corresponding reporting limit.
 NR Not reported in sample.
 N Presumptive evidence to make a tentative identification.
 TPH Total petroleum hydrocarbons.
 * Concentrations (mg/kg).
 mg/kg Milligrams per kilogram.
 D Analyte identified at a secondary dilution.

PR01301/030893.wt3/1cb

TUT 002 1669

APPENDIX I

FIRST SAMPLING ROUND DATA VALIDATION REPORT

APPENDIX J

FIRST SAMPLING ROUND DATA VALIDATION REPORT

Appendix J includes the data validation summary and the supporting documentation generated during the analytical data review of first round ground-water samples collected in September and October 1992 for the Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands and analyzed by Enseco East (Enseco) of Somerset, New Jersey.

APPENDIX FORMAT

The data validation report appendix is divided in the following sections:

- Introduction.
- Attachment J1 - The U.S. Environmental Protection Agency (USEPA) Standard Operating Procedure (SOP) Number (No.) HW-6 (Revision No. 8) Contract Laboratory Program (CLP) organics data review and preliminary review checklist, and the data assessment narrative.
- Attachment J2 - The USEPA SOP No. HW-2 (Revision 11) "Evaluation of Metals Data for the CLP" total review inorganics checklist and the data assessment narrative for the target analyte list (TAL).
- Attachment J3 - Tables associated with the validation checklists and narratives.

The introduction summarizes (1) the field investigation sampling effort, (2) the analytical parameters and methods employed in support of the field investigation, (3) the data validation requirements and validation protocols used for the data assessment, and (4) an overall assessment.

Attachment J1 is comprised of the USEPA Region II SOP No. HW-6 (Revision No. 8) CLP organics preliminary data review checklist and the data assessment narrative (USEPA 1992a). The data review checklist guides the data reviewer in evaluating pertinent field and laboratory sample documentation and analytical procedures. By evaluating critical quality control (QC) criteria, the data reviewer determines the validity of the analytical data and places limitations on data use. In the data assessment narrative, the data reviewer summarizes the validation, discusses sample anomalies and QC outliers, and provides an overall assessment of the analytical data generated in support of the field investigation.

Attachment J2 is comprised of the USEPA Region II SOP No. HW-2 (Revision 11) data review checklist and associated narrative for the evaluation of CLP inorganics (USEPA 1992b).

In Attachment J3, tables are provided that summarize sample identification/delivery groups; holding time non-compliance; associated trip blank, field blank, and method blank contamination; calibration outliers; and matrix spike outliers.

INTRODUCTION

This report represents the data validation and narrative summary for 23 ground-water samples (including three field replicates [FR]), six field blanks, seven trip blanks, one field-decontamination water blank, one matrix spike (MS), and one matrix spike duplicate (MSD) sample collected in September and October 1992 for the Tutu Service Station Investigation.

SAMPLING

The samples were collected on seven days during the period of September 29, 1992 through October 7, 1992. They were delivered to the laboratory in seven sample delivery groups (SDGs). An SDG and sample identification (ID) summary is provided below in Table J3-1 of this appendix.

TUT 002 1672

Three replicate ground-water samples were collected and provided to the laboratory with blind field identifications. The field replicates were collected at a frequency of 10 percent of the total field sample number. The sample/field replicate pairs were as follows:

<u>Sample ID</u>	<u>Replicate Field ID</u>	<u>Report ID</u>
MW-5	MW-104	MW-5 FR
MW-7	MW-105	MW-7 FR
MW-9	MW-106	MW-9 FR

A field blank and trip blank were prepared daily and accompanied each SDG shipment. The field blank collected on October 2, 1992 was cancelled at the laboratory due to an internal error.

Sample MW-1 was initially collected on October 2, 1992 in SDG 25009. However, the shipping cooler was lost in transit by the overnight carrier. Since the sample cooler was not delivered to the laboratory during the required time period and the sample preservation requirements were exceeded, MW-1 was resampled on October 6, 1992 and delivered to the laboratory with SDG 25071.

The volatile analysis vials for samples MW-4D and MW-7 collected on October 5, 1992 were received at the laboratory with headspace. Sample MW-4D was resampled for volatiles on October 7, 1992 and delivered to the laboratory with SDG 25091. Sample MW-7 was not resampled since a field replicate of sample MW-7 designated MW-105 was collected on October 5, 1992 and sent to the laboratory for analysis. Geraghty & Miller instructed the laboratory to cancel the volatile organic compound (VOC) analyses on the volatile sample vials delivered for MW-7. To satisfy the 10 percent frequency required for the evaluation of sampling precision and homogeneity of the sample matrix, an additional sample (MW-9) was collected in duplicate in the field. The field replicate of MW-9 was designated MW-106 for analysis of volatile organics only.

TUT 002 1673

A sample of the water used as the source for field decontamination was collected for analysis on October 7, 1992 and designated "ESSO-TAP." The sample was analyzed for the total suite of analytical parameters.

ANALYSIS

Samples collected during the field investigation were analyzed for the target compound list (TCL) VOCs, 1,2,-dibromoethane (EDB), n-propylbenzene, methyl tert-butyl ether (MTBE), TCL semivolatiles (i.e., base neutral and acid [BNA] extractable compounds), TAL metals, cyanide, and total petroleum hydrocarbons (TPH).

All VOC and BNA analyses were performed in accordance with the USEPA March 1990 CLP organic routine analytical services (RAS) SOW (USEPA 1990a). The SOW was modified during the VOC analysis in order to analyze and quantitate EDB, MTBE, and n-propylbenzene.

For TAL metal and cyanide analyses, the USEPA March 1990 inorganic SOW protocols were used for the quantitation of TAL analytes (USEPA 1990b).

For the analysis of TPH in water samples, preparation and instrumental analysis was performed in accordance with USEPA Method 418.1 in *Methods of Chemical Analysis of Water and Wastes* (USEPA 1983).

DATA VALIDATION

All VOC, BNA, metals, and cyanide data were validated in accordance with the USEPA Region II data validation guidelines for organic and inorganic analyses performed in accordance with CLP RAS protocols. The guidelines for organics and inorganics are provided in the regional Standard Operating Procedures (SOP) No. HW-6, Revision 8, and No. HW-2, Revision 11, respectively (USEPA 1992a; 1992b).

TUT 002 1674

Data validation of TPH data was performed according to criteria specified in USEPA Method 418.1 (USEPA 1983) and in accordance with the following guidelines:

- Method and/or reagent blanks - Reported concentration should be less than the quantitation limit. Blanks, including field blanks, associated with field samples were reviewed for contamination. Sample results were evaluated using a five times (5x) multiplier of the highest concentration associated TPH blank.
- Precision of duplicates - Acceptable precision was demonstrated by calculation of relative percent difference (RPD) with a limit of 20 percent. For calculated RPD between 20 to 40 percent, all associated sample data for the analytical batch was estimated and qualified with a "J" flag.
- Accuracy of matrix spikes - Acceptable accuracy was demonstrated by percent recovery (%R) of MS and MSD in the acceptance window range of 80 to 120 percent. For %R values outside of the 80 to 120 window, but within 50 to 150 %R, associated sample data was qualified as estimated.
- Accuracy of laboratory control spikes - Acceptable %R of blank spikes was within the window of 80 to 120 percent. For %R values outside of the 80 to 120 window, but within 50 to 150 %R, associated sample data in the SDG were qualified as estimated concentrations.

OVERALL ASSESSMENT

Overall, the data submitted by Enseco-East are of good quality and demonstrate acceptable precision, accuracy, and completeness.

Some data generated for the VOC and BNA organic analyses have been negated for blank contamination and estimated for holding time, calibration criteria, surrogate and MS/MSD

recoveries, and for sample disposition issues. The acid-extractable compounds reported as non-detects in samples MW-6D and MW-11D were rejected due to surrogate outliers.

In the data review of TAL inorganics, some data were estimated for the following criteria: holding times and sample preservation, calibration, furnace precision and accuracy outliers, serial dilution, and for greater than a 10 percent difference between sample results for total and dissolved constituents. The following data were determined unusable because of QC outliers:

- The cyanide data for samples MW-6R and MW-8 due to holding time and sample preservation requirements.
- The cyanide data for MW-11D due to the matrix precision and accuracy data (MS/MSD analyses).
- Total aluminum and iron data in sample ESSO-TAP due to field blank contamination.
- Total chromium in samples MW-9, MW-9S, and MW-1 due to field blank contamination.
- Total and dissolved arsenic in sample MW-9S due to a greater than 50 percent difference between the arsenic sample results.

REFERENCES

- U.S. Environmental Protection Agency (USEPA). 1983. Methods of Chemical Analysis of Water and Wastes, EPA-600/4-7-90-020, United States Environmental Protection Agency, Cincinnati, Ohio, March 1983.
- U.S. Environmental Protection Agency (USEPA). 1990a. USEPA Contract Laboratory Program, Statement of Work for Organic Analysis, Multi-Media, Multi-Concentration, SOW No. 3/90 including Rev. 12/90 and 2/91, United States Environmental Protection Agency, March 1990.
- U.S. Environmental Protection Agency (USEPA). 1990b. USEPA Contract Laboratory Program, Statement of Work for Inorganic Analysis, Multi-Media, Multi-Concentration, SOW No. 3/90, United States Environmental Protection Agency, March 1990.
- U.S. Environmental Protection Agency (USEPA). 1992a. Evaluation of Organic Data for the Contract Laboratory Program (CLP), Region II Standard Operating Procedure No. HW-6, Revision No. 8, United States Environmental Protection Agency, January 1992.
- U.S. Environmental Protection Agency (USEPA). 1992b. Evaluation of Metals Data for the Contract Laboratory Program (CLP), Region II Standard Operating Procedure No. HW-2, Revision No. 11, United States Environmental Protection Agency, January 1992.

laburi-wp DV/appx.d

TUT 002 1677

ATTACHMENT J1
ORGANIC DATA VALIDATION REPORT

TU1 002 1678

SOP NO. HW-6
Revision #8

CLP ORGANICS DATA REVIEW
AND PRELIMINARY REVIEW

BY: Leon Lazarus
Leon Lazarus, Environmental Scientist
Toxic and Hazardous Waste Section

Date: January 27

BY: George Karras
George Karras, Chemist
Toxic and Hazardous Waste Section

Date: January 27

BY: Stelios Gerazounis
Stelios Gerazounis, Chemist
Toxic and Hazardous Waste Section

Date: 1/3/92

CONCURRED BY: Kevin W. Kubik
Kevin Kubik, Chief
Toxic and Hazardous Waste Section

Date: 1/3/92

APPROVED BY: Robert Runyon
Robert Runyon, Chief
Monitoring Management Branch

Date: 1/7/92

STANDARD OPERATING PROCEDURE

Date: January 1992
Revision: 8

YES NO N/A

PACKAGE COMPLETENESS AND DELIVERABLES

CASE NUMBER: _____

LAB: Enseco East

SITE: Tutu Service Station Investigation

1.0 Data Completeness and Deliverables

- 1.1 Have any missing deliverables been received and added to the data package? ☒ _____

ACTION: Call lab for explanation/resubmittal of any missing deliverables. If lab cannot provide them, note the effect on review of the package under the "Contract Problems/Non-Compliance" section of reviewer narrative.

- 1.2 Was SMO CCS checklist included with package? ☐ _____ ☒

2.0 Cover Letter SDG Narrative

- 2.1 Is the Narrative or Cover Letter Present? ☒ _____

- 2.2 Are Case Number and/or SAS number contained in the Narrative or Cover letter? ☒ _____

3.0 Data Validation Checklist

The following checklist is divided into three parts. Part A is filled out if the data package contains any VOA analyses, Part B for any BNA analyses and Part C for Pesticide/PCBs.

Does this package contain:

VOA Data? ☒ _____

BNA Data? ☒ _____

Pesticide/PCB data? _____ ☒

Action: Complete corresponding parts of checklist.

STANDARD OPERATING PROCEDURE

Date: January 1992
Revision: 8

YES NO N/A

PART A: VOA ANALYSES

1.0 Traffic Reports and Laboratory Narrative

- 1.1 Are the Traffic Report Forms present for all samples? ☒ ☐ ☐

ACTION: If no, contact lab for replacement of missing or illegible copies.

- 1.2 Do the Traffic Reports or Lab Narrative indicate any problems with sample receipt, condition of samples, analytical problems or special circumstances affecting the quality of the data? ☒ ☐ ☐

ACTION: If any sample analyzed as a soil, other than TCLP, contains 50%-90% water, all data should be flagged as estimated (J). If a soil sample other than TCLP contains more than 90% water, all data should be qualified as unusable (R).

ACTION: If samples were not iced upon receipt at the laboratory, flag all positive results "J" and all Non-Detects "UJ".

ACTION: If both VOA vials for a sample have air bubbles or the VOA vial analyzed had air bubbles, flag all positive results "J" and all non-detects "R".

STANDARD OPERATING PROCEDURE

Date: January 1992

Revision: 8

YES NO N/A

2.0 Holding Times

- 2.1 Have any VOA technical holding times, determined from date of collection to date of analysis, been exceeded?

✓ []

If unpreserved, aqueous samples maintained at 4°C which are to be analyzed for aromatic hydrocarbons must be analyzed within 7 days of collection. If preserved with HCl (pH<2) and stored at 4°C, then aqueous samples must be analyzed within 14 days of collection. If uncertain about preservation, contact sampler to determine whether or not samples were preserved.

The holding time for soils is 10 days.

Table of Holding Time Violations

Refer to Table
DS-2 in the appendix.

Sample ID	Sample Matrix	Preserved?	(See Traffic Report)		
			Date Sampled	Date Lab Received	Date Analyzed
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

ACTION: If technical holding times are exceeded, flag all positive results as estimated ("J") and sample quantitation limits as estimated ("UJ"), and document in the narrative that holding times were exceeded. If analyses were done more than 14 days beyond holding time, either on the first analysis or upon re-analysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. At a minimum, all results must be qualified "J", but the reviewer may determine that non-detect data are unusable (R). If holding times are exceeded by more than 28 days, all non-detect data are unusable (R).

STANDARD OPERATING PROCEDURE

Date: January 1992

Revision: 8

YES NO N/A

3.0 System Monitoring Compound (SMC) Recovery (Form II)

3.1 Are the VOA SMC Recovery Summaries (Form II) present for each of the following matrices:

a. Low Water

☒

—

—

b. Low Soil

☐

—

☒

c. Med Soil

☐

—

☒

3.2 Are all the VOA samples listed on the appropriate System Monitoring Compound Recovery Summary for each of the following matrices:

a. Low Water

☒

—

—

b. Low Soil

☐

—

☒

c. Med Soil

☐

—

☒

ACTION: Call lab for explanation/
resubmittals. If missing
deliverables are unavailable,
document effect in data assessments.

3.3 Were outliers marked correctly with an asterisk?

☒

—

—

ACTION: Circle all outliers in red.

3.4 Was one or more VOA system monitoring compound recovery outside of contract specifications for any sample or method blank?

☒

☐

—

If yes, were samples re-analyzed?

☒

—

—

Were method blanks re-analyzed?

☐

—

☒

STANDARD OPERATING PROCEDURE

Date: January 1992

Revision: 8

YES NO N/A

ACTION: If recoveries are > 10% but 1 or more compounds fail to meet SOW specifications:

1. All positive results are qualified as estimated (J).
2. Flag all non-detects as estimated detection limits ("UJ") where recovery is less than the lower acceptance limit.
3. If SMC recoveries are above allowable levels, do not qualify non-detects.

If any system monitoring compound recovery is <10% :

1. Flag all positive results as estimated ("J").
2. Flag all non-detects as unusable ("R").

Professional judgement should be used to qualify data that only have method blank SMC recoveries out of specification in both original and re-analyses. Check the internal standard areas.

- 3.5 Are there any transcription/calculation errors between raw data and Form II? ☒

ACTION: If large errors exist, call lab for explanation/resubmittal, make any necessary corrections and note errors in the data assessment.

4.0 Matrix Spikes (Form III)

- 4.1 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form (Form III) present? ☒

STANDARD OPERATING PROCEDURE

Date: January 1992
Revision: 8

YES NO N/A

4.2 Were matrix spikes analyzed at the required frequency for each of the following matrices:

a.	Low Water	☒	—	—
b.	Low Soil	☐	—	☒
c.	Med Soil	☐	—	☒

ACTION: If any matrix spike data are missing, take the action specified in 3.2 above.

4.3 How many VOA spike recoveries are outside QC limits?

<u>Water</u>	<u>Soils</u>
<u>3</u> out of 10	<u>NA</u> out of 10

4.4 How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits?

<u>Water</u>	<u>Soils</u>
<u>0</u> out of 5	<u>NA</u> out of 5

ACTION: No action is taken based on MS/MSD data alone. However, using informed professional judgement, the MS/MSD results may be used in conjunction with other QC criteria to determine the need for qualification of the data.

5.0 Blanks (Form IV)

5.1 Is the Method Blank Summary (Form IV) present? ☒ — —

5.2 Frequency of Analysis: for the analysis of VOA TCL compounds, has a reagent/method blank been analyzed for each SDG or every 20 samples of similar matrix (low water, low soil, medium soil), whichever is more frequent? ☒ — —

STANDARD OPERATING PROCEDURE

Date: January 1992
Revision: 8

YES NO N/A

- 5.3 Has a VOA method/instrument blank been analyzed at least once every twelve hours for each concentration level and GC/MS system used? ☒ ☐ ☐

ACTION: If any method blank data are missing, call lab for explanation/ resubmittal. If method blank data are not available, reject (R) all associated positive data. However, using professional judgement, the data reviewer may substitute field blank or trip blank data for missing method blank data.

- 5.4 Chromatography: review the blank raw data - chromatograms (RICs), quant reports or data system printouts and spectra.

Is the chromatographic performance (baseline stability) for each instrument acceptable for VOAs? ☒ ☐ ☐

ACTION: Use professional judgement to determine the effect on the data.

6.0 Contamination

NOTE: "Water blanks", "drill blanks", and distilled water blanks" are validated like any other sample, and are not used to qualify data. Do not confuse them with the other QC blanks discussed below.

- 6.1 Do any method/instrument/reagent blanks have positive results (TCL and/or TIC) for VOAs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample dilution factor and corrected for % moisture when necessary. ☒ ☐ ☐

- 6.2 Do any field/trip/rinse blanks have positive VOA results (TCL and/or TIC)? ☒ ☐ ☐

ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet.)

STANDARD OPERATING PROCEDURE

Date: January 1992
Revision: 8

YES NO N/A

NOTE: All field blank results associated to a particular group of samples (may exceed one per case) must be used to qualify data. Trip blanks are used to qualify only those samples with which they were shipped and are not required for non-aqueous matrices. Blanks may not be qualified because of contamination in another blank. Field Blanks & Trip Blanks must be qualified for system monitoring compound, instrument performance criteria, spectral or calibration QC problems.

ACTION: Follow the directions in the table below to qualify TCL results due to contamination. Use the largest value from all the associated blanks. If any blanks are grossly contaminated, all associated data should be qualified as unusable (R).

	Sample conc > CRQL but < 10x blank value	Sample conc < CRQL & <10x blank value	Sample conc > CRQL & >10x blank value
Methylene Chloride Acetone Toluene 2-Butanone	Flag sample result with a "U";	Report CRQL & qualify "U"	No qualification is needed
	Sample conc > CRQL but < 5x blank	Sample conc < CRQL & is < 5x blank value	Sample conc > CRQL value & > 5x blank value
Other Contam- inants	Flag sample result with a "U"	Report CRQL & qualify "U"	No qualification is needed

NOTE: Analytes qualified "U" for blank contamination are still considered as "hits" when qualifying for calibration criteria.

STANDARD OPERATING PROCEDURE

Date: January 1992

Revision: 8

YES NO N/A

ACTION: For TIC compounds, if the concentration in the sample is less than five times the concentration in the most contaminated associated blank, flag the sample data "R" (unusable).

- 6.3 Are there field/rinse/equipment blanks associated with every sample?

☐ ☒ ☐

ACTION: For low level samples, note in data assessment that there is no associated field/rinse/equipment blank. Exception: samples taken from a drinking water tap do not have associated field blanks.

7.0 GC/MS Instrument Performance Check (Form V)

- 7.1 Are the GC/MS Instrument Performance Check Forms (Form V) present for Bromofluorobenzene (BFB)?

☒ ☐ ☐

- 7.2 Are the enhanced bar graph spectrum and mass/charge (m/z) listing for the BFB provided for each twelve hour shift?

☒ ☐ ☐

- 7.3 Has an instrument performance compound been analyzed for every twelve hours of sample analysis per instrument?

☒ ☐ ☐

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Date: January 1992

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YES NO N/A

ACTION: List date, time, instrument ID, and sample analysis for which no associated GC/MS tuning data are available.

DATE	TIME	INSTRUMENT	SAMPLE NUMBERS
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

ACTION: If lab cannot provide missing data, reject ("R") all data generated outside an acceptable twelve hour calibration interval.

- 7.4 Have the ion abundances been normalized to m/z 95? ☒ _____

ACTION: If mass assignment is in error, qualify all associated data as unusable (R).

- 7.5 Have the ion abundance criteria been met for each instrument used? ☒ _____

ACTION: List all data which do not meet ion abundance criteria (attach a separate sheet).

ACTION: If ion abundance criteria are not met, the Region II TPO must be notified.

- 7.6 Are there any transcription/calculation errors between mass lists and Form Vs? (Check at least two values but if errors are found, check more.) ☒ _____

STANDARD OPERATING PROCEDURE

Date: January 1992
Revision: 8

	YES	NO	N/A
7.7 Have the appropriate number of significant figures (two) been reported?	☐	☒	☐
ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and document effect in data assessments.			
7.8 Are the spectra of the mass calibration compound acceptable?	☒	☐	☐
ACTION: Use professional judgement to determine whether associated data should be accepted, qualified, or rejected.			
8.0 <u>Target Compound List (TCL) Analytes</u>			
8.1 Are the Organic Analysis Data Sheets (Form I VOA) present with required header information on each page, for each of the following:			
a. Samples and/or fractions as appropriate	☒	☐	☐
b. Matrix spikes and matrix spike duplicates	☒	☐	☐
c. Blanks	☒	☐	☐
8.2 Are the VOA Reconstructed Ion Chromatograms, the mass spectra for the identified compounds, and the data system printouts (Quant Reports) included in the sample package for each of the following?			
a. Samples and/or fractions as appropriate	☒	☐	☐
b. Matrix spikes and matrix spike duplicates (Mass spectra not required)	☒	☐	☐
c. Blanks	☒	☐	☐
ACTION: If any data are missing, take action specified in 3.2 above.			

STANDARD OPERATING PROCEDURE

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	YES	NO	N/A
8.3 Are the response factors shown in the Quant Report?	☐	☒	☐
8.4 Is chromatographic performance acceptable with respect to:			
Baseline stability?	☒	☐	☐
Resolution?	☒	☐	☐
Peak shape?	☒	☐	☐
Full-scale graph (attenuation)?	☒	☐	☐
Other: _____	☐	☐	☒
ACTION: Use professional judgement to determine the acceptability of the data.			
8.5 Are the lab-generated standard mass spectra of the identified VOA compounds present for each sample?	☒	☐	☐
ACTION: If any mass spectra are missing, take action specified in 3.2 above. If lab does not generate their own standard spectra, make note in "Contract Problems/Non-compliance".			
8.6 Is the RRT of each reported compound within 0.06 RRT units of the standard RRT in the continuing calibration?	☐	☒	☐
8.7 Are all ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the sample mass spectrum?	☒	☐	☐

STANDARD OPERATING PROCEDURE

Date: January 1992
Revision: 8

YES NO N/A

- 8.8 Do sample and standard relative ion intensities agree within 20%? ☒ ☐ ☐

ACTION: Use professional judgement to determine acceptability of data. If it is determined that incorrect identifications were made, all such data should be rejected (R), flagged "N" (presumptive evidence of the presence of the compound) or changed to not detected (U) at the calculated detection limit. In order to be positively identified, the data must comply with the criteria listed in 8.6, 8.7, and 8.8.

ACTION: When sample carry-over is a possibility, professional judgement should be used to determine if instrument cross-contamination has affected any positive compound identification.

9.0 Tentatively Identified Compounds (TIC)

- 9.1 Are all Tentatively Identified Compound Forms (Form I Part B) present; and do listed TICs include scan number or retention time, estimated concentration and "JN" qualifier? ☐ ☒ ☐
- 9.2 Are the mass spectra for the tentatively identified compounds and associated "best match" spectra included in the sample package for each of the following:
- a. Samples and/or fractions as appropriate ☒ ☐ ☐
- b. Blanks ☒ ☐ ☐

ACTION: If any TIC data are missing, take action specified in 3.2 above.

ACTION: Add "JN" qualifier if missing.

STANDARD OPERATING PROCEDURE

Date: January 1992
Revision: 8

YES NO N/A

- 9.3 Are any TCL compounds (from any fraction) listed as TIC compounds (example: 1,2-dimethylbenzene is xylene- a VOA TCL analyte - and should not be reported as a TIC)? YES ☒ NO ☐ N/A ☐

ACTION: Flag with "R" any TCL compound listed as a TIC.

- 9.4 Are all ions present in the reference mass spectrum with a relative intensity greater than 10% also present in the sample mass spectrum? YES ☒ NO ☐ N/A ☐

- 9.5 Do TIC and "best match" standard relative ion intensities agree within 20%? YES ☒ NO ☐ N/A ☐

ACTION: Use professional judgement to determine acceptability of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some less specific identification (example: "C3 substituted benzene") as appropriate.

Also, when a compound is not found in any blank, but is detected in a sample and is a suspected artifact of a common laboratory contaminant, the result should be qualified as unusable (R). (i.e. Common Lab Contaminants: CO₂ (M/E 44), Siloxanes (M/E 73) Hexane, Aldol Condensation Products, Solvent Preservatives, and related by products - see Functional Guidelines for more guidance).

STANDARD OPERATING PROCEDURE

Date: January 1992

Revision: 8

YES NO N/A

10.0 Compound Quantitation and Reported Detection Limits

10.1 Are there any transcription/calculation errors in Form I results? Check at least two positive values. Verify that the correct internal standard, quantitation ion, and RRF were used to calculate Form I result. Were any errors found? ☒ ☐ ☐

10.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, sample moisture? ☒ ☐ ☐

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and note errors under "Conclusions".

ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" and its associated value on the original Form I and substituting the data from the analysis of the diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.

11.0 Standards Data (GC/MS)

11.1 Are the Reconstructed Ion Chromatograms, and data system printouts (Quant. Reports) present for initial and continuing calibration? ☒ ☐ ☐

ACTION: If any calibration standard data are missing, take action specified in 3.2 above.

STANDARD OPERATING PROCEDURE

Date: January 1992

Revision: 8

YES NO N/A

12.0 GC/MS Initial Calibration (Form VI)

- 12.1 Are the Initial Calibration Forms (Form VI) present and complete for the volatile fraction at concentrations of 10, 20, 50, 100, 200 ug/l? Are there separate calibrations for low water/med soils and low soil samples? ☒ ☐ ☐

ACTION: If any calibration standard forms are missing, take action specified in 3.2 above.

- 12.2 Were all low level soil standards, blanks and samples analyzed by heated purge? ☐ ☐ ☒

ACTION: If low level soil samples were not heated during purge, qualify positive hits "J" and non-detects "R".

- 12.3 Are response factors stable for VOA's over the concentration range of the calibration (%Relative Standard Deviation (%RSD) <30.0%)? ☐ ☒ ☐

ACTION: Circle all outliers in red.

NOTE: Although 11 VOA compounds have a minimum RRF and no maximum %RSD, the technical criteria are the same for all analytes.

ACTION: If %RSD > 30.0%, qualify associated positive results for that analyte "J" and non-detects using professional judgement. When RSD > 90%, flag all non-detects for that analyte R (unusable).

NOTE: Analytes previously qualified "U" for blank contamination are still considered as "hits" when qualifying for initial calibration criteria.

- 12.4 Are the RRFs above 0.05? ☒ ☐ ☐

Action: Circle all outliers in red.

Action: If any RRF are < 0.05, qualify associated non-detects (R) and flag associated positive data as estimated (J).

STANDARD OPERATING PROCEDURE

Date: January 1992
Revision: 8

YES NO N/A

- 12.5 Are there any transcription/calculation errors in the reporting of average response factors (RRF) or %RSD? (Check at least 2 values, but if errors are found, check more.)

YES ☒ NO ☐ N/A ☐

13.0 GC/MS Continuing Calibration (Form VII)

- 13.1 Are the Continuing Calibration Forms (Form VII) present and complete for the volatile fraction?

YES ☒ NO ☐ N/A ☐

- 13.2 Has a continuing calibration standard been analyzed for every twelve hours of sample analysis per instrument?

YES ☒ NO ☐ N/A ☐

ACTION: List below all sample analyses that were not within twelve hours of the previous continuing calibration analysis.

ACTION: If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation/resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R").

- 13.3 Do any volatile compounds have a % Difference (% D) between the initial and continuing RRF which exceeds the $\pm 25\%$ criteria?

YES ☒ NO ☐ N/A ☐

ACTION: Circle all outliers in red.

ACTION: Qualify both positive results and non-detects for the outlier compound(s) as estimated. When % D is above 90%, reject all non-detects for that analyte (R) unusable.

STANDARD OPERATING PROCEDURE

Date: January 1992
Revision: 8

YES NO N/A

13.4 Do any volatile compounds have a RRF <0.05? ☐ ☒ ☐

ACTION: Circle all outliers in red.

ACTION: If the RRF <0.05, qualify associated non-detects as unusable (R) and "J" associated positive values.

13.5 Are there any transcription/calculation errors in the reporting of average response factors (RRF) or %difference (%D) between initial and continuing RRFs? (Check at least two values but if errors are found, check more.) ☐ ☒ ☐

ACTION: Circle errors in red.

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and note errors under "Conclusions".

14.0 Internal Standard (Form VIII)

14.1 Are the internal standard areas (Form VIII) of every sample and blank within the upper and lower limits (-50% to + 100%) for each continuing calibration? ☒ ☐ ☐

ACTION: List all the outliers below.

Sample #	Internal Std	Area	Lower Limit	Upper Limit
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

(Attach additional sheets if necessary.)

STANDARD OPERATING PROCEDURE

Date: January 1992

Revision: 8

YES NO N/A

- ACTION:**
1. If the internal standard area count is outside the upper or lower limit, flag with "J" all positive results quantitated with this internal standard.
 2. Non-detects associated with IS area counts > 100% should not be qualified.
 3. If IS area is below the lower limit (< 50%), qualify all associated non-detects (U values) "J". If extremely low area counts are reported, (< 25%) or if performance exhibits a major abrupt drop off, flag all associated non-detects as unusable ("R").

14.2 Are the retention times of the internal standards within 30 seconds of the associated calibration standard?



— —

ACTION: Professional judgement should be used to qualify data if the retention times differ by more than 30 seconds.

15.0 Field Duplicates

15.1 Were any field duplicates submitted for VOA analysis?



— —

ACTION: Compare the reported results for field duplicates and calculate the relative percent difference.

ACTION: Any gross variation between duplicate results must be addressed in the reviewer narrative. However, if large differences exist, identification of field duplicates should be confirmed by contacting the sampler.

YES NO N/A

PART B: BNA ANALYSES1.0 Traffic Reports and Laboratory Narrative

- 1.1 Are the Traffic Report Forms present for all samples?
- ☒
- 1
- 1
- 1

ACTION: If no, contact lab for replacement of missing or illegible copies.

- 1.2 Do the Traffic Reports or Lab Narrative indicate any problems with sample receipt, condition of samples, analytical problems or special notations affecting the quality of the data?
- ☒
- 1
- 1
- 1

ACTION: If any sample analyzed as a soil, other than TCLP, contains 50%-90% water, all data should be flagged as estimated ("J"). If a soil sample, other than TCLP, contains more than 90% water, all data should be qualified as unusable (R).

ACTION: If samples were not iced upon receipt at the laboratory, flag all positive results "J" and all non-detects "UJ".

2.0 Holding Times

- 2.1 Have any BNA technical holding times, determined from date of collection to date of extraction, been exceeded?
- ☒
- 1
- 1
- 1

Continuous extraction of water samples for BNA analysis must be started within seven days of the date of collection. Soil/sediment samples must be extracted within 7 days of collection. Extracts must be analyzed within 40 days of the date of extraction.

YES NO N/A

Table of Holding Time Violations Refer to Table DB-
In the appendix.

Sample	Sample Matrix	Date Sampled	(See Traffic Report)		Date Analyzed
			Date Lab Received	Date Extracted	
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

ACTION: If technical holding times are exceeded, flag all positive results as estimated ("J") and sample quantitation limits as estimated ("UJ"), and document in the narrative that holding times were exceeded.

If analyses were done more than 14 days beyond holding time, either on the first analysis or upon reanalysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. At a minimum, all results should be qualified "J", but the reviewer may determine that non-detect data are unusable ("R"). If holding times are exceeded by more than 28 days, all non detect data are unusable (R).

3.0 Surrogate Recovery (Form II)

3.1 Are the BNA Surrogate Recovery Summaries (Form II) present for each of the following matrices:

- a. Low Water
- b. Low Soil
- c. Med Soil

☒ _____
☐ _____ ☒
☐ _____ ☒

YES NO N/A

3.2 Are all the BNA samples listed on the appropriate Surrogate Recovery Summaries for each of the following matrices:

a. Low Water

☒ ☐ ☐

b. Low Soil

☐ ☐ ☒

c. Low Soil

☐ ☐ ☒

ACTION: Call lab for explanation/resubmittals.
If missing deliverables are unavailable,
document effect in data assessments.

3.3 Were outliers marked correctly with an asterisk?

☒ ☐ ☐

ACTION: Circle all outliers in red.

3.4 Were two or more base-neutral OR acid surrogate recoveries out of specification for any sample or method blank?

☒ ☐ ☐

If yes, were samples reanalyzed?

☒ ☐ ☐

Were method blanks reanalyzed?

☐ ☐ ☒

ACTION: If all BNA surrogate recoveries are > 10% but two within the base-neutral or acid fraction do not meet SOW specifications, for the affected fraction only (i.e. base-neutral or acid compounds):

1. Flag all positive results as estimated ("J").
2. Flag all non-detects as estimated detection limits ("UJ") when recoveries are less than the lower acceptance limit.
3. If recoveries are greater than the upper acceptance limit, do not qualify non-detects.

YES NO N/A

If any base-neutral or acid surrogate has a recovery of <10%:

1. Positive results for the fraction with <10% surrogate recovery are qualified with "J".
2. Non-detects for that fraction should be qualified as unusable (R) .

Professional judgement should be used to qualify data that have method blank surrogate recoveries out of specification in both original and reanalyses. Check the internal standard areas.

- 3.5 Are there any transcription/calculation errors between raw data and Form II? ☒

ACTION: If large errors exist, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments.

4.0 Matrix Spikes (Form III)

- 4.1 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form (Form III) present? ☒
- 4.2 Were matrix spikes analyzed at the required frequency for each of the following matrices:
- a. Low Water ☒
 - b. Low Soil ☐
 - c. Med Soil ☐

ACTION: If any matrix spike data are missing, take the action specified in 3.2 above.

YES NO N/A

- 4.3 How many BNA spike recoveries are outside QC limits?

Water

Soils

12 out of 22

NA out of 22

- 4.4 How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits?

Water

Soils

0 out of 11

NA out of 11

ACTION: No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer may use the matrix spike and matrix spike duplicate results in conjunction with other QC criteria and determine the need for some qualification of the data.

5.0 Blanks (Form IV)

- 5.1 Is the Method Blank Summary (Form IV) present? ☒ — —

- 5.2 Frequency of Analysis:

Has a reagent/method blank analysis been reported per 20 samples of similar matrix, or concentration level, and for each extraction batch? ☒ — —

- 5.3 Has a BNA method blank been analyzed for each GC/MS system used?
(See SOW p. D - 59/SV, Section 8.7) ☒ — —

ACTION: If any method blank data are missing, call lab for explanation/resubmittal. If not available, use professional judgement to determine if the associated sample data should be qualified.

YES NO N/A

- 5.4 Chromatography: review the blank raw data - chromatograms (RICs), quant reports or data system printouts and spectra.

Is the chromatographic performance (baseline stability) for each instrument acceptable for BNAs?

☒ 1 1 -

ACTION: Use professional judgement to determine the effect on the data.

6.0 Contamination

Note: "Water blanks", "drill blanks" and "distilled water blanks" are validated like any other sample and are not used to qualify the data. Do not confuse them with the other QC blanks discussed below.

- 6.1 Do any method/instrument/reagent blanks have positive results (TCL and/or TIC) for BNAs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample dilution factor and corrected for % moisture where necessary.

☒ 1 1 -

- 6.2 Do any field/rinse/ blanks have positive BNA results (TCL and/or TIC)?

☒ 1 1 -

ACTION: Prepare a list of the samples associated with each of the contaminated blanks. (Attach a separate sheet.)

Note: All field blank results associated to a particular group of samples (may exceed one per case) must be used to qualify data. Blanks may not be qualified because of contamination in another blank. Field Blanks must be qualified for surrogate, spectral, instrument performance or calibration QC problems.

YES NO N/A

ACTION: Follow the directions in the table below to qualify TCL results due to contamination. Use the largest value from all the associated blanks. If gross contamination exists, all data in the associated samples should be qualified as unusable (R).

Sample conc > CRQL but < 10x blank	Sample conc < CRQL & is < 10x blank value	Sample conc > CRQL value & > 10x blank
Common Phthalate Esters		
Flag sample result with a "U";	Report CRQL & qualify "U"	No qualification is needed
Sample conc > CRQL but < 5x blank	Sample conc < CRQL & is < 5x blank value	Sample conc > CRQL value & > 5 blank value
Other Contaminants		
Flag sample result with a "U";	Report CRQL & qualify "U"	No qualification is needed.

NOTE: Analytes qualified "U" for blank contamination are still considered as "hits" when qualifying for calibration criteria.

ACTION: For TIC compounds, if the concentration in the sample is less than five times the concentration in the most contaminated associated blank, flag the sample data "R" (unusable).

- 6.3 Are there field/rinse/equipment blanks associated with every sample?

11 ☒

ACTION: For low level samples, note in data assessment that there is no associated field/rinse/equipment blank. Exception: samples taken from a drinking water tap do not have associated field blanks.

YES NO N/A

7.0 GC/MS Instrument Performance Check

- 7.1 Are the GC/MS Instrument Performance Check Forms (Form V) present for Decafluorotriphenylphosphine (DFTPP)? ☒ 1
- 7.2 Are the enhanced bar graph spectrum and mass/charge (m/z) listing for the DFTPP provided for each twelve hour shift? ☒ 1
- 7.3 Has an instrument performance check solution been analyzed for every twelve hours of sample analysis per instrument? ☒ 1

ACTION: List date, time, instrument ID, and sample analyses for which no associated GC/MS tuning data are available.

DATE	TIME	INSTRUMENT	SAMPLE NUMBERS
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>

ACTION: If lab cannot provide missing data, reject ("R") all data generated outside an acceptable twelve hour calibration interval.

ACTION: If mass assignment is in error, flag all associated sample data as unusable (R).

- 7.4 Have the ion abundances been normalized to m/z 198? ☒ 1

YES NO N/A

- 7.5 Have the ion abundance criteria been met for each instrument used? ☒ ☐ ☐

ACTION: List all data which do not meet ion abundance criteria (attach a separate sheet).

ACTION: If ion abundance criteria are not met, the Region II TPO must be notified.

- 7.6 Are there any transcription/calculation errors between mass lists and Form Vs? (Check at least two values but if errors are found, check more.) ☐ ☒ ☐
- 7.7 Have the appropriate number of significant figures (two) been reported? ☐ ☒ ☐

ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and document effect in data assessments.

- 7.8 Are the spectra of the mass calibration compound acceptable? ☒ ☐ ☐

ACTION: Use professional judgement to determine whether associated data should be accepted, qualified, or rejected.

8.0 Target Compound List (TCL) Analytes

- 8.1 Are the Organic Analysis Data Sheets (Form I BNA) present with required header information on each page, for each of the following:

- a. Samples and/or fractions as appropriate ☒ ☐ ☐
- b. Matrix spikes and matrix spike duplicates ☒ ☐ ☐
- c. Blanks ☒ ☐ ☐

YES NO N/A

- 8.2 Has GPC cleanup been performed on all soil/
sediment sample extracts?

☐ ☐ ☒

ACTION: If data suggests that GPC was not performed, use professional judgement. Make note in "Contract Problems/Non-Compliance".

- 8.3 Are the BNA Reconstructed Ion Chromatograms, the mass spectra for the identified compounds, and the data system printouts (Quant Reports) included in the sample package for each of the following?

- a. Samples and/or fractions as appropriate
b. Matrix spikes and matrix spike duplicates (Mass spectra not required)
c. Blanks

☒ ☐ ☐
☒ ☐ ☐
☒ ☐ ☐

ACTION: If any data are missing, take action specified in 3.2 above.

- 8.4 Are the response factors shown in the Quant Report?

☐ ☒ ☐

- 8.5 Is chromatographic performance acceptable with respect to:

Baseline stability?

☒ ☐ ☐

Resolution?

☒ ☐ ☐

Peak shape?

☒ ☐ ☐

Full-scale graph (attenuation)?

☒ ☐ ☐

Other: _____

☐ ☐ ☒

ACTION: Use professional judgement to determine the acceptability of the data.

YES NO N/A

- 8.6 Are the lab-generated standard mass spectra of identified BNA compounds present for each sample? ☒ — —

ACTION: If any mass spectra are missing, take action specified in 3.2 above. If lab does not generate their own standard spectra, make note in "Contract Problems/Non-compliance". If spectra are missing, reject all positive data.

- 8.7 Is the RRT of each reported compound within 0.06 RRT units of the standard RRT in the continuing calibration? ☒ — —

- 8.8 Are all ions present in the standard mass spectrum at a relative intensity greater than 10% also present in the sample mass spectrum? ☒ — —

- 8.9 Do sample and standard relative ion intensities agree within 20%? ☒ — —

ACTION: Use professional judgement to determine acceptability of data. If it is determined that incorrect identifications were made, all such data should be rejected (R), flagged "N" (Presumptive evidence of the presence of the compound) or changed to not detected (U) at the calculated detection limit. In order to be positively identified, the data must comply with the criteria listed in 8.7, 8.8, and 8.9.

ACTION: When sample carry-over is a possibility, professional judgement should be used to determine if instrument cross-contamination has affected any positive compound identification.

9.0 Tentatively Identified Compounds (TIC)

- 9.1 Are all Tentatively Identified Compound Forms (Form I, Part B) present; and do listed TICs include scan number or retention time, estimated concentration and "JN" qualifier? ☒ — —

YES NO N/A

- 9.2 Are the mass spectra for the tentatively identified compounds and associated "best match" spectra included in the sample package for each of the following:

- a. Samples and/or fractions as appropriate ☒ ☐ ☐
- b. Blanks ☒ ☐ ☐

ACTION: If any TIC data are missing, take action specified in 3.2 above.

ACTION: Add "JN" qualifier if missing.

- 9.3 Are any TCL compounds (from any fraction) listed as TIC compounds (example: 1,2-dimethylbenzene is xylene a VOA TCL - and should not be reported as a TIC)? ☒ ☐ ☐

ACTION: Flag with "R" any TCL compound listed as a TIC.

- 9.4 Are all ions present in the reference mass spectrum with a relative intensity greater than 10% also present in the sample mass spectrum? ☒ ☐ ☐

- 9.5 Do TIC and "best match" standard relative ion intensities agree within 20%? ☒ ☐ ☐

ACTION: Use professional judgement to determine acceptability of TIC identifications. If it is determined that an incorrect identification was made, change identification to "unknown" or to some less specific identification (example: "C3 substituted benzene") as appropriate. Also, when a compound is not found in any blank, but is a suspected artifact of a common laboratory contaminant, the result should be qualified as unusable (R).

YES NO N/A

10.0 Compound Quantitation and Reported Detection Limits

10.1 Are there any transcription/calculation errors in Form I results? Check at least two positive values. Verify that the correct internal standard, quantitation ion, and RRF were used to calculate Form I result. Were any errors found? ☒ ☐ ☐

10.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, sample moisture? ☒ ☐ ☐

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments.

ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" and it's associated value on the original Form I and substituting the data from the analysis of the diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.

11.0 Standards Data (GC/MS)

11.1 Are the Reconstructed Ion Chromatograms, and data system printouts (Quant, Reports) present for initial and continuing calibration? ☒ ☐ ☐

ACTION: If any calibration standard data are missing, take action specified in 3.2 above.

YES NO N/A

12.0 GC/MS Initial Calibration (Form VI)

12.1 Are the Initial Calibration Forms (Form VI)
present and complete for the BNA fraction? ☒ 1

ACTION: If any calibration standard forms
are missing, take action specified
in 3.2. above.

12.2 Are response factors stable for BNAs over
the concentration range of the calibration?
(% Relative standard deviation (%RSD) < 30.0%) ☒ 1

ACTION: Circle all outliers in red.

NOTE: Although 20 BNA compounds have a minimum
RRF and no maximum %RSD, the technical
criteria are the same for all analytes.

ACTION: If the % RSD is > 30.0%, qualify
positive results for that analyte "J"
and non-detects using professional
judgement. When RSD > 90%, flag all non-
detect results for that analyte R (unusable).

NOTE: Analytes previously qualified "U" due to
blank contamination are still considered
as "hits" when qualifying for calibration
criteria.

12.3 Are all BNA compound RRFs > 0.05? ☒ 1

ACTION: Circle all outliers in red.

ACTION: If any RRF < 0.05
1. "R" all non-detects.
2. "J" all positive results.

12.4 Are there any transcription/calculation errors in
the reporting of average response factors (RRF)
or % RSD? (Check at least two values but if errors
are found, check more.) ☒ 1

ACTION: Circle Errors in red.

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Date: January 1992

Revision: 8

YES NO N/A

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and note errors in data assessments.

13.0 GC/MS Continuing Calibration (Form VIII)

13.1 Are the Continuing Calibration Forms (Form VII) present and complete for the BNA fraction?

☒ ☐ ☐

13.2 Has a continuing calibration standard been analyzed for every twelve hours of sample analysis per instrument?

☒ ☐ ☐

ACTION: List below all sample analyses that were not within twelve hours of a continuing calibration analysis for each instrument used.

ACTION: If any forms are missing or no continuing calibration standard has been analyzed within twelve hours of every sample analysis, call lab for explanation/resubmittal. If continuing calibration data are not available, flag all associated sample data as unusable ("R").

13.3 Do any semivolatile compounds have a % Difference (% D) between the initial and continuing RRF which exceeds the + 25.0% criteria?

☒ ☐ ☐

ACTION: Circle all outliers in red.

ACTION: Qualify both positive results and non-detects for the outlier compound(s) as estimated (J). When %D is above 90%, reject all non-detects for that analyte (R) unusable.

YES NO N/A

13.4 Do any semivolatile compounds have a RRF <0.05? ☒

ACTION: Circle all outliers in red.

ACTION: If RRF <0.05, qualify as unusable (R) associated non-detects and "J" associated positive values.

13.5 Are there any transcription/calculation errors in the reporting of average response factors (RRF) or % difference (%D) between initial and continuing RRFs? (Check at least two values but if errors are found, check more). ☒

ACTION: Circle errors in red.

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments.

14.0 Internal Standards (Form VIII)

14.1 Are the internal standard areas (Form VIII) of every sample and blank within the upper and lower limits (-50% to + 100%) for each continuing calibration? ☒

ACTION: List all the outliers below.

Sample #	Internal Std	Area	Lower Limit	Upper Limit
MW-11D MSD	Chrysene-d12	95467	8108	32430
MW-11D MSD	Perylene-d12	35775	8835	35340
_____	_____	_____	_____	_____
_____	_____	_____	_____	_____

(Attach additional sheets if necessary.)

ACTION: 1. If the internal standard area count is outside the upper or lower limit, flag with "J" all positive results and non-detects (U values) quantitated with this internal standard.

YES NO N/A

2. Non-detects associated with IS areas
> 100% should not be qualified.

3. If the IS area is below the lower limit
(<50%), qualify all associated non-detects
(U-values) "J". If extremely low area counts
are reported (<25%) or if performance
exhibits a major abrupt drop off, flag all
associated non-detects as unusable (R).

14.2 Are the retention times of the internal standards
within 30 seconds of the associated calibration
standard? ☒ — —

ACTION: Professional judgement should be
used to qualify data if the
retention times differ by more than
30 seconds.

15.0 Field Duplicates

15.1 Were any field duplicates submitted for BNA
analysis? ☒ — —

ACTION: Compare the reported results for
field duplicates and calculate
the relative percent difference.

ACTION: Any gross variation between field
duplicate results must be addressed
in the reviewer narrative. However,
if large differences exist,
identification of field duplicates
should be confirmed by contacting the
sampler.

YES NO N/A

PART C: PESTICIDE/PCB ANALYSIS

1.0 Traffic Reports and Laboratory Narrative

- 1.1 Are Traffic Report Forms present for all samples? ☐ ☐ ☐

ACTION: If no, contact lab for replacement of missing or illegible copies.

- 1.2 Do the Traffic Reports or SDG Narrative indicate any problems with sample receipt, condition of the samples, analytical problems or special circumstances affecting the quality of the data? ☐ ☐ ☐

ACTION: If any sample analyzed as a soil, other than TCLP, contains 50%-90% water, all data should be qualified as estimated (J). If a soil sample, other than TCLP, contains more than 90% water, all data should be qualified as unusable (R).

ACTION: If samples were not iced upon receipt at the laboratory, flag all positive results "J" and all non-detects "UJ".

2.0 Holding Times

- 2.1 Have any PEST/PCB technical holding times, determined from date of collection to date of extraction, been exceeded? ☐ ☐ ☐

Water and soil samples for PEST/PCB analysis must be extracted within 7 days of the date of collection. Extracts must be analyzed within 40 days of the date extraction.

YES NO N/A

ACTION: If technical holding times are exceeded, flag all positive results as estimated (J) and sample quantitation limits (UJ) and document in the narrative that holding times were exceeded. If analyses were done more than 14 days beyond holding time, either on the first analysis or upon re-analysis, the reviewer must use professional judgement to determine the reliability of the data and the effects of additional storage on the sample results. At a minimum, all the data should at least be qualified "J", but the reviewer may determine that non-detects are unusable (R).

3.0 Surrogate Recovery (Form II)

3.1 Are the PEST/PCB Surrogate Recovery Summaries (Form II) present for each of the following matrices?

a. Low Water	☐	☐	☐
b. Soil	☐	☐	☐

3.2 Are all the PEST/PCB samples listed on the appropriate Surrogate Recovery Summary for each of the following matrices?

a. Low Water	☐	☐	☐
b. Soil	☐	☐	☐

ACTION: Call lab for explanation/resubmittals.
If missing deliverables are unavailable, document effect in data assessments.

3.3 Were outliers marked correctly with an asterisk?

☐	☐	☐

ACTION: Circle all outliers in red.

3.4 Were surrogate recoveries of TCX or DCB outside of the contract specification for any sample or blank? (60-150%)

☐	☐	☐

YES NO N/A

ACTION: No qualification is done if surrogates are diluted out. If recovery for both surrogates is below the contract limit, but above 10%, flag all results for that sample "J". If recovery is < 10% for either surrogate, qualify positive results "J" and flag non-detects "R". If recovery is above the contract advisory limits for both surrogates qualify positive values "J".

- 3.5 Were surrogate retention times (RT) within the windows established during the initial 3-point analysis of Individual Standard Mixture A? ☐ ☐ ☐

ACTION: If the RT limits are not met, the analysis may be qualified unusable (R) for that sample on the basis of professional judgement.

- 3.6 Are there any transcription/calculation errors between raw data and Form II? ☐ ☐ ☐

ACTION: If large errors exist, call lab for explanation/resubmittal. Make any necessary corrections and document effect in data assessments.

4.0 Matrix Spikes (Form III)

- 4.1 Is the Matrix Spike/Matrix Spike Duplicate Recovery Form (Form III) present? ☐ ☐ ☐

- 4.2 Were matrix spikes analyzed at the required frequency for each of the following matrices?
(1 MS/MSD must be performed for every 20 samples of similar matrix or concentration level)

a. Low Water ☐ ☐ ☐

b. Soil ☐ ☐ ☐

ACTION: If any matrix spike data are missing, take the action specified in 3.2 above.

YES NO N/A

- 4.3 How many PEST/PCB spike recoveries are outside QC limits?

WaterSoil

_____ out of 12

_____ out of 12

- 4.4 How many RPD's for matrix spike and matrix spike duplicate recoveries are outside QC limits?

WaterSoil

_____ out of 6

_____ out of 6

ACTION: No action is taken on MS/MSD data alone. However, using informed professional judgement, the data reviewer may use the matrix spike and matrix spike duplicate results in conjunction with other QC criteria and determine the need for some qualification of the data.

5.0 Blanks (Form IV)

- 5.1 Is the Method Blank Summary (Form IV) present? ☐ _____

- 5.2 Frequency of Analysis: For the analysis of Pesticide/PCB TCL compounds, has a reagent/method blank been analyzed for each SDG or every 20 samples of similar matrix or concentration or each extraction batch, whichever is more frequent? ☐ _____

ACTION: If any blank data are missing, take the action specified above in 3.2. If blank data is not available, reject (R) all associated positive data. However, using professional judgement, the data reviewer may substitute field blank data for missing method blank data.

- 5.3 Has a PEST/PCB instrument blank been analyzed at the beginning of every 12 hr. period following the initial calibration sequence? (minimum contract requirement)

YES NO N/A

ACTION: If any blank data are missing, call lab for explanation/resubmittals. If missing deliverables are unavailable, document the effect in data assessments.

- 5.4 Chromatography: review the blank raw data - chromatograms, quant reports or data system printouts.

Is the chromatographic performance (baseline stability) for each instrument acceptable for PEST/PCBs? 1

ACTION: Use professional judgement to determine the effect on the data.

6.0 Contamination

NOTE: "Water blanks", "distilled water blanks" and "drilling water blanks" are validated like any other sample and are not used to qualify the data. Do not confuse them with the other QC blanks discussed below.

- 6.1 Do any method/instrument/reagent/cleanup blanks have positive results for PEST/PCBs? When applied as described below, the contaminant concentration in these blanks are multiplied by the sample Dilution Factor and corrected for % moisture when necessary. 1

- 6.2 Do any field/rinse blanks have positive PEST/PCB results? 1

ACTION: Prepare a list of the samples associated with each of the contaminated blanks.
(Attach a separate sheet)

NOTE: All field blank results associated to a particular group of samples (may exceed one per case or one per day) may be used to qualify data. Blanks may not be qualified because of contamination in another blank. Field blanks must be qualified for surrogate, or calibration QC problems.

YES NO N/A

ACTION: Follow the directions in the table below
to qualify TCL results due to contamination.
Use the largest value from all the associated blanks..

Sample conc > CRQL but < 5x blank	Sample conc < CRQL & is < 5x blank value	Sample conc > CRQL & > 5x blank value
Flag sample result with a "U";	Report CRQL & qualify "U"	No qualification is needed

NOTE: If gross blank contamination exists, all data
in the associated samples should be
qualified as unusable (R).

6.3 Are there field/rinse/equipment blanks associated
with every sample? ☐ ☐ ☐

ACTION: For low level samples, note in data assessment
that there is no associated field/rinse/equipment blank.
Exception: samples taken from a drinking water tap
do not have associated field blanks.

7.0 Calibration and GC Performance

7.1 Are the following Gas Chromatograms and Data
Systems Printouts for both columns present
for all samples, blanks, MS/MSD?

a. peak resolution check	☐	☐	☐
b. performance evaluation mixtures	☐	☐	☐
c. aroclor 1016/1260	☐	☐	☐
d. aroclors 1221, 1232, 1242, 1248, 1254	☐	☐	☐
e. toxaphene	☐	☐	☐
f. low points individual mixtures A & B	☐	☐	☐
g. med points individual mixtures A & B	☐	☐	☐
h. high points individual mixtures A & B	☐	☐	☐

YES NO N/A

i. instrument blanks

☐ ☐ ☐

ACTION: If no, take action specified in 3.2 above.

- 7.2 Are Forms VI - PEST 1-4 present and complete for each column and each analytical sequence? ☐ ☐ ☐

ACTION: If no, take action specified in 3.2 above.

- 7.3 Are there any transcription/calculation errors between raw data and Forms VI? ☐ ☐ ☐

ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and document effect in data assessments.

- 7.4 Do all standard retention times, including each pesticide in each level of Individual Mixtures A & B, fall within the windows established during the initial calibration analytical sequence? (For Initial Calibration Standards, Form VI - PEST - 1). ☐ ☐ ☐

ACTION: If no, all samples in the entire analytical sequence are potentially affected. Check to see if the chromatograms contain peaks within an expanded window surrounding the expected retention times. If no peaks are found and the surrogates are visible, non-detects are valid. If peaks are present and cannot be identified through pattern recognition or using a revised RT window, qualify all positive results and non-detects as unusable (R).
For aroclors, RT may be outside the RT window, but the aroclor may still be identified from the individual pattern.

- 7.5 Are the linearity criteria for the initial analyses of Individual Standards A & B within limits for both columns? (% RSD must be < 20.0% for all analytes except for the 2 surrogates, which must not exceed 30.0 % RSD). See Form VI PEST - 2. ☐ ☐ ☐

YES NO N/A

ACTION: If no, qualify all associated positive results generated during the entire analytical sequence "J" and all non-detects "UJ". When RSD >90%, flag all non-detect results for that analyte R (unusable).

- 7.6 Is the resolution between any two adjacent peaks in the Resolution Check Mixture > 60.0% for both columns? (Form VI-PEST - 4) ☐ ☐ ☐

ACTION: If no, positive results for compounds that were not adequately resolved should be qualified "J". Use professional judgement to determine if non-detects which elute in areas affected by co-eluting peaks should be qualified "N" as presumptive evidence of presence or unusable (R).

- 7.7 Is Form VII - Pest-1 present and complete for each Performance Evaluation Mixture analyzed during the analytical sequence for both columns? ☐ ☐ ☐

ACTION: If no, take action as specified in 3.2 above.

- 7.8 Has the individual % breakdown exceeded 20.0% on either column. ☐ ☐ ☐

- for 4,4' - DDT? ☐ ☐ ☐

- for endrin? ☐ ☐ ☐

Has the combined % breakdown for 4,4'- DDT/ Endrin exceeded 30.0% on either column? (required in all instances) ☐ ☐ ☐

ACTION: 1. If any % breakdown has failed the QC criteria in either PEM in steps 2 and 17 in the initial calibration sequence (p. D-38/Pest SOW 3/90), qualify all sample analyses in the entire analytical sequence as described below.

YES NO N/A

2. If any $\frac{1}{2}$ breakdown has failed the QC criteria in a PEM Verification calibration, review data beginning with the samples which followed the last in-control standard until the next acceptable PEM $\frac{1}{2}$ and qualify the data as described below.
 - a. 4,4'-DDT Breakdown: If 4,4'-DDT breakdown is greater than 20.0%:
 - i. Qualify all positive results for DDT with "J". If DDT was not detected, but DDD and DDE are positive, then qualify the quantitation limit for DDT as unusable (R).
 - ii. Qualify positive results for DDD and/or DDE as presumptively present at an approximated quantity (NJ).
 - b. Endrin Breakdown: If endrin breakdown is greater than 20.0%:
 - i. Qualify all positive results for endrin with "J". If endrin was not detected, but endrin aldehyde and endrin ketone are positive, then qualify the quantitation limit for endrin as unusable (R).
 - ii. Qualify positive results for endrin ketone and endrin aldehyde as presumptively present at an approximated quantity (NJ).
 - c. Combined Breakdown: If the combined 4,4'-DDT and endrin breakdown is greater than 30.0%:
 - i. Qualify all positive results for DDT and endrin with "J". If endrin was not detected, but endrin aldehyde and endrin ketone are positive, then qualify the quantitation limit for endrin as unusable (R). If DDT was not detected, but DDD and DDE are positive, then qualify the quantitation limit for DDT as unusable (R).

YES NO N/A

- ii. Qualify positive results for endrin ketone and endrin aldehyde as presumptively present at an approximated quantity (NJ). Qualify positive results for DDD and/or DDE as presumptively present at an approximated quantity (NJ).

7.9 Are the relative percent difference (RPD) values for all PEM analytes <25.0%? (Form VII-PEST-1) ☒ ☐ ☐

ACTION: If no, qualify all associated positive results generated during the analytical sequence "J" and sample quantitation limits "UJ".

NOTE: If the failing PEM is part of the initial calibration, all samples are potentially affected. If the offending standard is a verification calibration, the associated samples are those which followed the last in-control standard until the next passing standard.

7.10 Have all samples been injected within a 12 hr. period beginning with the injection of an Instrument Blank? ☒ ☐ ☐

ACTION: If no, use professional judgement to determine the severity of the effect on the data and qualify accordingly.

7.11 Is Form VII - Pest-2 present and complete for each INDA and INDB Verification Calibration analyzed? ☒ ☐ ☐

ACTION: If no, take action specified in 3.2 above.

7.12 Are there any transcription/calculation errors between raw data and Form VII - Pest-2? ☐ ☒ ☐

ACTION: If large errors exists, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments. under "Conclusions".

YES NO N/A

- 7.13 Do all standard retention times for each INDA and INDB Verification Calibration fall within the windows established by the initial calibration sequence? ☐ ☐ ☐

ACTION: If no, beginning with the samples which followed the last in-control standard, check to see if the chromatograms contain peaks within an expanded window surrounding the expected retention times. If no peaks are found and the surrogates are visible, non-detects are valid. If peaks are present and cannot be identified through pattern recognition or using a revised RT window, qualify all positive results and non-detects as unusable (R).

- 7.14 Are RPD values for all verification calibration standard compounds < 25.0%? ☐ ☐ ☐

ACTION: If the RPD is >25.0% for the compound being quantitated, qualify all associated positive results "J" and non-detects "UJ". The "associated samples" are those which followed the last in-control standard up to the next passing standard containing the analyte which failed the criteria. If the RPD is >90%, flag all non-detects for that analyte R (unusable).

8.0 Analytical Sequence Check (Form VIII-PEST)

- 8.1 Is Form VIII present and complete for each column and each period of analyses? ☐ ☐ ☐

ACTION: If no, take action specified in 3.2 above.

- 8.2 Was the proper analytical sequence followed for each initial calibration and subsequent analyses? (see CLP SOW p. D-39 & D-41/PEST) ☐ ☐ ☐

ACTION: If no, use professional judgement to determine the severity of the effect on the data and qualify it accordingly. Generally, the effect is negligible unless the sequence was grossly altered or the calibration was also out of limits.

YES NO N/A

9.0 Cleanup Efficiency Verification (Form IX)

- 9.1 Is Form IX - Pest-1 present and complete for each lot of Florisil Cartridges used? (Florisil Cleanup is required for all Pest/PCB extracts.) ☐ ☐ ☐

ACTION: If no, take action specified in 3.2 above. If data suggests that florisil cleanup was not performed, make note in "Contract Problems/Non-Compliance".

- 9.2 Are all samples listed on the Pesticide Florisil Cartridge Check Form? ☐ ☐ ☐

ACTION: If no, take action specified in 3.2 above.

- 9.3 If GPC Cleanup was performed, (mandatory for all soil sample extracts) is Form IX - Pest-2 present? ☐ ☐ ☐

ACTION: If no, take action specified in 3.2 above.

ACTION: If GPC was not performed when required, make note in "Contract Problems/Non-Compliance" section of data assessment.

- 9.4 Are percent recoveries (% R) of the pesticide and surrogate compounds used to check the efficiency of the cleanup procedures within QC limits:
80-120% for florisil cartridge check? ☐ ☐ ☐

80-110% for GPC calibration? ☐ ☐ ☐

Qualify only the analyte(s) which fail the recovery criteria as follows:

ACTION: If % R are < 80%, qualify positive results "J" and quantitation limits "UJ". Non-detects should be qualified "R" if zero %R was obtained for pesticide compounds. Use professional judgement to qualify positive results if recoveries are greater than the upper limit.

YES NO N/A

NOTE: Sample data should be evaluated for potential interferences if recovery of 2,4,5-trichlorophenol was > 5% in the Florisil Cartridge Performance Check analysis. Make note in Contract Problems/Non-Compliance section of reviewer narrative.

NOTE: The raw data of the GPC Calibration Check analysis is evaluated for pattern similarity with previously run Aroclor standards.

10.0 Pesticide/PCB Identification

- 10.1 Is Form X complete for every sample in which a pesticide or PCB was detected? ☐ ☐ ☐

ACTION: If no, take action specified in 3.2 above.

- 10.2 Are there any transcription/calculation errors between raw data and Forms 6E, 6G, 7E, 7D, 8D, 9A, B, 10A. ☐ ☐ ☐

ACTION: If large errors exist, call lab for explanation/resubmittal, make necessary corrections and note error under "Conclusions".

- 10.3 Are retention times (RT) of sample compounds within the established RT windows for both analyses? ☐ ☐ ☐

Was GC/MS confirmation provided when required (when compound concentration is > 10 ug/ml in final extract)? ☐ ☐ ☐

Action: Use professional judgement to qualify positive results which were not confirmed by GC/MS. Qualify as unusable (R) all positive results which were not confirmed by second GC column analysis. Also qualify as unusable (R) all positive results not meeting RT window unless associated standard compounds are similarly biased. (see Functional Guidelines) The reviewer should use professional judgement to assign an appropriate quantitation limit.

YES NO N/A

- 10.4 Is the percent difference (% D) calculated for the positive sample results on the two GC columns < 25.0%? 1

ACTION: If the reviewer finds neither column shows interference for the positive hits, the data should be flagged as follows:

<u>% Difference</u>	<u>Qualifier</u>
25-50 %	J
50-90 %	JN
> 90 %	R

NOTE: The lower of the two values is reported on Form I. If using professional judgement, the reviewer determines that the higher result was more acceptable, the reviewer should replace the value and indicate the reason for the change in the data assessment.

- 10.5 Check chromatograms for false negatives, especially the multiple peak compounds toxaphene and PCBs. Were there any false negatives? 1

ACTION: Use professional judgement to decide if the compound should be reported. If the appropriate PCB standards were not analyzed, qualify the data unusable (R).

11.0 Compound Quantitation and Reported Detection Limits

- 11.1 Are there any transcription/calculation errors in Form I results? Check at least two positive values. Were any errors found? 1

NOTE: Single-peak pesticide results can be checked for rough agreement between quantitative results obtained on the two GC columns. The reviewer should use professional judgement to decide whether a much larger concentration obtained on one column versus the other indicates the presence of an interfering compound. If an interfering compound is indicated, the lower of the two values should be reported and qualified as presumptively present at an approximated quantity (NJ). This necessitates a determination of an estimated concentration on the confirmation column. The narrative should indicate that the presence of interferences has interfered with the evaluation of the second column confirmation.

YES NO N/A

11.2 Are the CRQLs adjusted to reflect sample dilutions and, for soils, % moisture? ☒ ☐ ☐

ACTION: If errors are large, call lab for explanation/resubmittal, make any necessary corrections and document effect in data assessments.

ACTION: When a sample is analyzed at more than one dilution, the lowest CRQLs are used (unless a QC exceedance dictates the use of the higher CRQL data from the diluted sample analysis). Replace concentrations that exceed the calibration range in the original analysis by crossing out the "E" value on the original Form I and substituting it with data from the analysis of diluted sample. Specify which Form I is to be used, then draw a red "X" across the entire page of all Form I's that should not be used, including any in the summary package.

ACTION: Quantitation limits affected by large, off-scale peaks should be qualified as unusable (R). If the interference is on-scale, the reviewer can provide an approximated quantitation limit (UJ) for each affected compound.

12.0 Chromatogram Quality

12.1 Were baselines stable? ☒ ☐ ☐

12.2 Were any electropositive displacement (negative peaks) or unusual peaks seen? ☐ ☒ ☐

ACTION: Address comments under System Performance of data assessment.

YES NO N/A

13.0 Field Duplicates

13.1 Were any field duplicates submitted for PEST/PCB analysis?

 1

ACTION: Compare the reported results for field duplicates and calculate the relative percent difference.

ACTION: Any gross variation between field duplicate results must be addressed in the reviewer narrative. However, if large differences exist, identification of field duplicates should be confirmed by contacting the sampler.

TOTAL REVIEW

CLP DATA ASSESSMENT

Functional Guidelines for Evaluating Organics Analysis

Case No. - SDG No. 24744.24950. 24997. 25009. 25052. 25071. 25091

LABORATORY Enseco - East SITE Tutu Service Station Investigation

DATA ASSESSMENT:

The current functional guidelines (USEPA February 1988) for evaluating organic data have been applied.

All data are valid and acceptable except those analytes which have been qualified with a "J" (estimated), "U" (undetected), "R" (unusable), or "JN" (presumptive evidence for the presence of the material at an estimated value). All action is detailed on the attached sheets.

Two facts should be noted by all data users. First, the "R" flag means that the associated value is unusable and rejected. In other words, due to significant QC problems the analysis is invalid and provides no information as to whether the compound is present or not. "R" values should not appear on data tables because they cannot be relied upon, even as a last resort. The second fact to keep in mind is that no compound concentration, even if it has passed all QC tests, is guaranteed to be accurate. Strict QC serves to increase confidence in data but any value potentially contains some error.

Reviewer's
Signature:

Lidya Gulizia / U.P

Date: 5/21/1993

Verified by:

Thomas V. Davahy

Date: 5/21/1993

001 002 1753

1. HOLDING TIME:

The amount of an analyte in a sample can change with time due to chemical instability, degradation, volatilization, etc. If the specified holding time is exceeded, the data may not be valid. Those analytes detected in the samples whose holding time has been exceeded are qualified as estimated (J). The non-detects (sample quantitation limits) are qualified as estimated (J), unless the holding times are grossly exceeded (over one week beyond maximum holding time), in which case the associated data are unusable and rejected (R).

The following action was taken in the samples and analytes shown due to excessive holding time:

Volatile Organic Compounds

All of the samples including the associated trip blanks and field blanks for SDGs # 24997, 25009, and 25052 were reanalyzed because the continuing calibration criteria for bromoform was not met in the initial analysis. All of the samples were reanalyzed beyond the holding time due to the calibration deficiency. The reanalysis sample results were qualified as estimated based on holding time exceedances. Since the reanalysis results (estimated for holding time) were similar to the results calculated from the initial analyses (estimated due to calibration), the initial analyses of all the samples and blanks were used when reporting the data. No further discussion of the reanalysis results will be given unless reanalysis was required for other reasons than those stated above.

The volatile analysis vials for MW-13D were not preserved with hydrochloric acid (HCl) and the sample was analyzed two days out of the prescribed holding time (seven days) for aromatic volatile organic compound (VOC) analyses. All aromatic compounds for this sample were qualified as estimated (J) if detected and estimated at the quantitation limit (UJ) if not detected.

The dilution analyses for unpreserved VOC sample MW-9, MW-9 FR (MW-106), and MW-9S were analyzed outside of the seven-day holding time for aromatic VOC analyses. As the dilutions were for quantitation of MTBE only and not for any aromatic VOC, no qualifications to the data were made.

Semivolatile Organic Compounds

The reextraction of sample MW-6D was performed 12 days beyond the holding time of seven days (calculated from time of sample collection) for base neutral and acid (BNA) extractable compounds. All positive results for this sample were qualified as estimated (J) and all non-detects for this sample were qualified as estimated at the quantitation limit (UJ). All other extractions and instrumental analyses were performed within the prescribed holding times.

A summary of holding time outliers is provided in Table J3-2.

100 002 1733

2. BLANK CONTAMINATION

Quality assurance (QA) blanks, i.e., method, trip, field, rinse and water blanks are prepared to identify any contamination which may have been introduced into the samples during sample preparation or field activity. Method blanks measure laboratory contamination. Trip blanks measure cross-contamination of samples during shipment. Field blanks measure cross-contamination of samples during field operations. If the concentration of the analyte is less than five times the blank contaminant level (ten times for the common contaminants), the analytes are negated and qualified as undetected, "U".

A summary of all contaminants detected in the method, field, and trip blanks associated with the VOC, BNA, and total petroleum hydrocarbon (TPH) analyses of the ground-water samples is presented in Table J3-3. Additionally, the table summarizes the SDGs and the ground-water samples that are associated and would be qualified, if appropriate, using the USEPA Region II validation guidelines. Sample qualifications were assessed using the following guidelines:

- *If the sample concentration was less than five times ($<5x$) the blank contaminant level (or less than ten times [$<10x$] for the common laboratory contaminants) and less than the quantitation limit, the analyte was negated, the sample result was raised to the quantitation limit, and qualified as undetected (U).*
- *If the sample concentration was $<5x$ the blank contaminant level (or $<10x$ for the common laboratory contaminants) and greater than the quantitation limit, the analyte was negated and qualified as undetected (U) at the reported concentration.*
- *If the sample concentration was greater than five times ($5x$ [or ten times ($10x$) for the common laboratory contaminants]) and greater than the quantitation limit, no qualification for blank contamination was assessed.*
- *Method blanks were evaluated and the contaminants detected in them were used to assess all associated samples with the exception of the trip and/or field blanks. Trip and/or field blanks were used in the assessment of associated ground-water samples and were not used in the evaluation of each other. The highest contaminant level for an analyte from all of the associated blanks (method, trip, or field) was used in the determination of the $5x$ (or $10x$) upper limit for blank negation.*
- *Tentatively-identified compounds (TICs) and unknowns of similar retention times (RT) were evaluated using the $5x$ multiplier of the highest-concentration, associated blank contaminant. In those instances where blank contamination was*

determined to be present, the TIC or unknown were rejected, qualified "R", and subsequently, not reported on the data summaries.

Table J3-4 summarizes all analyte sample-result qualifications for each ground-water sample for which the sample result and sample qualifier were changed due to suspected blank-contamination. Only those samples and analytes that were qualified in some manner due to this criterion are summarized. In the analysis of TPH, all field and method blanks were free of contamination and reported as non-detects at the quantitation limit.

Two volatile target compounds, dibromochloromethane and tetrachloroethene, were reported as TICs in the semivolatiles analysis of several samples. Since these two VOCs were analyzed and quantitated in the volatiles analysis, the estimated sample results for each of these VOCs were rejected in the semivolatiles TIC analysis, qualified "R", and will not be reported as a semivolatile TIC. Tetrachloroethene was rejected from the semivolatiles analysis in the following samples: MW-1, MW-1D, MW-2, MW-3, MW-4, MW-4D, MW-7, MW-7 FR (MW-105), MW-10, and MW-10D. Dibromochloroethane, reported as a semivolatile TIC, was rejected from the semivolatiles analysis in the following samples: MW-6D, MW-11D, and MW-12D.

3. MASS SPECTROMETER TUNING:

Tuning and performance criteria are established to ensure adequate mass resolution, proper compound identification, and to some degree, sufficient instrument sensitivity. These criteria are not sample specific. Instrument performance is determined using standard materials. Therefore, these criteria should be met in all circumstances. The tuning standard for volatile organic compounds (VOCs) is bromofluorobenzene (BFB).

If the mass calibration is in error, all associated data will be classified as unusable, "R".

All mass calibrations associated with the VOC and BNA analyses for these SDGs have met the QC criteria to ensure adequate mass resolution, proper compound identification, and instrument response.

4. CALIBRATION

Satisfactory instrument calibration is established to ensure that the instrument is capable of producing acceptable quantitative data. An initial calibration demonstrates that the instrument is capable of giving acceptable performance at the beginning of an analytical sequence. The continuing calibrations document that the instrument is giving satisfactory daily performance.

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A) RESPONSE FACTOR:

The response factor measures the instrument's response to specific chemical compounds. The response factor for the Target Compound List (TCL) must be ≥ 0.05 (a ratio of areas) in both the initial and continuing calibrations. A value < 0.05 indicates a serious detection and quantitation problem (poor sensitivity). Analytes detected in the sample will be qualified as estimated, "J". All non-detects for that compound will be rejected ("R").

For the volatile analyses, two initial calibration verifications (ICVs) for TCL analytes and one ICV for the site-specific VOCs were associated with all VOC sample analyses. A total of eight continuing calibration verification (CCV) TCL analyses and five CCVs for the site-specific VOCs were used to confirm precision and accuracy of instrument calibration.

In the analysis and quantitation of TCL semivolatiles (i.e., BNAs) in the ground-water and associated QC sample analyses, three ICVs and 11 CCVs were analyzed.

In the analyses of VOCs and BNAs for all SDGs and associated ground-water and QC samples, the response factors for all the TCL constituents and the site-specific target VOCs were greater than 0.05, based on a ratio of peak areas, in all initial and continuing calibrations. No sample result qualifications were assessed due to deficient response factors for any of the target and site-specific analytes.

5. CALIBRATION:

A) PERCENT RELATIVE STANDARD DEVIATION AND PERCENT DIFFERENCE:

Percent relative standard deviation (%RSD) is calculated from the initial calibration and is used to indicate the stability of the specific compound response factor over increasing concentration. Percent difference (%D) compares the response factor of the continuing calibration check to the average response factor (RRF) from the initial calibration. Percent D is a measure of the instrument's daily performance. Percent RSD must be $< 30\%$ and %D must be $< 25\%$. A value outside of these limits indicates potential detection and quantitation errors. For these reasons, all positive results are flagged as estimated, "J", and non-detects are flagged "UJ" (if %D or RSD $> 50\%$). If there is a gross deviation (i.e. $> 90\%$) of %RSD and %D, the non-detects may be rejected (R).

Volatile Organic Compounds

In the analysis of VOCs, 2-butanone in the TCL ICV analyzed on August 3, 1992 and n-propylbenzene analyzed on November 5, 1992 in the ICV for site-specific VOCs exceeded the plus or minus ($\pm$) 30 percent RSD limit used to evaluate linearity and precision of calibration. All ground-water samples, QC samples, and most sample reanalyses are within these ICVs. All positive results above the quantitation limit and estimated results below the quantitation limit for

each of these outlier VOCs were qualified as estimated (J). Similarly, non-detects for outlier VOCs were flagged as estimated at the quantitation limits (UJ). For the ICV analyzed for TCL constituents associated with sample reanalyses for bromoform on November 22, 1992, no calibration outliers were found for any VOC.

In the review of the volatile analysis CCVs, a total of seven of eight CCVs for TCL quantitation were found to have calibration outliers outside the $\pm 25\%$ limit. None of the five CCVs associated with any sample analysis for the site-specific VOCs were found to have any calibration outlier for %D. The compounds that were found to have %D exceedances were primarily either (1) a ketone compound, (2) an early-eluting VOC, or (3) a common laboratory contaminant. In all cases, %D was not exceeded by greater than ± 47 percent. The following VOCs were reported with exceeded %D in one or more of the CCVs: acetone, bromoform, 2-butanone, 2-hexanone, methylene chloride, 4-methylene-2-pentanone, and vinyl chloride.

A complete summary of all outlier ICVs and CCVs for VOC analyses and the associated samples qualified due to the QC exceedances are summarized in Table J3-5. Positive sample results for those analytes for which the %D in the associated CCV exceeded ± 25 percent were qualified as estimated (J). Non-detect sample results for analytes in CCVs with an exceeded %D were qualified as estimated at the quantitation limit (UJ). When appropriate, qualifications were applied to all blanks (method, field, and trip); other QC samples, such as matrix spikes (MS) and matrix spike duplicates (MSD); and to all associated ground-water samples, their dilution analyses, and reanalyses.

Other qualifications to sample results or anomalies due to VOC calibration issues are as follows:

- *In the VOC analysis of ground-water sample MW-3, the concentration of total 1,2-dichloroethene (1,2-DCE) exceeded the calibration range of the instrument. The sample result for this analyte in MW-3 was qualified "E" by the data reviewer to reflect the linear range exceedance.*
- *Samples MW-9, MW-9 FR (MW-106), and MW-9S were diluted and reanalyzed because the concentration of MTBE exceeded the calibration range of the instrument. The dilution analyses of these samples were used to report the MTBE results for each sample. For all other VOCs, the initial analyses were used to quantitate and report the VOC data.*
- *All of the ground-water samples, including the field and trip blanks for SDGs 24997, 25009, and 25052 were reanalyzed for VOCs outside their holding time since the continuing calibration criteria for bromoform was not met initially. The data reviewer assessed all of the bromoform results for these samples as estimated (J) or estimated at the quantitation limit (UJ) based on the initial analyses. The bromoform reanalysis results were also qualified as estimated (J or UJ) based on the holding-time exceedance. It was determined that the initial analysis results*

would be used for this report and in the evaluation of bromoform sample concentrations. The samples affected in the SDGs listed above are as follows: MW-5, MW-5 FR (MW-104), MW-14, TB100192, FB100192, MW-10, MW-11D, MW-11D MS, MW-11D MSD, MW-13D, TB100692, FB100692, MW-12D, MW-7 FR (MW-105), MW-4D, TB100592, and FB100592.

Semivolatile Organic Compounds

Three semivolatile ICVs for TCL only were analyzed and are associated with the BNA analyses of the samples. All response factors were greater than the 0.05 lower limit for all ICVs and CCVs. The RSD for all compounds in the associated ICVs were within the ± 30 percent upper limit.

The BNA analyses for the ground-water samples, QC samples, sample reanalyses, and dilution analyses are associated with 11 semivolatile CCVs. Each of these CCVs were reported with at least one, but no more than seven compounds with %D greater than ± 25 percent. A summary of each CCV with the calibration outliers and associated samples is presented in Table J3-5 following the volatiles summary. All outlier compounds for each CCV were qualified (J) if detected in the associated samples and estimated at the quantitation limit (UJ) if not detected in these samples.

In general, the frequency of the calibration outliers for some compound classes and specific compounds in the 11 semivolatile CCVs may be summarized as follows:

- In seven of 11 CCVs, one or more of the phthalate compounds, such as butylbenzylphthalate, bis(2-ethylhexyl)phthalate, and di-n-octylphthalate, were reported with %D greater than ± 25 percent. These compounds are common laboratory contaminants associated with semivolatile analyses.
- In seven of 11 CCVs, an acid-fraction semivolatile surrogate compound (2,4,6-tribromophenol) was reported with %D above ± 25 percent. Surrogates are used to monitor the extraction efficiency of the method in the sample matrix.

Total Petroleum Hydrocarbons

The CCVs in the TPH analyses were evaluated to determine if the precision of calibration was adequate for accurate, quantitative analysis of the samples. Most of the CCVs were reported with less than 10%D calculated from the initial calibration curve and all were less than 15%D. Although no strict criteria was established for the evaluation of this criterion for TPH analyses, it is the data reviewer's determination that an acceptable level of %D was exhibited for the analyses associated with this parameter.

6. SURROGATES:

All samples are spiked with surrogate compounds prior to sample preparation to evaluate overall laboratory performance and efficiency of the analytical technique. If the measured surrogate concentrations were outside contract specifications, qualifications were applied to the samples and analytes as shown below.

Volatile Organic Compounds

The system monitoring compound (SMC) recovery of toluene-d8 in sample MW-6D was below the QC limit (88 percent), but above 10 percent. The sample was reanalyzed (MW-6DRE) with the surrogate recovery of toluene-d8 also found to be below QC limit, but again, above 10 percent. All volatile compounds detected in MW-6D and MW-6DRE were qualified as estimated (J) and all non-detects were qualified as estimated at the quantitation limit (UJ). It is the data reviewer's opinion that the initial analysis of sample MW-6D be used when reporting the data.

The SMC recovery of toluene-d8 for the initial analysis of sample MW-11D was below the QC limit, but above 10 percent. This sample was reanalyzed and the SMC recovery was again below the lower limit for toluene-d8. Additionally, sample MW-11D was analyzed as the matrix spike and matrix spike duplicate (MS and MSD). The SMC recoveries of toluene-d8 were also below the QC limits for MW-11D MS and MW-11D MSD. Reanalysis of the MS/MSD resulted in toluene-d8 SMC recoveries below 88 percent. Since all six VOC analyses results for toluene-d8 were below the lower acceptance limit, a matrix interference is suspected. All volatile compounds detected in the initial analysis, reanalysis, and spike analyses of this sample were qualified as estimated (J) and all non-detects were qualified as estimated at the quantitation limit (UJ).

Semivolatile Organic Compounds

In the semivolatiles analysis and reanalysis of MW-6D, the acid-extractable surrogate spike recoveries for phenol-d5 and 2-fluorophenol were less than 10 percent. The recoveries for the advisory acid surrogate, 2-chlorophenol-d4, were reported to be 11 percent in each analysis. For the analysis and reanalysis results for MW-6D, all detected acid-extractable compounds were qualified as estimated (J) and all non-detects were qualified as unusable (R).

The recovery values for all three acid-extractable surrogates and for the advisory acid surrogate were less than 10 percent for sample MW-11D. This sample was also analyzed as the MS/MSD. In the MS/MSD, two of the three acid-extractable surrogates and the advisory acid surrogate spike recoveries were found to be less than 10 percent. For samples MW-11D, MW-11D MS and MW-11D MSD, all acid extractable compounds detected were qualified as estimated (J) and all non-detects were qualified as unusable (R). All other sample and all blank surrogate spike recoveries were within the prescribed QC limits.

7. INTERNAL STANDARDS PERFORMANCE:

Internal standard (IS) performance criteria ensure that the GC/MS sensitivity and response are stable during every analytical run. The internal standard area count must not vary by more than a factor of two (-50% to +100%) from the associated continuing calibration standard. The retention time of the internal standard must not vary by more than ± 30 seconds from the associated continuing calibration standard. If the area count is outside the (-50% to +100%) range of the associated standard, all of the positive results for compounds quantitated using that IS are qualified as estimated (J), and all non-detects as estimated at the reporting limit (UJ), or unusable and rejected (R), if there is a severe loss of sensitivity.

If an internal standard retention time varies by more than 30 seconds, the reviewer will use professional judgement to determine either partial or total rejection of the data for that sample fraction.

The internal standard areas were above QC limits for chrysene-d12 and perylene-d12 in the semivolatiles analysis for sample MW-11D MSD. All compounds quantitated in the semivolatiles analysis using these two internal standards were qualified as estimated (J) in MW-11D MS.

8. COMPOUND IDENTIFICATION:

A) VOLATILE AND SEMI-VOLATILE FRACTIONS:

TCL compounds are identified on the GC/MS by using the analyte's relative retention time (RRT) and by comparison to the ion spectra obtained from known standards. For the results to be a positive hit, the sample peak must be within ± 0.06 RRT units of the standard compound and have an ion spectra which has a ratio of the primary and secondary m/e intensities within 20% of that in the standard compound. For the tentatively identified compounds (TICs), the ion spectra must match accurately. In the cases where there is not an adequate ion spectrum match, the laboratory may have provided false positive identifications.

1,2-DCE (total) was detected and reported in several samples. The retention time (RT) of this compound in the quantitation reports does not match the RTs in the associated CCV standard quantitation reports. This discrepancy is attributed to the use of the trans isomer in the calibration standard solution while the cis isomer was detected in the field samples. The RTs for 1,2-DCE in the sample quantitation reports for the following samples were greater than 0.06 RRT units when compared to the associated CCVs: MW-1, MW-1D, MW-2, MW-3, MW-4, MW-4D, MW-6R, MW-8, MW-9S, MW-10, MW-10D, and MW-14.

Xylene (total) was detected in samples MW-5, MW-5 FR (MW-104), and MW-5RE. The retention time of this compound in the quantitation reports does not match the retention time in

the standard quantitation report because the isomer used in the standard solution was a different isomer than that detected in the samples.

9. MATRIX SPIKE/MATRIX SPIKE DUPLICATE:

The matrix spike/matrix spike duplicate (MS/MSD) data are generated to determine the long-term precision and accuracy of the analytical method in various matrices. The MS/MSD may be used in conjunction with other QC criteria for some additional qualification of the data.

Volatile Organic Compounds

Sample MW-11D was designated as the MS/MSD for the VOC analyses. Two matrix spike recoveries and one matrix spike duplicate recovery were found to be below QC limits, but above 10 percent. The MS/MSD were reanalyzed due to calibration criteria not being met in the initial analysis. All subsequent spike recoveries in the reanalyses were found to be within the appropriate QC limits. All relative percent difference (RPD) values for both MS/MSD analyses were within the QC limits. It is the data reviewer's determination that since all the spike recoveries were within QC limits for the MS/MSD reanalyses that no data should be qualified based on the initial MS/MSD results. Refer to Table J3-6 for a summary of outlier MS/MSD results for the volatile and semivolatile fractions.

Semivolatile Organic Compounds

Sample MW-11D was designated as the MS/MSD for the semivolatiles analyses. Twelve out of the twenty-two spike recoveries were found to be outside the QC acceptance limits. The acid-extractable compounds for sample MW-11D have already been qualified based on the surrogate spike results. Based on the MS/MSD data, it is the data reviewers' determination that the base neutral compounds for sample MW-11D be qualified as estimated (J) if detected and estimated (UJ) if not detected. This matrix interference was not observed for the other samples collected in this sampling round since surrogate recoveries were within the appropriate acceptance limits. Therefore, further qualification of other samples based on the MS/MSD results for sample MW-11D was not performed.

Total Petroleum Hydrocarbons

Sample MW-11D was designated as the MS/MSD for the TPH analyses. The recovery for each of the spikes was 108 percent (with zero RPD) which is within the 80 to 120 percent window established for the evaluation of accuracy in this parameter. No qualification of sample data was required.

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10. OTHER QC DATA OUT OF SPECIFICATION:

A) Sample Disposition

Five out of the five volatile organic analysis (VOA) vials for samples MW-1D, ESSO-TAP, and FB100792 were received by the laboratory containing air bubbles and headspace. All positive results for these samples were qualified as estimated (J) and all non-detects were qualified as unusable (R).

The VOA vials for sample MW-7 were received with headspace at the laboratory. This sample was replicated in the field and designated MW-105. Since the VOA vials for MW-105 (the field replicate for MW-7) were received in good condition and without headspace at the laboratory, the VOC results for MW-105 (i.e., MW-7 FR) were substituted for the VOC analysis of MW-7 after the laboratory data was received.

Sample MW-1 was initially sampled on October 2, 1992. Since the VOA vials were received at the laboratory with headspace, the sample was resampled in entirety for all analytical parameters on October 6, 1992. All sample analyses associated with the October 2, 1992 field collection of MW-1 were cancelled and the results for the sample collected on October 6, 1992 were used in the remedial investigation and reviewed in this validation report.

Due to laboratory error, the field blank collected on October 2, 1992 for SDG 25009 was cancelled for analysis at the laboratory. This sample (FB100292) was associated with samples MW-1D, MW-11D (and the MS/MSD for this sample), and the previously cancelled MW-1 (see above discussion). The samples in this SDG were qualified for blank contamination using the trip blank (TB100292) and the associated method blanks for each parameter.

B) Field Replicates

All results for the comparison of the sample/field replicate pairs are reported in micrograms per liter (ug/L) or milligrams per liter (mg/L).

Volatile Organic Compounds

A field replicate of MW-7 was collected and labeled MW-105. However, sample MW-7 was not analyzed for VOCs and the results of MW-7 FR (MW-105) are presented and discussed for the VOC analysis of MW-7 in the remedial investigation report.

Sample MW-5 was collected in duplicate. The field replicate of MW-5 was labeled MW-104. The compounds listed below were detected in the sample/field-replicate pair and resulted in the following RPDs between the sample results:

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<u>Compound/TIC</u>	<u>Concentration (ug/L)</u>		<u>RPD (%)</u>
	<u>MW-5</u>	<u>MW-5 FR (MW-104)</u>	
Benzene	1000	950	5
Toluene	180J	170J	6
Ethylbenzene	930	890	4
Xylenes (total)	1600	1500	6
MTBE	6200	6200	0
n-Propylbenzene	180J	170J	6
C-3 Benzene			
Isomers (total)	2600J	2500	4
C-4 Benzene Isomer	not reported	250J	not calculated
C6H12 Isomer	250J	not reported	not calculated
C9H10 Isomer	500J	500J	0
C11H14 Isomer	not reported	400J	not calculated

Sample MW-9 was also collected in duplicate. The field replicate of MW-9 was labeled MW-106. The following compounds were detected in the sample and replicate with the corresponding RPD values:

<u>Compound/TIC</u>	<u>Concentration (ug/L)</u>		<u>RPD (%)</u>
	<u>MW-9</u>	<u>MW-9 FR (MW-106)</u>	
Acetone	10	10	0
Benzene	26	28	7
Ethylbenzene	19	24	23
Xylenes (total)	2J	3J	40
MTBE	2700	2900	7
n-Propylbenzene	8	13	48
1,2,3,4-Tetrahydro- naphthalene	11JN	14JN	24
C-3 Benzene Isomer	15J	15J	0
C-4 Benzene			
Isomers (total)	270	310	14
C10H12 Isomers (total)	150J	160J	6

Semivolatile Organic Compounds

Sample MW-5 was collected in duplicate. The field replicate of MW-5 was labeled MW-104. The following compounds were detected in the sample and replicate with the corresponding RPD values:

<u>Compound/TIC</u>	<u>Concentration (ug/L)</u>		<u>RPD (%)</u>
	<u>MW-5</u>	<u>MW-5 FR (MW-104)</u>	
4-Methylphenol	3J	3J	0
2,4-Dimethylphenol	7J	7J	0
Naphthalene	310D	230D	30
2-Methylnaphthalene	130D	110D	17
1-Methylcyclopentanol	64JN	60JN	6
C-2 Benzene Isomers (total)	600J	440J	31
C-3 Benzene Isomers (total)	1900J	1500J	24
C-4 Benzene Isomers (total)	7200J	2100J	110
Unknowns (total)	3500J	770J	131
2,3-Dihydromethyl-1H- indene Isomers (total)	7100J	2300J	100
1-Methylnaphthalene	4100JN	1200JN	110

Sample MW-7 was also collected in duplicate. The field replicate of MW-7 was labeled MW-105. The following compound was detected in the sample and replicate with the corresponding RPD value:

<u>Compound/TIC</u>	<u>Concentration (ug/L)</u>		<u>RPD (%)</u>
	<u>MW-7</u>	<u>MW-7 (MW-105)</u>	
Unknowns (total)	660J	6J	95

Total Petroleum Hydrocarbons

Sample MW-5 and MW-7 were collected in duplicate. The field replicates of MW-5 and MW-7 were labeled MW-104 and MW-105, respectively. The following results for TPH were calculated for the sample/field-replicate pairs with the corresponding RPD values:

<u>Sample/Field Replicate</u>	<u>Concentration (mg/L)</u>		<u>RPD (%)</u>
	<u>Sample</u>	<u>Field Replicate</u>	
MW-5/MW-104	4.2	2.2	63
MW-7/MW-105	not detected	not detected	0

11. SYSTEM PERFORMANCE AND OVERALL ASSESSMENT:

Overall, the data submitted by Enseco-East are of good quality and demonstrate acceptable precision, accuracy, and completeness. There are no indications that the instrument performance has degraded to a point that would affect the quality of the data for these SDGs.

No abrupt shifts occurred in the chromatographic baselines in the VOC and BNA analyses and minimal baseline drift was observed.

The majority of the data for the VOC and BNA analyses and all of the data for the TPH analyses are valid with the following qualifications.

- *In the analysis of volatiles, several SDGs were reanalyzed outside of the holding time for bromoform since the CCV criteria for this compound had not been met initially. Since the initial data and reanalysis data were fairly similar, and both were estimated due to either deficient CCV criteria or exceeded holding time, the initial results, estimated for the CCV deficiency, were reported.*
- *With the exception of one analyte in one ground-water sample (see contract non-compliance), data derived from dilution analyses for analytes found to be above the linear range in the initial analysis, were incorporated into the Form I data summary forms from the initial analyses or the more concentrated analysis (i.e., less diluted). The data from the dilution analysis were flagged D to indicate data originating from a secondary dilution.*
- *The volatile organic SMC recoveries and the surrogate recoveries for BNA analyses were all within the appropriate acceptance windows for all ground-water samples and QC samples, except for in samples MW-6D and MW-11D. For the BNA analyses, only the acid-extractable compounds were affected in these samples. Repeat analyses of both samples for both analytical fractions (and additional review of the MS/MSD surrogate and SMC recoveries in MW-11D) resulted in and confirmed similar surrogate outliers. Because of this, matrix interferences are suspected in these sample matrices which may preclude accurate, quantitation of volatile and acid-extractable analyte concentrations. Both samples were qualified in accordance with the validation guidelines.*
- *Some matrix precision and accuracy data, generated by the analysis of MW-11D as the MS and MSD for VOCs and BNAs were outside the SOW acceptance limits. The initial MS/MSD outliers in the VOC analyses were established to be the result of poor calibration precision since the VOC reanalyses exhibited acceptable recoveries for the MS/MSD. The BNA outliers in the MS/MSD for MW-11D are suspected to be the result of matrix interferences since poor recoveries were also reported for the surrogate compounds.*
- *Field-replicate analyses for VOCs, BNAs, and TPH were performed on sample MW-5. Field-replicate analysis for BNAs and TPH were performed on sample MW-7. Field-replicate analyses for VOCs were performed on sample MW-9. Most RPD results were within 20 percent, indicating acceptable precision. In analyses where estimated concentrations and/or low-level sample concentrations above the quantitation limit were reported, greater variability in RPD was noted.*

Similarly, TIC concentrations displayed RPDs greater than 20 percent in most cases; however, this may be primarily due to the method of quantitation used in TIC library searches.

- *Some TCL data were negated and some TIC rejected due to associated blank contamination.*
- *Several ketone compounds, phthalate compounds, and some of the common laboratory contaminants, in addition to other TCL analytes, were qualified as estimated due to exceeded CCV criteria.*
- *No TCL or site-specific targets were rejected due to calibration, internal standard, and/or tuning accuracy and precision.*
- *Sample MW-11D was reanalyzed because a low SMC spike recovery was reported for toluene-d8. A low SMC recovery was also reported for toluene-d8 in the reanalysis of MW-11D. The initial analysis of MW-11D will be used when reporting the data.*
- *The VOC analysis data for sample MW-7 FR is referred to in this SDG as MW-105. Sample MW-105 was originally collected as the field replicate of MW-7. However, the VOA vials for the sample MW-7 were received at the laboratory with headspace. The VOC analyses for MW-7 were canceled by Geraghty & Miller, and the VOC results obtained for the MW-7 FR (MW-105) were substituted for MW-7 for the purposes of the remedial investigation.*
- *Sample MW-6D was reextracted and reanalyzed because of low acid-extractable surrogate recoveries. The reextraction was performed out of holding time and low surrogate recoveries were again reported. Since the results of both analyses were similar and the reextraction was performed out of the holding time, the initial results of sample MW-6D will be used when reporting the data.*
- *Samples MW-5 and MW-5 FR (MW-104) were diluted and reanalyzed because the concentrations of 2-methylnaphthalene and naphthalene exceeded the calibration range of the instrument. The dilution analysis results for 2-methylnaphthalene and naphthalene and the initial results for all other compounds will be used when reporting the data for MW-5 and MW-5 FR (MW-104).*

CONTRACT NON-COMPLIANCE

The following section presents a non-compliance summary for general issues associated with all of the SDGs in this investigation.

- *Two volatile TCL constituents (tetrachloroethene and dibromochloromethane) were rejected from the semivolatile TIC fraction for several samples since they were quantitated as a volatile target compound.*
- *In the analysis of the tuning standards for VOCs and semivolatiles, greater than two significant figures were used when reporting the tune information.*
- *The response factors were not shown in the quantitation reports.*
- *TICs for which presumptive evidence in the sample existed and were identified by the laboratory with a chemical abstracts services (CAS) number were not reported with the "N" qualifier. The "N" qualifier was applied to these TICs by the data reviewer.*
- *The total 1,2-DCE result in the volatile analysis of sample MW-3 was qualified "E" by the data reviewer since the concentration exceeded the linear range of the instrument and no dilution for this target compound was analyzed.*

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ATTACHMENT J2
INORGANIC DATA VALIDATION REPORT

TUT 002 1748

Evaluation of Metals Data for the Contract Laboratory Program (CLP)

based on

SOW. 3/90

(SOP Revision XI)

PREPARED BY: Hanif Sheikh DATE: 1-30-92
Hanif Sheikh, Quality Assurance Chemist
Toxic and Hazardous Waste Section

APPROVED BY: Kevin W. Kubik DATE: 1-30-92
Kevin Kubik, Chief
Toxic and Hazardous Waste Section

APPROVED BY: Robert Runyon DATE: 1/30/92
Robert Runyon, Chief
Monitoring Management Branch

TUT 002 1749

Title: Evaluation of Metals Data for the
Contract Laboratory Program

Date: Jan. 1992
Number: HW-2
Revision: 11

1.0 Scope

1.1 This procedure is applicable to inorganic data obtained from contractor laboratories working for Hazardous Waste Site Contract Laboratory Program (CLP).

1.2 The data validation is based upon analytical and quality assurance requirements specified in Statement of Work (SOW) 3/90.

2.0 Responsibilities - Data reviewers will complete the following tasks as assigned by the Data Review Coordinator:

2.1. For a total review:

2.1.1 Data Assessment - "Total Review-Inorganics" Checklist Appendix (A.1).
The reviewer must answer every question on the checklist.

2.1.2 Data Assessment - Data Assessment Narrative (Appendix A.2)
The answer on the checklist must match the action in the narrative (appendix A.2) and on Form I's. Do not use pencil to write the narrative.

2.1.3 Contract Non-Compliance - SMD Report (Appendix A.3)
This report is to be completed only when a serious contract violation is encountered, or upon the request of the Data Validation Task Monitor, or Technical Project Officer (TPO). Forward 5 copies: one each for internal files, appropriate Regional TPO, Sample Management Office (SMD) and last two addresses of Mailing List for Data Reviewers (Appendix A.4). In other cases, all contract violations should be appended to the end of the Data Assessment Narrative (Sec. A.2.2).

2.1.4 CLP Data Assessment Summary Forms

2.1.4.1 Appendix A.5

Fill in the total number of analytes analyzed by different analyses and the number of analytes rejected or flagged as estimated due to corresponding quality control criteria. Place an "X" in boxes where analyses were not performed, or criteria do not apply.

2.1.4.2 Appendix A.6

Data reviewer is also required to fill out Inorganic Regional Data Assessment form (Appendix A.7) provided by EPA Headquarters. Codes listed on the form will be used to describe the Data Assessment Summary.

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2.1.5 Data Review Log: It is recommended that each data reviewer should maintain a log of the reviews completed to include: a. date of start of case review

- b. date of completion of case review
- c. site
- d. case number
- e. contract laboratory
- f. number of samples
- g. matrix
- h. hours worked
- i. reviewer's initials

2.1.6 Telephone Record Log - the data reviewer should enter the bare facts of inquiry, before initiating any phone conversation with CLP laboratory. After the case review has been completed, mail white copy of Telephone Record Log to the laboratory and pink copy to SMD. File yellow copy in the Telephone Record Log folder, and attach a xerox copy of the Telephone Record Log to the completed Data Assessment Narrative (Appendix A.2).

2.1.7 Forwarded Paperwork

2.1.7.1 Upon completion of review, the following are to be forwarded to the Regional Sample Control Center (RSOC) located in the Surveillance and Monitoring Branch:

- a. data package
- b. completed data assessment checklist (Appendix A.1, original)
- c. SMD Contract Compliance Screening (CCS)
- d. Record of Communication (copy)
- e. CLP Reanalysis Request/Approval Record (original + 3 copies)
- f. Appendix A.6 (original).

2.1.7.2 Forward 2 copies of completed Data Assessment Narrative (Appendix A.2) along with 2 copies of the Inorganic Data Assessment Form (Appendix A.6) and Telephone Record Log, if any, one each for appropriate Regional TPO, and the other one to EPA EMSL office in Las Vegas. The addresses of TPOs and EPA office in Las Vegas are given in Appendix A-4.

2.1.8 Filed Paperwork - Upon completion of review, the following are to be filed within MMB files:

- a. Two copies of completed Data Assessment Narrative (Appendix A.2) each carrying Appendix A.6.
- b. Telephone Record Log (copy)
- c. SMD Report (copy Appendix A-3)
- d. CLP Reanalysis Request/Approval Record (copy)

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3.0 Data Completeness

Each data package is checked by a Regional Sample Control Coordinator (RSSC) for completeness. A data package is assumed to be complete when all the deliverables required under the contract are present. If a data package is incomplete, the RSSC would call the laboratory for missing document(s). If the laboratory does not respond within a week, SMO and MMB coordinator of Region II will be notified.

4.0 Rejection of Data - All values determined to be unacceptable on the Inorganic Analysis Data Sheet (Form I) must be lined over with a red pencil. As soon as any review criteria causes data to be rejected, that data can be eliminated from any further review or consideration.

5.0 Acceptance Criteria - In order that reviews be consistent among reviewers, acceptance criteria as stated in Appendix A.1 (pages 4-25) should be used. Additional guidance can be found in the National Inorganic Functional Guidelines of October 1, 1989.

6.0 SMO Contract Compliance Screening (CCS) - This is intended to aid reviewer in locating any problems, both corrected and uncorrected. However, the validation should be carried out even if CCS is not present. Resubmittals received from laboratory in response to CCS must be used by the reviewer.

7.0 Request for Reanalysis - Data reviewers must note all items of contract non-compliance within Data Assessment Narrative. If holding times and sample storage times have not been exceeded, TPO may request reanalysis if items of non-compliance are critical to data assessment. Requests are to be made on "CLP Re-Analysis Request/Approval Record".

8.0 Record of Communication - Provided by the Regional Sample Control Center (RSOC) to indicate which data packages have been received and are ready to be reviewed.

9.0 Rounding off numbers - The data reviewer will follow the standard practice.

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	YES	NO	N/A
A.1.1 <u>Contract Compliance Screening Report (CCS)</u> - Present?	☐	☐	☒
<u>ACTION:</u> If no, contact RSOC.			
A.1.2 <u>Record of Communication (from RSOC)</u> - Present?	☐	☐	☒
<u>ACTION:</u> If no, request from RSOC.			
A.1.3 <u>Trip Report</u> - Present and complete?	☐	☐	☒
<u>ACTION:</u> If no, contact RSOC for trip report.			
A.1.4 <u>Sample Traffic Report</u> - Present?	☒	☐	☐
Legible?	☒	☐	☐
<u>ACTION:</u> If no, request from Regional Sample Control Center (RSOC).			
A.1.5 <u>Cover Page</u> - Present?	☒	☐	☐
Is cover page properly filled in and signed by the lab manager or the manager's designee?	☒	☐	☐
<u>ACTION:</u> If no, prepare Telephone Record Log, and contact laboratory.			
Do numbers of samples correspond to numbers on Record of Communication?	☐	☐	☒
Do sample numbers on cover page agree with sample numbers on:			
(a) Traffic Report Sheet?	☒	☐	☐
(b) Form I's?	☒	☐	☐
<u>ACTION:</u> If no for any of the above, contact RSOC for clarification.			

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A.1.6 Form I to IX Yes No N/A

A.1.6.1 Are all the Form I through Form IX labeled with:

Laboratory name?	☒	—	—
Case/SAS number?	☐	—	☒
EPA sample No.?	☒	—	—
SDG No.?	☒	—	—
Contract No.?	☒	—	—
Correct units?	☒	—	—
Matrix?	☒	—	—

ACTION: If no for any of the above, note under
Contract Problem/Non-Compliance section
of the "Data Assessment Narrative".

A.1.6.2 Do any computation/transcription errors exceed 10% of
reported values on Forms I-IX for:

(NOTE: Check all forms against raw data.)

(a) all analytes analyzed by ICP?	☐	☒	—
(b) all analytes analyzed by GFAA?	☐	☒	—
(c) all analytes analyzed by AA Flame?	☐	—	☒
(d) Mercury?	☐	☒	—
(e) Cyanide?	☐	☒	—

ACTION: If yes, prepare Telephone Log, contact
laboratory for corrected data and
correct errors with red pencil and initial.

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	YES	NO	N/A
A.1.7 <u>Raw Data</u>			
A.1.7.1 Digestion Log* for flame AA/ICP (Form XIII) present?	☒	—	—
Digestion Log for furnace AA Form XIII present?	☒	—	—
Distillation Log for mercury Form XIII present?	☒	—	—
Distillation Log for cyanides Form XIII present?	☒	—	—
Are pH values (pH<2 for all metals, pH>12 for cyanide) present?	☐	☒	—
*Weights, dilutions and volumes used to obtain values.			
Percent solids calculation present for soils/sediments?	☐	—	☒
Are preparation dates present on sample preparation logs/bench sheets?	☒	—	—
A.1.7.2 Measurement read out record present? ICP	☒	—	—
Flame AA	☐	—	☒
Furnace AA	☒	—	—
Mercury	☒	—	—
Cyanides	☒	—	—
A.1.7.3 Are all raw data to support all sample analyses and QC operations present?	☒	—	—
Legible?	☒	—	—
Properly Labeled?	☒	—	—

ACTION: If no for any of the above questions in sections A.1.7.1 through A.1.7.3, write Telephone Record Log and contact laboratory for resubmittals.

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		YES	NO	N/A
A.1.8	<u>Holding Times</u> - (aqueous and soil samples)			
	(Examine sample traffic reports and digestion/distillation logs.)			
	Mercury analysis (28 days). exceeded?	☐	☒	☐
	Cyanide distillation (14 days). exceeded?	☒	☐	☐
	Other Metals analysis (6 months). exceeded?	☐	☒	☐
	<u>NOTE:</u> Prepare a list of all samples and analytes for which holding times have been exceeded. Specify the number of days from date of collection to the date of preparation (from raw data). Attach to checklist. <u>ACTION:</u> If yes, reject (red-line) values less than Instrument Detection Limit (IDL) and flag as estimated (J) the values above IDL even though sample(s) was preserved properly.			
A.1.8.2	Is pH of aqueous samples for:			
	Metals Analysis >2?	☒	☐	☐
	Cyanides Analysis <12?	☒	☐	☐
	<u>Action:</u> If yes, flag the associated metals and cyanides data as estimated.			
A.1.9	<u>Form I (Final Data)</u>			
A.1.9.1	Are all Form I's present and complete?	☒	☐	☐
	<u>ACTION:</u> If no, prepare telephone record log and contact laboratory for submittal.			
A.1.9.2	Are correct units (ug/l for waters and mg/kg for soils) indicated on Form I's?	☒	☐	☐
	Are soil sample results for each parameter corrected for percent solids?	☐	☐	☒
	Are all "less than IDL" values properly coded with "U"?	☒	☐	☐

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	YES	NO	N/A
Are the correct concentration qualifiers used with final data?	☒	—	—
ACTION: If no for any of the above, prepare Telephone Record Log, and contact laboratory for corrected data.			
A.1.9.3 Are EPA sample # s and corresponding laboratory sample ID # s the same as on the Cover Page, Form I's and in the raw data?	☒	—	—
Was a brief physical description of samples given on Form I's?	☒	—	—
Was the dilution of any sample diluted beyond the requirements of the contract noted on Form I or Form XIV?	—	☒	—
ACTION: If no for any of the above, note under Contract-Problem/Non-Compliance of the "Data Assessment Narrative".			
A.1.10 <u>Calibration</u>			
A.1.10.1 Is record of at least 2 point calibration present for ICP analysis?	☒	—	—
Is record of 5 point calibration present for Hg analysis?	☒	—	—
Is record of 4 point calibration present for:			
Flame AA?	☐	—	☒
Furnace AA?	☒	—	—
Cyanides?	☒	—	—
Is one calibration standard at the CRDL level for all AA (except Hg) and cyanides analyses?	☐	☒	—
ACTION: If no for any of the above, write in the Contract Problem/Non-Compliance section of the "Data Assessment Narrative".			

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	YES	NO	N/A
A.1.10.2 Is correlation coefficient less than 0.995 for:			
Mercury Analysis?	—	☒	—
Cyanide Analysis?	—	☒	—
Atomic Absorption Analysis?	—	☒	—

ACTION: If yes, flag the associated data as estimated.

NOTE: The data validator shall calculate the correlation coefficient using concentrations of the standards and the corresponding instrument response (e.g. absorbance, peak area, peak height, etc.).

A.1.10.3 In the instance where less than 4 standards are measured in absorbance (or peak area, peak height, etc.) mode, are the remaining standards analyzed in concentration mode immediately after calibration within $\pm 10\%$ of the true values? ☐ — ☒

ACTION: If no, flag the associated data as estimated if standards are not within $\pm 10\%$ of true values. Do not flag the data as estimated in linear range indicated by good recovery of standard(s).

A.1.11 Form II A (Initial and Continuing Calibration Verification)-

A.1.11.1 Present and complete for every metal and cyanide? ☒ — —
Present and complete for AA and ICP when both are used for the same analyte? ☐ — ☒

ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory.

A.1.11.2 Circle on each Form IIA all percent recoveries that are outside the contract windows.
Are all calibration standards (initial and continuing) within control limits:

Metals- 90-110%R?	☒	—	—
Hg - 80-120%R?	☒	—	—
Cyanides- 85-115%R?	☒	—	—

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	YES	NO	N/A
ACTION: Flag as estimated (J) all positive data (not flagged with a "U") analyzed between a calibration standard with $\pm R$ between 75-89% (65-79% for Hg; 70-84% for CN) or 111-125% (121-135% for Hg; 116-130% for CN) recovery and nearest good calibration standard. Qualify results <IDL as estimated (U) if the ICV or CCV $\pm R$ is 75-89% (CN, 70-84% ; HG, 65-79%). Reject (red-line) as unacceptable data if recovery of the ICV or CCV is outside the range 75-125% (CN, 70-130%; Hg, 65-135%). Qualify five samples on either side of verification standard out of control limits.			
A.1.11.3 Was continuing calibration performed every 10 samples or every 2 hours?	☒	—	—
Was ICV for cyanides distilled?	☒	—	—
ACTION: If no for any of the above, write in the Contract-Problem/Non-Compliance section of the "Data Assessment Narrative".			
A.1.12 <u>Form II B (CRDL Standards for AA and ICP) -</u>			
A.1.12.1 Was a CRDL standard (CRA) analyzed after initial calibration for all AA metals (<u>except Hg</u>)?	☒	—	—
Was a mid-range calib. verification standard distilled and analyzed for cyanide analysis?	☒	—	—
Was a 2xCRDL (or 2xIDL when IDL>CRDL) analyzed (CRI) for each ICP run? (Note: CRI for AL,Ba,Ca,Fe,Mg,Na,or K is not required.)	☒	—	—
ACTION: If no for any of the above, flag as estimated all data falling within the affected ranges. The affected ranges are: AA Analysis - **True Value $\pm$ CRDL ICP Analysis - **True Value $\pm$ 2CRDL CN Analysis - **True Value $\pm$ 0.5 x True Value.			

**True value of CRA, CRI or mid-range standard. Substitute IDL for CRDL when IDL > CRDL.
Compute the concentration of the missing mid-range standard from the calibration range.

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	YES	NO	N/A
A.1.12.2 Was CRI analyzed after ICV/ICB and before the final OCV/OCB, and twice every eight hours of ICP run?	☒	☐	☐

ACTION: If no, write in Contract Problem/Non-Compliance Section of the "Data Assessment Narrative".

A.1.12.3 Circle on each Form IIB all the percent recoveries that are outside the acceptance windows.

Are CRA and CRI standards within control limits:

Metals	80 - 120%R?	☐	☒	☐

Is mid-range standard within control limits:

Cyanide	80 - 120%R?	☒	☐	☐

ACTION: Flag as estimated all sample results within the affected range if the recovery of the standard is between 50-79%; flag only positive data within the affected range if the recovery is between 121-150%; reject all data within the affected range if the recovery is less than 50%; reject only positive data within the affected range if the recovery is greater than 150%. Qualify 50% of the samples on either side of CRI standard outside the control limits.

Note: Flag or reject the final results only when sample raw data are within the affected ranges and the CRDL standards are outside the acceptance windows.

A.1.13 Form III (Initial and Continuing Calibration Blanks)

A.1.13.1 Present and complete?	☒	☐	☐

For both AA and ICP when both are used for the same analyte?

☐	☐	☒

Was an initial calibration blank analyzed?

☒	☐	☐

Was a continuing calibration blank analyzed after every 10 samples or every 2 hours (which ever is more frequent)?

☒	☐	☐

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	YES	NO	N/A
ACTION: If no, prepare Telephone Record Log, contact laboratory and write in the Contract-Problems/Non-Compliance section of the "Data Assessment Narrative".			
A.1.13.2 Circle on each Form III all calibration blank values that are above CRDL (or 2 x IDL when IDL > CRDL).			
Are all calibration blanks (when IDL < CRDL) less than or equal to the Contract Required Detection Limits (CRDLs)?	☒	—	—
Are all calibration blanks less than two times Instrument Detection Limit (when IDL > CRDL)?	☐	—	☒
ACTION: If no for any of the above, flag as estimated (J) positive sample results when <u>raw sample value</u> is less than or equal to calibration blank value analyzed between calibration blank with value over CRDL (or 2xIDL) and nearest good calibration blank. Flag five samples on either side of the calibration blank outside the control limits.			
A.1.14 FORM III (Preparation Blank) - (Note: The preparation blank for mercury is the same as the calibration blank.)			
A.1.14.1 Was one prep. blank analyzed for:			
each Sample Delivery Group (SDG)?	☒	—	—
each batch of digested samples?	☒	—	—
each matrix type?	☒	—	—
both AA and ICP when both are used for the same analyte?	☐	—	☒
ACTION: If no for any of the above, flag as estimated (J) all the associated positive data <10 x IDLs for which prep. blank was not analyzed.			
NOTE: If only one blank was analyzed for more than 20 samples, then first 20 samples analyzed do not have to be flagged as estimated (J).			

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	YES	NO	N/A
A.1.14.2 Is concentration of prep. blank value greater than the CRDL when IDL is less than or equal to CRDL?	—	☒	—
If yes, is the concentration of the sample with the least concentrated analyte less than 10 times the prep. blank?	—	☐	☒
<u>ACTION:</u> If yes, reject (red-line) all associated data greater than CRDL concentration but less than ten times the prep. blank value.			
A.1.14.3 Is concentration of prep. blank value (Form III) less than two times IDL, when IDL is greater than CRDL?	☐	—	☒
<u>ACTION:</u> If no, reject (red-line) all positive sample results when sample raw data are less than 10 times the prep. blank value.			
A.1.14.4 Is concentration of prep. blank below the negative CRDL?	—	☒	—
<u>ACTION:</u> If yes, reject (red-line) all associated sample results less than 10xCRDL.			
A.1.15 <u>Form IV (ICP Interference Check Sample)</u>			
A.1.15.1 Present and complete?	☒	—	—
(NOTE: Not required for furnace AA, flame AA, mercury, cyanide and Ca, Mg, K and Na.)			
Was ICS analyzed at beginning and end of run (or at least twice every 8 hours)?	☒	—	—
<u>ACTION:</u> If no, flag as estimated (J) all the samples for which Al, Ca, Fe, or Mg is higher than in ICS.			
A.1.15.2 Circle all values on each Form IV that are more than $\pm 20\%$ of true or established mean value.			
Are all Interference Check Sample results inside the control limits ($\pm 20\%$)?	☒	—	—
If no, is concentration of Al, Ca, Fe, or Mg lower than the respective concentration in ICS?	☐	—	☒

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YES NO N/A

X

~~[X]~~ ~~_____~~ ~~_____~~

☒ _____

[] : X

 X

U X

1] X _

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YES NO N/A

ACTION: If yes, disregard spike recoveries for analytes whose concentrations are greater than or equal to four times spike added. If no, circle those analytes on Form V for which sample concentration is less than four times the spike concentration.

Are results outside the control limits (75-125%) flagged with "N" on Form I's and Form VA?

☒ ☐ ☐

ACTION: If no, write in the Contract - Problem/Non - Compliance section of "Data Assessment Narrative".

A.1.16.4 Aqueous

Are any spike recoveries:

(a) less than 30%?

☒ ☐ ☐

(b) between 30-74%?

☐ ☒ ☐

(c) between 126-150%?

☐ ☒ ☐

(d) greater than 150%?

☐ ☒ ☐

ACTION: If less than 30%, reject all associated aqueous data; if between 30-74%, flag all associated aqueous data as estimated (J); if between 126-150%, flag as estimated (J) all associated aqueous data not flagged with a "U"; if greater than 150%, reject (red-line) all associated aqueous data not flagged with a "U".

A.1.16.5 Soil/Sediment

Are any spike recoveries:

(a) less than 10%?

☐ ☐ ☒

(b) between 10-74%?

☐ ☐ ☒

(c) between 126-200%?

☐ ☐ ☒

(d) greater than 200%?

☐ ☐ ☒

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		YES	NO	N/A
ACTION:	If less than 10%, reject all associated data; if between 10-74%, flag all associated data as estimated; if between 126-200%, flag as estimated all associated data was not flagged with a "U"; if greater than 200%, reject all associated data not flagged with a "U".			
A.1.17	<u>Form VI (Lab Duplicates)</u>			
A.1.17.1	Present and complete for: each SDG?	☒	—	—
	each matrix type?	☒	—	—
	each concentration range (i.e. low, med., high)?	☒	—	—
	both AA and ICP when both are used for the same analyte?	☐	—	☒
ACTION:	If no for any the above, flag as estimated (J) all the data $\geq$ CRDL* for which duplicate sample was not analyzed.			
Note:	1. If one duplicate sample was analyzed for more than 20 samples, then first 20 samples do not have to be flagged as estimated. 2. If percent solids for soil sample and its duplicate differ by more than 1%, prepare a Form VI for each duplicate pair, report concentrations in ug/L on wet weight basis and calculate RPD or Difference for each analyte.			
A.1.17.2	Was field blank used for duplicate analysis?	—	☒	—
ACTION:	If yes, flag all data $\geq$ CRDL* as estimated (J) for which field blank was used as duplicate.			
A.1.17.3	Are all values within control limits (RPD 20% or difference $\leq \pm$ CRDL)?	☒	—	—
	If no, are all results outside the control limits flagged with an * on Form I's and VI?	☐	—	☒
ACTION:	If no, write in the Contract - Problems/Non-Compliance section of "Data Assessment Narrative".			

* Substitute IDL for CRDL when IDL > CRDL.

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YES NO N/A

- NOTE:** 1. RPD is not calculable for an analyte of the sample - duplicate pair when both values are less than IDL.
2. If the result of lab duplicate analyzed by GFAA is rejectable due to coefficient of correlation of MSA, analytical spike recovery, or duplicate injections criteria, do not apply precision criteria to metals analyzed by GFAA.

A.1.17.4 Aqueous

Circle on each Form VI all values that are:

RPD > 50%, or
Difference > CRDL*

Is any RPD greater than 50% where sample and duplicate are both greater than or equal to 5 times *CRDL?

___ ☒ ___

Is any difference** between sample and duplicate greater than *CRDL where sample and/or duplicate is less than 5 times *CRDL?

___ ☒ ___

ACTION: If yes, flag the associated data as estimated.

A.1.17.5 Soil/Sediment

Circle on each Form VI all values that are:

RPD > 100%, or
Difference > 2 x CRDL*

Is any RPD (where sample and duplicate are both greater than or equal to 5 times *CRDL) :

> 100%?

___ ☐ ☒

Is any **difference between sample and duplicate (where sample and/or duplicate is less than 5x*CRDL) :

> 2x*CRDL?

___ ☐ ☒

* Substitute IDL for CRDL when IDL > CRDL.

** Use absolute values of sample and duplicate to calculate the difference.

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YES NO N/A

ACTION: If yes, flag the associated data as estimated.

A.1.18 Field Duplicates

A.1.18.1 Were field duplicates analyzed? ☒ ☐ ☐

ACTION: If yes, prepare a Form VI for each aqueous field duplicate pair. Prepare a Form VI for each soil duplicate pair, if percent solids for sample and its duplicate differ by more than 1%; report concentrations of soils in ug/l on wet weight basis and calculate RPDs or Difference for each analyte.

NOTE: 1. Do not calculate RPD when both values are less than IDL.
2. Flag all associated data only for field duplicate pair.

A.1.18.2 Aqueous

Circle all values on self prepared Form VI for field duplicates that are:

RPD > 50%, or
Difference > CRDL*

Is any RPD greater than 50% where sample and duplicate are both greater than or equal to 5 times *CRDL? ☐ ☒ ☐

Is any **difference between sample and duplicate greater than *CRDL where sample and/or duplicate is less than 5 times *CRDL? ☐ ☒ ☐

ACTION: If yes, flag the associated data as estimated.

* Substitute IDL for CRDL when IDL > CRDL.

** Use absolute values of sample and duplicate to calculate the difference.

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YES NO N/A

A.1.18.3 Soil/Sediment

Circle all values on self prepared Form VI for
field duplicates that are:

RPD >100%, or

Difference > 2 x CRDL*

Is any RPD (where sample and duplicate are both
greater than 5 times *CRDL) :

>100%?

— ☐ ☒

Is any **difference between sample and duplicate
(where sample and/or duplicate is less than 5x *CRDL) :

>2x *CRDL?

— ☐ ☒

ACTION: If yes, flag the associated data as estimated.

A.1.19 Form VII (Laboratory Control Sample) (Note: LCS - not
required for aqueous Hg and cyanide analyses.)

A.1.19.1 Was one LCS prepared and analyzed for:

each SDG?

☒ — —

each batch samples digested/distilled?

☒ — —

both AA and ICP when both are used for the same
analyte?

☐ — ☒

ACTION: If no for any of the above, prepare Telephone
Record Log and contact laboratory for submittal
of results of LCS. Flag as estimated (J) all
the data for which LCS was not analyzed.

NOTE: If only one LCS was analyzed for more than 20
samples, then first 20 samples close to LCS
do not have to be flagged as estimated.

* Substitute IDL for CRDL when IDL > CRDL.

** Use absolute values of sample and duplicate to calculate the difference.

Title: Evaluation of Metals Data for the
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YES NO N/A

A.1.19.2 Aqueous LCS

Circle on each Form VII the LCS percent recoveries
outside control limits (80 - 120%) except for aqueous
Ag and Sb.

Is any LCS recovery:	less than 50%?	—	☒	—
	between 50% and 79%?	—	☒	—
	between 121% and 150%?	—	☒	—
	greater than 150%?	—	☒	—

ACTION: Less than 50%, reject (red-line) all data;
between 50% and 79%, flag all associated data
as estimated (J); between 121% and 150%, flag
all positive (not flagged with a "U") results
as estimated; greater than 150%, reject all
positive results.

A.1.19.3 Solid LCS

- NOTE: 1. If "Found" value of LCS is rejectable due to duplicate
injections or analytical spike recovery criteria,
regardless of LCS recovery, flag the associated data
as estimated (J).
2. If IDL of an analyte is equal to or greater than
true value of LCS, disregard the "Action" below even
though LCS is out of control limits.

Is LCS "Found" value higher than the control
limits on Form VII? — ☐ ☒

ACTION: If yes, qualify all associated positive data
as estimated.

Is LCS "Found" value lower than the Control
limits on Form VII? — ☐ ☒

ACTION: If yes, qualify all associated data as
estimated.

TUT 002 1769

Title: Evaluation of Metals Data for the
Contract Laboratory Program
Appendix A.1: Data Assessment - Contract
Compliance (Total Review)

Date: Jan. 1992
Number: HW-2
Revision: 11

	YES	NO	N/A
A.1.20 <u>Form IX (ICP Serial Dilution) -</u>			
<u>NOTE:</u> Serial dilution analysis is required only for initial concentrations equal to or greater than 10 x IDL.			
A.1.20.1 Was Serial Dilution analysis performed for:			
each SDG?	☒	—	—
each matrix type?	☒	—	—
each concentration range (i.e. low, med.)?	☒	—	—
<u>ACTION:</u> If no for any of the above, flag as estimated all the positive data $\geq 10 \times \text{IDL}$ or $\geq \text{CRDL}$ when $10 \times \text{IDL} \leq \text{CRDL}$ for which Serial Dilution Analysis was not performed.			
A.1.20.2 Was field blank(s) used for Serial Dilution Analysis?	—	☒	—
<u>ACTION:</u> If yes, flag all associated data $\geq 10 \times \text{IDL}$ as estimated (J). If $10 \times \text{IDL} \leq \text{CRDL}$, flag all data $\geq \text{CRDL}$.			
A.1.20.3 Are results outside control limit flagged with an "E" on Form I's and Form IX when initial concentration on Form IX is equal to 50 times IDL or greater.	☒	—	—
<u>ACTION:</u> If no, write in the Contract-Problem/Non-Compliance section of the "Data Assessment Narrative".			
A.1.20.4 Circle on each Form IX all percent difference that are outside the control limits for initial concentrations equal to or greater than 10 x IDLs only.			
Are any % difference values:			
> 10%?	☒	☐	—
$\geq 100\%$?	☒	☐	—

TUT 002 1770

Title: Evaluation of Metals Data for the
Contract Laboratory Program
Appendix A.1: Data Assessment - Contract
Compliance (Total Review)

Date: Jan. 1992
Number: HW-2
Revision: 11

		YES	NO	N/A
ACTION: Flag as estimated (J) all the associated sample data $\geq 10 \times \text{IDLs}$ (or $\geq \text{CRDL}$ when $10 \times \text{IDL} \leq \text{CRDL}$) for which percent difference is greater than 10% but less than 100%. Reject (red-line) all the associated sample results equal to or greater than $10 \times \text{IDLs}$ (or $\geq \text{CRDL}$ when $10 \times \text{IDL} \leq \text{CRDL}$) for which PD is greater than or equal to 100%. Note: Flag or reject on Form I's only the sample results whose associated raw data are $\geq 10 \times \text{IDL}$ (or $\geq \text{CRDL}$ when $10 \times \text{IDL} \leq \text{CRDL}$)				
A.1.21	<u>Furnace Atomic Absorbtion (AA) OC Analysis</u>			
A.1.21.1	Are duplicate injections present in furnace raw data (except during full Method of Standard Addition) for each sample analyzed by GFAA?	☒	☐	☐
	ACTION: If no, <u>reject</u> the data on Form I's for which duplicate injections were not performed.			
A.1.21.2	Do the duplicate injection readings agree within 20% Relative Standard Deviation (RSD) or Coefficient of Variation (CV) for concentration greater than CRDL?	☒	☐	☐
	Was a dilution analyzed for sample with analytical spike recovery less than 40%?	☒	☐	☐
	ACTION: If no for any of the above, flag all the associated data as estimated.			
A.1.21.3	Is *analytical spike recovery outside the control limits (85-115%) for any sample?	☒	☐	☐
	ACTION: If yes, flag as estimated the affected sample results if the recovery is between 10-84%; if the recovery is between 115-200%, flag the associated positive sample results as estimated; reject the associated sample results if the recovery is less than 10%; reject positive sample results if the recovery is greater than 200%.			

* Analytical spike is not required on the pre-digestion spiked sample.

Title: Evaluation of Metals Data for the
Contract Laboratory Program
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Date: Jan. 1992
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YES NO N/A

NOTE: Reject or flag the data only when the affected sample(s) was not subsequently analyzed by Method of Standard Addition.

A.1.22 Form VIII (Method of Standard Addition Results)

A.1.22.1 Present?

☒ ☐ ☐

If no, is any Form I result coded with "S" or a "+"?

☐ ☐ ☒

ACTION: If yes, write request on Telephone Record Log and contact laboratory for submittal of Form VIII.

A.1.22.2 Is coefficient of correlation for MSA less than 0.990 for any sample?

☒ ☐ ☐

ACTION: If yes, reject (red-line) the affected data.

A.1.22.3 Was *MSA required for any sample but not performed?

☒ ☒ ☐

Is coefficient of correlation for MSA less than 0.995?

☒ ☐ ☐

Are MSA calculations outside the linear range of the calibration curve generated at the beginning of the analytical run?

☐ ☒ ☐

ACTION: If yes for any of the above, flag all the associated data as estimated (J).

A.1.22.4 Was proper quantitation procedure followed correctly as outlined in the SOW on page E-23?

☒ ☐ ☐

ACTION: If no, note exception under Contract Problem/Non-Compliance section of the "Data Assessment Narrative", and prepare a separate list.

* MSA is not required on LCS and prep. blank..

TUT 002 1772

Title: Evaluation of Metals Data for the
Contract Laboratory Program
Appendix A.1: Data Assessment - Contract
Compliance (Total Review)

Date: Jan. 1992
Number: HW-2
Revision: 11

	YES	NO	N/A
A.1.23 <u>Dissolved/Total or Inorganic/Total Analytes -</u>			
A.1.23.1 Were any analyses performed for dissolved as well as total analytes on the same sample(s).	☒	☐	☐
Were any analyses performed for inorganic as well as total (organic + inorganic) analytes on the same sample(s)?	☐	☒	☐
NOTE: 1. If yes, prepare a list comparing differences between all dissolved (or inorganic) and total analytes. Compute the differences as a percent of the total analyte only when dissolved concentration is greater than CRDL as well as total concentration. 2. Apply the following questions only if inorganic (or dissolved) results are (i) above CRDL, and (ii) greater than total constituents. 3. At least one preparation blank, ICS, and LCS should be analyzed in each analytical run.			
A.1.23.2 Is the concentration of any dissolved (or inorganic) analyte greater than its total concentration by more than 10%?	☒	☐	☐
A.1.23.3 Is the concentration of any dissolved (or inorganic) analyte greater than its total concentration by more than 50%?	☒	☐	☐
ACTION: If more than 10%, flag both dissolved (or inorganic) and total values as estimated (J); if more than 50%, reject (red-line) the data for both values.			
A.1.24 <u>Form I (Field Blank) -</u>			
(Note: Designate "Field Blank" as such on Form I.)			
A.1.24.1 Circle all field blank values on Form I that are greater than CRDL, (or 2 x IDL when IDL > CRDL).			
Is field blank concentration less than CRDL (or 2 x IDL when IDL > CRDL) for all parameters of associated aqueous and soil samples?	☐	☒	☐

EUT 002 1773

Title: Evaluation of Metals Data for the
Contract Laboratory Program
Appendix A.1: Data Assessment - Contract
Compliance (Total Review)

Date: Jan. 1992
Number: HW-2
Revision: 11

	YES	NO	N/A
If no, was field blank value already rejected due to other QC criteria?	☐	☒	☐
ACTION: If no, reject (except field blank results) all associated positive sample data less than or equal to five times the field blank value. Reject on Form I's the soil sample results that when converted to ug/L on wet basis are less than or equal to five times the field blank value in ug/L.			
A.1.25 <u>Form X, XI, XII (Verification of Instrumental Parameters).</u>			
A.1.25.1 Is verification report present for:			
Instrument Detection Limits (quarterly)?	☒	☐	☐
ICP Interelement Correction Factors (annually)?	☒	☐	☐
ICP Linear Ranges (quarterly)?	☒	☐	☐
ACTION: If no, contact TPO of the lab.			
A.1.25.2 <u>Form X (Instrument Detection Limits)</u> - (Note: IDL is not required for Cyanide.)			
A.1.25.2.1 Are IDLs present for:			
all the analytes?	☒	☐	☐
all the instruments used?	☒	☐	☐
For both AA and ICP when both are used for the same analyte?	☐	☐	☒
ACTION: If no for any of the above, prepare Telephone Record Log and contact laboratory.			
A.1.25.2.2 Is IDL greater than CRDL for any analyte?	☐	☒	☐
If yes, is the concentration on Form I of the sample analyzed on the instrument whose IDL exceeds CRDL, greater than 5 x IDL.	☐	☐	☒

TUT 002 1774

Title: Evaluation of Metals Data for the
 Contract Laboratory Program
 Appendix A.1: Data Assessment - Contract
 Compliance (Total Review)

Date: Jan. 1992
 Number: HW-2
 Revision: 11

YES NO N/A

Action : If no, flag as estimated all values less
 than five times IDL of the instrument whose
 IDL exceeds CRDL.

A.1.25.3 Form XI (Linear Ranges)

A.1.25.3.1 Was any sample result higher than high linear range
 of ICP.

Was any sample result higher than the highest
 calibration standard for non-ICP parameters?

If yes for any of the above, was the
 sample diluted to obtain the result on Form I?

—	☒	—
—	☒	—
☐	—	☒

ACTION: If no, flag the result reported on Form I
 as estimated(J).

A.1.26 Percent Solids of Sediments

A.1.26.1 Are percent solids in sediment(s):

< 50%?

< 10%?

—	☐	☒
—	☐	☒

ACTION: If yes, qualify as estimated all the
 results of a sample that has per cent
 solids between 10%-50% (i.e. moisture
 content between 50%-90%). Reject all
 the results of a sample that has per cent
 solids less than 10% (i.e. moisture content
 greater than 90%).

NOTE: Reject or flag(J) only the sample results
 that were not previously rejected or flagged
 due to other QC criteria.

TUT 002 1775

STANDARD OPERATING PROCEDURE

Title: Evaluation of Metals Data for the
Contract Laboratory Program
Attachment J.2: Data Assessment Narrative

Date: January 1992
Number: HW-2
Revision: 11

Case# - Site Tutu Service Station Investigation Matrix: Soil
SDG# 24744, 24950, 24997, 25009 Lab Enseco-East Water X
25052, 25071, 25091
Contractor Geraghty & Miller, Inc. Reviewer Lauren Sjogren Other

J.2.1. Validation Flags - The following flags have been applied in red by the data validator and must be considered by the data user.

J - This flag indicates the results qualified as estimated.

Red-Line - A red-line drawn through a sample result indicates unusable value. The red-line data are known to contain significant errors based on documented information and must not be used by the data user.

Fully Usable Data- The results that do not carry "J" or "red-line" are fully usable.

Contractual Qualifiers - The legend of contractual qualifiers applied by the lab on Form I's is found on page B-20 of SOW ILM01.0.

J.2.2 The data assessment is given below and on the attached sheets.

The quality of the data was acceptable with the appropriate qualifiers as discussed below.

HOLDING TIMES/SAMPLE PRESERVATION

Samples MW-6R and MW-8 were analyzed for total cyanide out of the 12-day holding time by two days. Cyanide was not detected in either sample, therefore, these non-detect cyanide results were qualified as unusable (R).

No mention is made in the cyanide distillation logs as to whether the pH of samples FB092992, FB093092, MW-6D, MW-2, MW-4, and MW-3 were greater than ($>$) 12 standard pH units. The laboratory was contacted and it was determined that the pH of these samples had not been measured. Cyanide was not detected in any of the samples, therefore, the non-detect cyanide results were qualified as estimated (UJ).

The pH of the cyanide samples MW-6R and MW-8 were less than ($<$) 12. The non-detect cyanide results for MW-6R and MW-8 were already qualified as unusable (R) based on the holding times, therefore, further qualification of this data was not necessary.

The pH of all cyanide samples contained in sample delivery groups (SDGs) 24997, 25009, 25052, 25071, and 25091 were < 12 . Cyanide was not detected in any of these samples, therefore, the non-detect cyanide results were qualified as estimated (UJ).

The pH of the total metals sample for MW-1D > 2 . All total metals detected for MW-1D were qualified as estimated (J) and non-detects were qualified as estimated at the quantitation limit (UJ).

CALIBRATION

For the majority of the arsenic, lead, selenium, and thallium initial calibrations, the data reviewer could not confirm the correlation coefficients (r) reported by the laboratory. The r values were calculated using a non-linear regression formula; all reported r values were > 0.995 .

CRDL STANDARDS

For SDGs 25071 and 25091, the spike recovery for the lead CRDL standard analyzed on October 19, 1992 was 70 percent which is outside the acceptance range of 80 to 120 percent. Therefore, all total lead sample results contained in SDGs 25071 and 25091 were qualified as estimated (J) if detected and estimated (UJ) if not detected.

MATRIX SPIKE RESULTS

Sample MW-11D was designated for the matrix spike analysis. All matrix spike recoveries were within the 75 to 125 percent range with the exception of the cyanide analysis.

A zero percent recovery for cyanide was reported for the matrix spike analysis of MW-11D. The laboratory also analyzed sample MW-10 as a matrix spike sample with a 104 percent recovery for cyanide. Therefore, the cyanide result for sample MW-11D was qualified as unusable (R) since there was no recovery of cyanide. No other cyanide sample results were qualified since the cyanide matrix spike recovery for sample MW-10 was within the quality control (QC) limits of 75 to 125 percent.

LAB DUPLICATE RESULTS

Sample MW-11D was designated for the laboratory duplicate analysis. All laboratory duplicate results were within the appropriate QC limits.

FURNACE ATOMIC ABSORPTION ANALYSES

Duplicate injections and furnace post-digestion spikes are used to establish the precision and accuracy of individual analytical determinations.

Arsenic

The arsenic post-digestion spike recoveries were between 115 to 200 percent for total metals sample MW-14 and all the total metal samples contained in SDGs 24744 and 24950. Arsenic post-digestion spike recoveries for the dissolved metal analyses for samples MW-12D, MW-7, MW-7 FR (MW-105), MW-4D, MW-10, MW-10D, MW-1, and ESSO-TAP were also between 115 percent and 200 percent. As a result, the positive arsenic result for total metals sample MW-10 was qualified as estimated (J). Since arsenic was not detected in any of the other samples, no qualification of these results was necessary.

Lead

With the exception of the total metals sample for MW-6R, the lead post-digestion spike recoveries for all other total samples contained in SDGs 24744 and 24950 were between 115 to 200 percent. The lead concentrations detected in the total analyses for samples MW-4 and MW-3 were qualified as estimated (J). Lead was not detected in any of the other associated samples, therefore, further qualification of this data was not necessary.

Selenium

The selenium post-digestion spike recovery was outside the QC limits of 85 to 115 percent for total sample MW-6R. The selenium detected in this sample was qualified as estimated (J).

Selenium post-digestion spike recoveries between 10 to 84 percent were reported for dissolved metals sample MW-11D and for total metals sample MW-1. The selenium detected in dissolved metals sample MW-11D and for total metals sample MW-1 were qualified as estimated (J).

Selenium post-digestion spike recoveries were between 10 and 84 percent for dissolved metals samples MW-14 and MW-3 and total metal samples MW-9, MW-9S, and MW-14. Since selenium was not detected in these samples, these results were qualified as estimated at the quantitation limit (UJ).

Selenium post-digestion spike recoveries for dissolved metals sample FB093092 and total metal samples MW-12D and MW-7 were between 115 and 200 percent. Since selenium was not detected in these samples, no qualification of these results was necessary.

Thallium

Thallium post-digestion spike recoveries were between 10 and 84 percent for total metal samples MW-10, MW-10D, MW-1, MW-13D, MW-8, MW-6R, and MW-4. Thallium was not detected in any of these samples, therefore, these non-detect thallium results were qualified as estimated (UJ).

Thallium post-digestion spike recoveries were between 10 and 84 percent for dissolved metal samples MW-10D, MW-1D, MW-5, MW-14, MW-5FR (MW-104), MW-8, MW-6R, MW-2, MW-4, and MW-3. Thallium was not detected in any of these samples, therefore, these non-detect thallium results were qualified as estimated (UJ).

Thallium post-digestion spike recoveries for dissolved metal samples MW-7, MW-10, MW-1, MW-9S, and ESSO-TAP were between 115 and 200 percent. Thallium was not detected in any of these samples, therefore, these results were not qualified.

All other post-digestion sample spike recoveries were within the QC limits of 85 to 115 percent with the exception of those samples analyzed by the method of standard addition.

ICP SERIAL DILUTION

For SDG number 24997, sample MW-5 FR (MW-104) was used for the inductively coupled plasma (ICP) serial dilution analysis. The percent difference between the total zinc initial sample result and the total zinc serial dilution result was > 10, but < 100 percent. As a result, all total zinc sample results contained in SDG number 24997 greater than ten times the instrument detection limit (IDL) were qualified as estimated (J).

For SDG number 25009, sample MW-11D was used for the ICP serial dilution analysis. The percent difference between the total sodium initial sample result and the total sodium serial dilution result was > 10, but < 100 percent. As a result, all positive total sodium sample

results contained in SDG number 25009 greater than ten times the IDL were qualified as estimated (J).

For SDG number 25052, sample MW-12D was used for the ICP serial dilution analysis. The percent difference between the total manganese, sodium, and zinc initial sample results and the total manganese, sodium, and zinc serial dilution results were > 10 , but < 100 percent. As a result, all positive total manganese, sodium, and zinc sample results contained in SDG number 25052 greater than the contract required detection limit (CRDL) or ten times the IDL, whichever was greater, were qualified as estimated (J). The percent difference between the dissolved chromium initial sample result and the dissolved chromium serial dilution result was > 10 , but < 100 percent. As a result, all positive dissolved chromium results contained in SDG number 25052 greater than ten times the IDL were qualified as estimated (J).

Sample MW-9 was used for the ICP serial dilution analysis for SDG number 25091. The percent difference between the dissolved iron and zinc initial sample results and the dissolved iron and zinc serial dilution results were > 10 , but < 100 percent. As a result, all positive dissolved iron and zinc sample results contained in SDG number 25091 greater than the CRDL were qualified as estimated (J). The percent difference between the total copper initial sample result and the total copper serial dilution result was > 10 , but < 100 percent. As a result, all positive total copper results contained in SDG number 25091 greater than ten times the IDL were qualified as estimated (J).

Sample MW-10 was used for the ICP serial dilution analysis for SDG number 25071. The percent difference between the total potassium, vanadium, and zinc initial sample results and the total potassium, vanadium, and zinc serial dilution results were > 10 , but < 100 percent. As a result, all positive vanadium and zinc sample results contained in SDG number 25071 greater than the CRDL were qualified as estimated (J). All positive potassium sample results contained in SDG number 25071 greater than ten times the IDL were qualified as estimated (J).

All other ICP serial dilution results were acceptable.

BLANKS

With the exception of the field blank FB100792, all analytes detected in any other blanks associated with the samples had concentrations below the CRDL.

Aluminum, chromium, and iron were detected in the total metals analysis of field blank FB100792 with concentrations of 776 micrograms per liter (ug/L), 16.2 ug/L, and 820 ug/L, respectively. The following sample results were qualified as unusable (R) because the concentration was $<$ five times the associated blank value.

<u>Sample ID</u>	<u>Analyte</u>
ESSO-TAP	Aluminum (total)
ESSO-TAP	Iron (total)
MW-9	Chromium (total)
MW-9S	Chromium (total)
MW-1	Chromium (total)

SAMPLE RESULTS

Only one transcription error was found. Iron originally reported as not detected (7U) in the dissolved metals analysis of sample MW-3 was detected at a concentration of 55.6 ug/L. The sample result was corrected by the data reviewer.

DISSOLVED/TOTAL ANALYTES

The concentration of dissolved calcium was greater than total calcium for sample MW-5 FR (MW-104) by more than 10 percent. Total and dissolved calcium for sample MW-5 FR (MW-104) were qualified as estimated (J).

The concentration of dissolved manganese was greater than total manganese for sample MW-4D by more than 10 percent. Total and dissolved manganese for sample MW-4D were qualified as estimated (J).

The concentration of dissolved arsenic was greater than total arsenic for sample MW-9 by more than 10 percent. Total and dissolved arsenic for sample MW-9 were qualified as estimated (J).

The concentration of dissolved sodium was greater than total sodium for sample MW-1 by more than 10 percent. Total and dissolved sodium for sample MW-1 were qualified as estimated (J).

The concentration of dissolved arsenic was greater than total arsenic for sample MW-9S by more than 50 percent. Total and dissolved arsenic for sample MW-9S were qualified as unusable (R).

A.2.3 Contract-Problem/Non-Compliance

For the arsenic, lead, selenium, and thallium initial calibrations, none of the calibration standards were at the CRDL level. However, after each one of these initial calibrations were analyzed and prior to the analysis of any samples, standards with a concentration at the CRDL

were analyzed for each furnace sequence. The recovery of these standards were found to be within a range of 94 to 118 percent. It is this data reviewer's opinion that the data was not compromised.

MMB/ESAT Reviewer: _____
Signature

Date: _____

Contractor Reviewer: Lauren Sjogren / U.P.
Signature

Date: 5-21-93

Verified by: Thomas V. Donahy

Date: 5-21-93

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TUT 002 1782

U.S. EPA - CLP

6
DUPLICATES

EPA SAMPLE NO.

MW-5

Total

Lab Name: ENSECO EASTContract: --Lab Code: --Case No.: --SAS No.: --SDG No.: 24997Matrix (soil/water): --Level (low/med): Low% Solids for Sample: --% Solids for Duplicate: --Concentration Units (ug/L or mg/kg dry weight): ug/L

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum		1490		1140		26.6		
Antimony		20.0	U	20.0	U			
Arsenic		3.9	B	4.0	B	2.5		
Barium		167	B	167	B	0		
Beryllium		1.0	U	1.0	U			
Cadmium		3.0	U	3.0	U			
Calcium		40100		40100		0		
Chromium		15.7		12.5		22.6		
Cobalt		6.9	B	6.5	B	6.0		
Copper		9.2	B	10.9	B	16.9		
Iron		2280		1910		17.7		
Lead		1.0	U	1.0	U			
Magnesium		21700		21400		1.4		
Manganese		407		406		0.2		
Mercury		0.10	U	0.10	U			
Nickel		54.3		49.0		10.3		
Potassium		9310		8970		3.7		
Selenium		2.0	U	2.0	U			
Silver		4.0	U	4.0	U			
Sodium		21400		213000		0.5		
Thallium		3.0	U	3.0	U			
Vanadium		6.4	B	4.9	B	26.5		
Zinc		26.1		26.4		1.1		
Cyanide		10.0	U	10.0	U			

PR01301/MW-5TOTAL.WK3

TUT 002 1783

U.S. EPA - CLP

6
DUPLICATES

EPA SAMPLE NO.
MW-5
Dissolved

Lab Name: ENSECO EASTContract: --Lab Code: --Case No.: --SAS No.: --SDG No.: 24997Matrix (soil/water): --Level (low/med): Low% Solids for Sample: --% Solids for Duplicate: --Concentration Units (ug/L or mg/kg dry weight): ug/L

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum		34.9	B	36.1	B	3.3		
Antimony		20.0	U	24.8	B			
Arsenic		3.9	B	3.9	B	0		
Barium		172	B	162	B	5.6		
Beryllium		1.0	U	1.0	U			
Cadmium		3.0	U	3.0	U			
Calcium		40300		39500		2.0		
Chromium		4.0	U	4.0	U			
Cobalt		4.0	U	5.4	B			
Copper		4.0	U	4.0	U			
Iron		278		278		0		
Lead		1.0	U	1.0	U			
Magnesium		21600		23200		7.1		
Manganese		373		383		2.6		
Mercury		0.10	U	0.10	U			
Nickel		39.7	B	48.8	B	20.7		
Potassium		9850		9380		4.9		
Selenium		2.0	U	2.0	U			
Silver		4.0	U	4.0	U			
Sodium		233000		236000		1.3		
Thallium		3.0	U	3.0	U			
Vanadium		4.0	U	4.0	U			
Zinc		7.5	B	5.6	B	29.0		
Cyanide								

PR01301/MW-5DIS.WK3

TUT 002 1784

GERAGHTY & MILLER, INC.

U.S. EPA - CLP

6

DUPLICATES

EPA SAMPLE NO.

MW-7

Total

Lab Name: ENSECO EASTContract: --Lab Code: --Case No.: --SAS No.: --SDG No.: 25052Matrix (soil/water): WaterLevel (low/med): Low% Solids for Sample: --% Solids for Duplicate: --Concentration Units (ug/L or mg/kg dry weight): ug/L

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum		3640		4000		9.4		
Antimony		20.0	U	20.0	U			
Arsenic		2.0	U	2.0	U			
Barium		18.8	B	16.5	B	13.0		
Beryllium		1.0	B	1.0	U			
Cadmium		3.0	U	3.0	U			
Calcium		49200		51700		5.0		
Chromium		12.7		10.4		20.0		
Cobalt		5.1	B	4.8	B	6.1		
Copper		19.9	B	14.4	B	32.0		
Iron		5120		5470		6.6		
Lead		1.0	U	1.0	U			
Magnesium		30300		30500		0.7		
Manganese		120		132		9.5		
Mercury		0.10	U	0.10	U			
Nickel		8.0	U	8.0	U			
Potassium		21100		22100		4.6		
Selenium		2.0	U	2.0	U			
Silver		4.0	U	4.0	U			
Sodium		199000		201000		1.0		
Thallium		3.0	U	3.0	U			
Vanadium		103		106		2.9		
Zinc		16.0	B	17.0	B	6.1		
Cyanide		10.0	U	10.0	U			

PR01301/MW-7TOTAL.WK3

TUT 002 1755

GERAGHTY & MILLER, INC.

U.S. EPA - CLP

6
DUPLICATES

EPA SAMPLE NO.

MW-7

Dissolved

Lab Name: ENSECO EASTContract: --Lab Code: --Case No.: --SAS No.: --SDG No.: 25052Matrix (soil/water): WaterLevel (low/med): Low% Solids for Sample: --% Solids for Duplicate: --Concentration Units (ug/L or mg/kg dry weight): ug/L

Analyte	Control Limit	Sample (S)	C	Duplicate (D)	C	RPD	Q	M
Aluminum		32.0	U	32.0	U			
Antimony		20.1	B	20.0	U	200		
Arsenic		2.0	U	2.0	U			
Barium		4.8	B	7.4	B	42.6		
Beryllium		1.0	U	1.0	U			
Cadmium		3.0	U	3.0	U			
Calcium		41200		41100	U	0.2		
Chromium		4.0	U	4.0	U			
Cobalt		4.0	U	4.0	U			
Copper		4.0	U	4.0	U			
Iron		7.0	U	10.5	B	200		
Lead		1.0	U	1.0	U			
Magnesium		28600		28700		0.3		
Manganese		1.2	B	2.0	B	50.0		
Mercury		0.10	U	0.10	U			
Nickel		8.0	U	8.0	U			
Potassium		20100		22400		10.8		
Selenium		2.1	B	2.0	U			
Silver		4.0	U	4.0	U			
Sodium		209000		211000		1.1		
Thallium		3.0	U	3.0	U			
Vanadium		96.8		99.2		2.4		
Zinc		3.9	B	7.4	B	61.9		
Cyanide								

PR01301/MW-7DIS.WK3

TUT 002 1786

ATTACHMENT J3

TABLES

TUT 002 1787

Table J3-1. Ground-Water Sample Delivery Groups for September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Sample Delivery Group	Sample Identification	Laboratory Identification	Collection Date
24744	FB092992	24744-1	September 29, 1992
	TB092992	24744-2	September 29, 1992
	MW-8	24744-3	September 29, 1992
	MW-6R	24744-4	September 29, 1992
24950	FB093092	24950-1	September 30, 1992
	TB093092	24950-2	September 30, 1992
	MW-6D	24950-3	September 30, 1992
	MW-2	24950-4	September 30, 1992
	MW-4	24950-5	September 30, 1992
	MW-3	24950-6	September 30, 1992
24997	TB100192	24997-1	October 1, 1992
	FB100192	24997-2	October 1, 1992
	MW-5	24997-3	October 1, 1992
	MW-14	24997-4	October 1, 1992
	MW-104	24997-5	October 1, 1992
25009	FB100292	25009-1 (cancelled)	October 2, 1992
	TB100292	25009-2	October 2, 1992
	MW-1	25009-3 (resampled)	October 2, 1992
	MW-1D	25009-4	October 2, 1992
	MW-11D	25009-5	October 2, 1992
	MW-11D MS	25009-5 MS	October 2, 1992
	MW-11D MSD	25009-5 MSD	October 2, 1992
25052	FB100592	25052-1	October 5, 1992
	TB100592	25052-2	October 5, 1992
	MW-12D	25052-3	October 5, 1992
	MW-7	25052-4	October 5, 1992
	MW-105	25052-5	October 5, 1992
	MW-4D	25052-6	October 5, 1992
25071	FB100692	25071-1	October 6, 1992
	TB100692	25071-2	October 6, 1992
	MW-10	25071-3	October 6, 1992
	MW-10D	25071-4	October 6, 1992
	MW-1	25071-5	October 6, 1992
	MW-13D	25071-6	October 6, 1992
25091	MW-4D	25091-1	October 7, 1992
	MW-9	25091-2	October 7, 1992
	MW-9S	25091-3	October 7, 1992
	FB100792	25091-4	October 7, 1992
	TB100792	25091-5	October 7, 1992
	ESSO-TAP	25091-6	October 7, 1992
	MW-106	25091-7	October 7, 1992

FB Field blank.
 TB Trip blank.
 MS Matrix spike.
 MSD Matrix spike duplicate.

TUT 002 1788

Table J3-2 Summary of Volatile and Semivolatile Holding-Time Outliers Associated with Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Sample ID	Collection Date/Acid Preserved	Analysis (or Preparation) Date	Days Holding Time Exceeded	Action
VOCs	MW-13D	October 6, 1992/No	October 16, 1992	3	Estimated data for aromatic VOCs
VOCs (bromoform only)	TB100192 RE	October 1, 1992/Yes	October 23, 1992	8	Used initial analysis for bromoform.
	FB100192 RE	October 1, 1992/Yes	October 16, 1992	1	
	MW-5 RE	October 1, 1992/Yes	October 16, 1992	1	
	MW-5 FR RE (MW-104 RE)	October 1, 1992/Yes	October 23, 1992	8	
	MW-14 RE	October 1, 1992/Yes	October 16, 1992	1	
VOCs (bromoform only)	TB100292 RE	October 2, 1992/Yes	October 29, 1992	13	Used initial analysis for bromoform.
	MW-1D RE	October 2, 1992/Yes	October 29, 1992	13	
	MW-11D RE	October 2, 1992/Yes	October 29, 1992	13	
VOCs (bromoform only)	FB100592 RE	October 5, 1992/Yes	October 22, 1992	3	Used initial analysis for bromoform.
	TB100592 RE	October 5, 1992/Yes	October 23, 1992	4	
	MW-12D RE	October 5, 1992/Yes	October 22, 1992	3	
	MW-7 FR RE (MW-105 RE)	October 5, 1992/Yes	October 23, 1992	4	
Volatiles	MW-6D RE	September 30, 1992/NA	October 20, 1992	12	Estimated data.

Identification.
Volatile organic compounds.
Reanalysis.
Not applicable.

-T1/TablD3wt3

Table J3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/L)	Associated Ground-Water Samples
Volatiles			
24744	Method (05 Oct 92-A/C1412)	Methylene chloride/3J	MW-6R, MW-8, MW-2, MW-3, MW-4, MW-6D
24950	Method (06 Oct 92-A/C1426)	Methylene chloride/3J Acetone/8J	MW-6D RE, MW-5, MW-14, MW-5 FR (MW-104), MW-11D, MW-1D, TB100292
24997	Method (23 Oct 92-A/J0166)	Unknown (22.92)/8J	MW-5 FR RE (MW-104 RE)
25052	Method (07 Oct 92-A/C1445)	Methylene chloride/5J Acetone/9J	MW-12D, MW-7 FR (MW-105) *
25071	Method (09 Oct 92-A/C1469)	Methylene chloride/14	MW-1, MW-10, MW-10D, MW-4D, MW-9, MW-9 FR (MW-106), MW-9S
24744	Trip (TB092992)	Methylene chloride/3BJ Acetone/7J Unknown (20.05)/6J Unknown (26.15)/5J	MW-6R, MW-8
950	Trip (TB093092)	Methylene chloride/4BJ Acetone/7J Carbon disulfide/1J	MW-2, MW-3, MW-4, MW-6D
1997	Trip TB100192	Methylene chloride/1BJ 1,1,2-Trichloro-1,2,2-trifluoroethane (4.43)/21JN	MW-5, MW-5 FR (MW-104), MW-14

ee last page for footnotes.

Table J3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/L)	Associated Ground-Water Samples
25009	Trip (TB100292)	Methylene chloride/2BJ Acetone/9BJ Unknown (4.49)/7J Octamethylcyclotetrasiloxane (20.04)/5JN C12H12 Isomer (31.55)/8J	MW-11D, MW-1D, MW-1
25052	Trip (TB100592)	Methylene chloride/4BJ Acetone/6BJ	MW-12D, MW-7, MW-7 FR (MW-105)
25071	Trip (TB100692)	Methylene chloride/1J	MW-1, MW-10, MW-10D, MW-13D
25091	Trip (TB100792)	Methylene chloride/4BJ	MW-4D, MW-9, MW-9 FR (MW-106), MW-9S, ESSO-TAP
24744	Field (FB092992)	Methylene chloride/4BJ Acetone/6J Unknown (20.03)/6J	MW-6R, MW-8
24950	Field (FB093092)	Methylene chloride/4BJ Acetone/8J Carbon disulfide/3J Octamethylcyclotetrasiloxane (20.03)/8JN Unknown (26.13)/6J	MW-2, MW-3, MW-4, MW-6D
24997	Field (FB100192)	Methylene chloride/2BJ Acetone/7BJ Unknown (4.54)/9J	MW-5, MW-5 FR (MW-104), MW-14

See last page for footnotes.

Table J3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/L)	Associated Ground-Water Samples
<u>Volatiles (continued)</u>			
25052	Field (FB100592)	Methylene chloride/5BJ Acetone/6BJ	MW-12D, MW-7, MW-7 FR (MW-105)
25071	Field (FB100692)	Methylene chloride/1J Hexane (5.59)/5JN	MW-1, MW-10, MW-10D, MW-13D
25091	Field (FB100792)	Methylene chloride/5BJ Hexane (5.62)/120JN	MW-4D, MW-9, MW-9 FR (MW-106)
<u>Semivolatiles</u>			
24744	Method (WMB - 01Oct92B/H3261)	bis(2-Ethylhexyl)phthalate/17 1,1'-Sulfonylbis[4-chlorobenzene] (30.58)/6JN	MW-6R, MW-8, FB092992
24950	Method (WMB - 05Oct92A/G8631)	Substituted 1,2-benzenedicarboxylic acid (33.31)/39J	FB093092, MW-2, MW-3, MW-4, MW-6D, FB100192, MW-5, MW-5 FR (MW-104), MW-14
24997	Method (WMB - 20Oct92A/H3479)	Unknown amide (35.24)/5J	MW-6D RE
25009	Method (WMB - 06Oct92B/G8680)	bis(2-Ethylhexyl)phthalate/1B cis-Terpin hydrate (16.86)/22JN Unknown (17.23)/6J Unknown (29.55)/3J	MW-11D MW-1D
25052	Method (WMB - 07Oct92B/G8691)	Unknown (15.60)/3J	MW-4D, FB100592, MW-105, MW-12D, MW-7

See last page for footnotes.

Table J3-3. Summary of Contaminated Method, Trip, and Field Blanks and Associated Ground-Water Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

SDG No.	Blank (Lab or Field ID/ File ID)	Compound or TIC (RT) Found/ Concentration (ug/L)	Associated Ground-Water Samples
24744	Field (FB092992)	bis(2-Ethylhexyl)phthalate/50	MW-6R, MW-8
24950	Field (FB093092)	bis(2-Ethylhexyl)phthalate/17	MW-6D, MW-2, MW-3, MW-4, MW-6D RE
24997	Field (FB100192)	bis(2-Ethylhexyl)phthalate/15	MW-5, MW-5 FR (MW-104), MW-14, MW-5 DL
25052	Field (FB100592)	bis(2-Ethylhexyl)phthalate/16	MW-7, MW-4D, MW-12D
25071	Field (FB100692)	bis(2-Ethylhexyl)phthalate/16 1,1'-Sulfonylbis[4-chlorobenzene] (30.34)/18JN	MW-1, MW-10, MW-10D, MW-13D
25091	Field (FB100792)	bis(2-Ethylhexyl)phthalate/41 1,1'-Sulfonylbis[4-chlorobenzene] (30.33)/3J Unknown (41.88)/21J	MW-9, MW-9S, ESSO-TAP

* The results for the VOC analysis of MW-7 FR (MW-105) have been reported for MW-7 in the remedial investigation report.

SDG N Sample delivery group number.

ID Identification.

TIC Tentatively-identified compound.

RT Retention time in minutes.

ug/L Micrograms per liter.

J Result is detected below the reporting limit and/or is an estimated concentration.

B Analyte is detected in the laboratory blank.

N Presumptive evidence to make a tentative identification.

RE Reanalysis.

FR Field replicate of previous sample.

DL Dilution analysis.

tuturi-wp dv/tbld2.wk3

Table J3-4. Summary of Ground-Water Samples Qualified for Associated Blank Contamination, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Sample ID	Target Compound or TIC (RT)	Reported Result (ug/L)	Qualified Result (ug/L)
Volatiles	MW-8	Methylene chloride	3 BJ	10 U
	MW-6R	Methylene chloride	3 BJ	10 U
		Unknown (26.14)	5 J	R
	MW-6D	Methylene chloride	3 BJ	10 U
		Acetone	12	12 U
	MW-6D RE	Methylene chloride	2 BJ	10 U
		Acetone	11 B	11 U
	MW-2	Methylene chloride	2 BJ	10 U
		Acetone	6 J	10 U
		Octamethylcyclotetrasiloxane (20.04)	6 J	R
	MW-4	Methylene chloride	1 BJ	10 U
		Acetone	5 BJ	10 U
	MW-3	Methylene chloride	5 BJ	10 U
	MW-5	Methylene chloride	160 BJ	500 U
		1,1,2-Trichloro-1,2,2-trifluoroethane (4.38)	1100 J	R
	MW-5 FR (MW-104)	Methylene chloride	130 BJ	500 U
		1,1,2-Trichloro-1,2,2-trifluoroethane (4.48)	550 J	R
	MW-14	Methylene chloride	1 BJ	10 U
		Acetone	7 BJ	10 U
	MW-1D	Methylene chloride	4 BJ	20 U
		Acetone	22 B	22 U

Table J3-4. Summary of Ground-Water Samples Qualified for Associated Blank Contamination, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Sample ID	Target Compound or TIC (RT)	Reported Result (ug/L)	Qualified Result (ug/L)
Volatiles (continued)	MW-11D	Methylene chloride	1 BJ	10 U
		Acetone	12 B	12 U
	MW-11D RE	Acetone	8 J	10 U
	MW-12D	Methylene chloride	3 BJ	10 U
		Acetone	11 B	11 U
	MW-7	Methylene chloride	3 BJ	10 U
		Acetone	4 BJ	10 U
	MW-10	Methylene chloride	21 BJ	21 U
	MW-1	Methylene chloride	20 BJ	50 U
	MW-10D	Methylene chloride	28 BJ	50 U
	MW-4D	Methylene chloride	5 BJ	10 U
	MW-9	Methylene chloride	3 BJ	10 U
	MW-9 FR (MW-106)	Methylene chloride	5 BJ	10 U
	MW-9S	Methylene chloride	4 BJ	10 U
	MW-9S DL	Methylene chloride	62 DJ	170 U
	ESSO-TAP	Methylene chloride	2 J	10 U

Table J3-4. Summary of Ground-Water Samples Qualified for Associated Blank Contamination, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Sample ID	Target Compound or TIC (RT)	Reported Result (ug/L)	Qualified Result (ug/L)
Semivolatiles	MW-8	bis(2-Ethylhexyl)phthalate	10 B	10 U
	MW-6R	bis(2-Ethylhexyl)phthalate	64 B	64 U
	MW-6D	bis(2-Ethylhexyl)phthalate	5 J	10 U
	MW-6D RE	bis(2-Ethylhexyl)phthalate	6 J	10 U
	MW-2	bis(2-Ethylhexyl)phthalate	11	11 U
	MW-4	bis(2-Ethylhexyl)phthalate	56	56 U
	MW-3	bis(2-Ethylhexyl)phthalate	18	18 U
	MW-5	bis(2-Ethylhexyl)phthalate	22	22 U
	MW-5 DL	bis(2-Ethylhexyl)phthalate	31 DJ	50 U
	MW-5 FR (MW-104)	bis(2-Ethylhexyl)phthalate	22	22 U
	MW-14	bis(2-Ethylhexyl)phthalate	7 J	10 U
	MW-11D	bis(2-Ethylhexyl)phthalate	1 BJ	10 U
	MW-12D	bis(2-Ethylhexyl)phthalate	2 J	10 U
	MW-7	bis(2-Ethylhexyl)phthalate	1 J	10 U
	MW-4D	bis(2-Ethylhexyl)phthalate	1 J	10 U
	MW-10	bis(2-Ethylhexyl)phthalate	3 J	10 U
		1,1'-Sulfonylbis[4-chlorobenzene] (30.34)	3 J	R

Table J3-4. Summary of Ground-Water Samples Qualified for Associated Blank Contamination, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Sample ID	Target Compound or TIC (RT)	Reported Result (ug/L)	Qualified Result (ug/L)
Semivolatiles (continued)	MW-10D	bis(2-Ethylhexyl)phthalate	7 J	10 U
		1,1'-Sulfonylbis[4-chlorobenzene](30.31)	3 J	R
	MW-1	bis(2-Ethylhexyl)phthalate	30	30 U
		1,1'-Sulfonylbis[4-chlorobenzene](30.31)	3 J	R
	MW-13D	bis(2-Ethylhexyl)phthalate	23	23 U
		1,1'-Sulfonylbis[4-chlorobenzene](30.33)	3 J	R
	MW-9	bis(2-Ethylhexyl)phthalate	8 J	10 U
	MW-9S	bis(2-Ethylhexyl)phthalate	13	13 U
	ESSO-TAP	bis(2-Ethylhexyl)phthalate	6 J	14 U
		1,1'-Sulfonylbis[4-chlorobenzene](30.33)	3 J	R

ID	Identification.
TIC	Tentatively-identified compound.
RT	Retention time in minutes.
ug/L	Micrograms per liter.
J	Result is detected below the reporting limit and/or is an estimated concentration.
U	Compound or element analyzed for, but not detected at the corresponding reporting limit.
R	Sample results are rejected and will not be reported.
B	Analyte is detected in the laboratory blank.
FR	Field replicate.
RE	Reanalysis.
DL	Dilution analysis.
D	Analyte identified at a secondary dilution (when qualifier is appended to a sample result).

Table J3-5. Summary of Volatile and Semivolatile Calibration Outliers Associated with Ground-Water and Quality Control Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Calibration (Initial/Continuing)	Date Analyzed	File ID(s)	Outliers (RSD or %D)	Associated Samples
Volatiles					
	Initial (TCL)	8/3/92	C0280, C0282-C0285	2-Butanone (30.3)	All samples.
	Initial (non-TCL)	10/5/92	C1405-C1410	n-Propylbenzene (34.1)	All samples.
	Continuing (TCL)	10/5/92	C1404	Acetone (45.5) 2-Butanone (39.9) Bromoform (-28.3)	MB 05OCT92-A, TB092992, FB092992, MW-6R, MW-8, MB 05OCT92-A, TB093092, FB093092, MW-6D, MW-2, MW-4, MW-3
	Continuing (TCL)	10/6/92	C1424	Acetone (41.7) 2-Butanone (34.7) Bromoform (-42.2)	MB 06OCT92-A, TB100292, TB100192, FB100192, MW-5, MW-5 FR (MW-104), MW-14, MW-1D, MW-11D, MW-6D RE
	Continuing (TCL)	10/29/92	C1822	Vinyl chloride (-31.2) Acetone (32.8) 4-Methyl-2-pentanone (26.5) 2-Hexanone (31.3)	MB 29OCT92-A, MW-11D RE, TB100292 RE, MW-11D RE
	Continuing (TCL)	10/7/92	C1444	2-Butanone (32.4) Bromoform (-44.0)	MW-12D, MW-7 FR (MW-105), TB100592, FB100592, MW 07OCT92-A
	Continuing (TCL)	10/09/92	C1467	Acetone (31.9) 2-Butanone (45.1) Bromoform (-36.1) 4-Methyl-2-pentanone (25.1) 2-Hexanone (30.2)	MW-10, MW-10D, MW-1, TB100792, FB100792, MW-4D, MW-9, MW-9S, MW-9 FR (MW-106)

See last page for footnotes.
Tuturi-wp dv/tbld4.wk3

Table J3-5. Summary of Volatile and Semivolatile Calibration Outliers Associated with Ground-Water and Quality Control Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Calibration (Initial/Continuing)	Date Analyzed	File ID(s)	Outliers (RSD or %D)	Associated Samples
Volatiles (Continued)					
	Continuing (TCL)	10/16/92	C1567	Vinyl chloride (-25.7) Methylene chloride (26.5) Acetone (33.6) 2-Butanone (35.2) Bromoform (-28.3) 4-Methyl-2-pentanone (27.6) 2-Hexanone (30.2)	MB 16OCT92-D, MW-5 RE, MW-14 RE, FB100692 RE, TB100692, MW-13D, ESSO-TAP
	Continuing (TCL)	10/17/92	C1586	Methylene chloride (29.5) Acetone (46.0) 2-Butanone (43.8) Bromoform (-26.2) 4-Methyl-2-pentanone (27.9) 2-Hexanone (31.9)	MW-9 DL, MW-9S DL, MW-9 FR DL (MW-106 DL)
Semivolatiles					
	Continuing (TCL)	10/08/92	H3260	4-Chloroaniline (40.8) 3-Nitroaniline (54.7) 2,4-Dinitrophenol (25.2) 4-Nitrophenol (28.6) 4-Nitroaniline (29.6) Benzo(k)fluoranthene (-31.9)	WMB-01OCT92B
	Continuing (TCL)	10/15/92	H3384	Pentachlorophenol (31.6)	MW-6R, MW-8

See last page for footnotes.

Table J3-5. Summary of Volatile and Semivolatile Calibration Outliers Associated with Ground-Water and Quality Control Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Calibration (Initial/Continuing)	Date Analyzed	File ID(s)	Outliers (RSD or %D)	Associated Samples
Semivolatiles (Continued)					
	Continuing (TCL)	10/16/92	H3399	Hexachlorobutadiene (-28.3) 4-Nitrophenol (38.5) Pentachlorophenol (36.3) Butylbenzylphthalate (31.1) bis(2-Ethylhexyl)phthalate (30.3) Di-n-octylphthalate (33.3) 2,4,6-Tribromophenol (-42.0)	FB092992
	Continuing (TCL)	10/16/92	G8630	Butylbenzylphthalate (-33.4) bis(2-Ethylhexyl)phthalate (-28.2) Di-n-octylphthalate (-44.9) 2,4,6-Tribromophenol (37.5)	WMB-05OCT92A
	Continuing (TCL)	10/18/92	G8655	2,2'-oxybis(1-Chloropropane) (40.4) Hexachlorobenzene (28.1) Butylbenzylphthalate (-37.7) bis(2-Ethylhexyl)phthalate (-38.4) Di-n-octylphthalate (-49.8) 2,4,6-Tribromophenol (38.2)	MW-5, MW-14, MW-5 FR (MW-104)
	Continuing (TCL)	10/19/92	G8672	Butylbenzylphthalate (-33.1) bis(2-Ethylhexyl)phthalate (-26.9) Di-n-octylphthalate (-37.7)	MW-5 DL
	Continuing (TCL)	10/22/92	H3458	2,2'-oxybis(1-Chloropropane) (-30.9) 2,4-Dinitrophenol (42.6) 3,3'-Dichlorobenzidine (-27.3) Di-n-octylphthalate (28.7) 2,4,6-Tribromophenol (-46.1)	MW-6D RE

Table J3-5. Summary of Volatile and Semivolatile Calibration Outliers Associated with Ground-Water and Quality Control Samples Collected in September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Calibration (Initial/Continuing)	Date Analyzed	File ID(s)	Outliers (RSD or %D)	Associated Samples
<u>Semivolatiles (Continued)</u>					
	Continuing (TCL)	10/23/92	H3477	2,2'-oxybis(1-Chloropropane) (-40.5) Pentachlorophenol (25.6) 2,4,6-Tribromophenol (-26.9)	WMB-20OCT92A
	Continuing (TCL)	10/20/92	G8686	2,4-Dinitrophenol (37.2) Pentachlorophenol (37.3) Di-n-octylphthalate (-30.8) Dibenz(a,h)anthracene (-29.0) 2,4,6-Tribromophenol (40.4)	MW-5 FR DL (MW-104 DL)
	Continuing (TCL)	10/21/92	G8703	Pentachlorophenol (26.9) 2,4,6-Tribromophenol (27.9)	WMB-10OCT92A
	Continuing (TCL)	10/22/92	G8719	Hexachloroethane (-29.6) 4-Nitrophenol (-28.5) Butylbenzylphthalate (-26.9) Di-n-octylphthalate (-28.5)	MW-10, MW-10D, MW-1, MW-13D, FB100692

ID Identification.
 RSD Relative standard deviation expressed as a percentage.
 %D Percent difference.
 TCL Target compound list of the U.S. Environmental Protection Agency March 1990 organic routine analytical services statement of work.
 FR Field replicate of previous sample.
 DL Dilution analysis.
 RE Reanalysis.
 MB Method blank/numerical suffix denotes analysis date and batch ID.
 WMB Water method blank for aqueous semivolatiles extraction; numerical suffix denotes analysis data and batch ID.

Table J3-6. Summary of Matrix Spike and Matrix Spike Duplicate Outliers for Ground-Water Samples Collected September and October 1992, Tutu Service Station Investigation, St. Thomas, U.S. Virgin Islands.

Analytical Parameter	Sample ID	Accuracy			
		Compound	Acceptance Range (%R)	MS (%R)	MSD (%R)
Volatiles	MW-11 D	1,1-Dichloroethene	61 to 145	55	-
		Toluene	76 to 125	67	75
Semivolatiles	MW-11 D	Phenol	12 to 110	1	1
		2-Chlorophenol	27 to 123	4	5
		4-Chloro-3-methylphenol	23 to 97	1	1
		Acenaphthene	46 to 118	2	2
		2,4-Dinitrotoluene	24 to 96	-	99
		Pentachlorophenol	9 to 103	-	108
		Pyrene	26 to 127	4	5

ID Identification.
 %R Percent recovery.
 MS Matrix spike.
 MSD Matrix spike duplicate.
 - No outlier found.

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