GERAGHTY & MILLER, INC.
Environmental Services

Ground Water *Engineering* *Hydrocarbon* *Remediation* *Education*

December 20, 1993

Caroline Kwan
Project Manager
U.S. Environmental Protection Agency - Region II
26 Federal Plaza, Room 737
New York, New York 10278

Re: Phase II Remedial Investigation Work Plan, Tutu Wells Site, St. Thomas, U.S. Virgin Islands.

Dear Ms. Kwan:

On behalf of Ana Gloria Ramos, Designated Coordinator of the Tutu Environmental Investigation Committee (TEIC), Geraghty & Miller, Inc. is submitting three copies of the two-volume Phase II Remedial Investigation (RI) Work Plan Tutu Wells Site for your review. We understand you will forward one of these copies to CDM Federal Programs. This work plan has been reviewed by the members of the newly formed Tutu Potentially Responsible Party (PRP) Committee prior to submittal to the U.S. Environmental Protection Agency (USEPA).

Additional copies of this work plan have been shipped directly to the U.S. Virgin Islands Department of Planning and Natural Resources (DPNR) and USEPA personnel in Puerto Rico as indicated in the copy list below. Members of the Tutu PRP Committee will also be receiving copies of this work plan.

201 West Passaic Street, 3rd Floor • Rochelle Park, New Jersey 07662 • (201) 909-0700 • FAX (201) 909-0567/0568

We hope this Phase II RI Work Plan addresses the USEPA's concerns. If you have any questions, please contact Ana Gloria Ramos at (809) 749-8943.

Sincerely,

GERAGHTY & MILLER, INC.

Marie F. McDonnell
Project Scientist

Thomas V. Danahy
Senior Scientist/Project Manager

Daniel A. Nachman
Vice President/Project Officer

Enclosures

c: Andrew Prashak, Esq. - USEPA (PR office)
Jose Font - USEPA (PR office)
Leonard Reed - DPNR (2 copies)
Clifford Crooke - DPNR
Ana Gloria Ramos - Tutu Environmental Investigation Committee
Paul Ryan - Texaco, Inc.

DAN:nr
PR0013.***-WP1/122093.ltr

PHASE II REMEDIAL INVESTIGATION
WORK PLAN
TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN ISLANDS

VOLUME 2 OF 2

December 1993

Prepared for

Tutu Environmental Investigation Committee

Prepared by

Geraghty & Miller, Inc.
201 West Passaic Street
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TUT 005 0232

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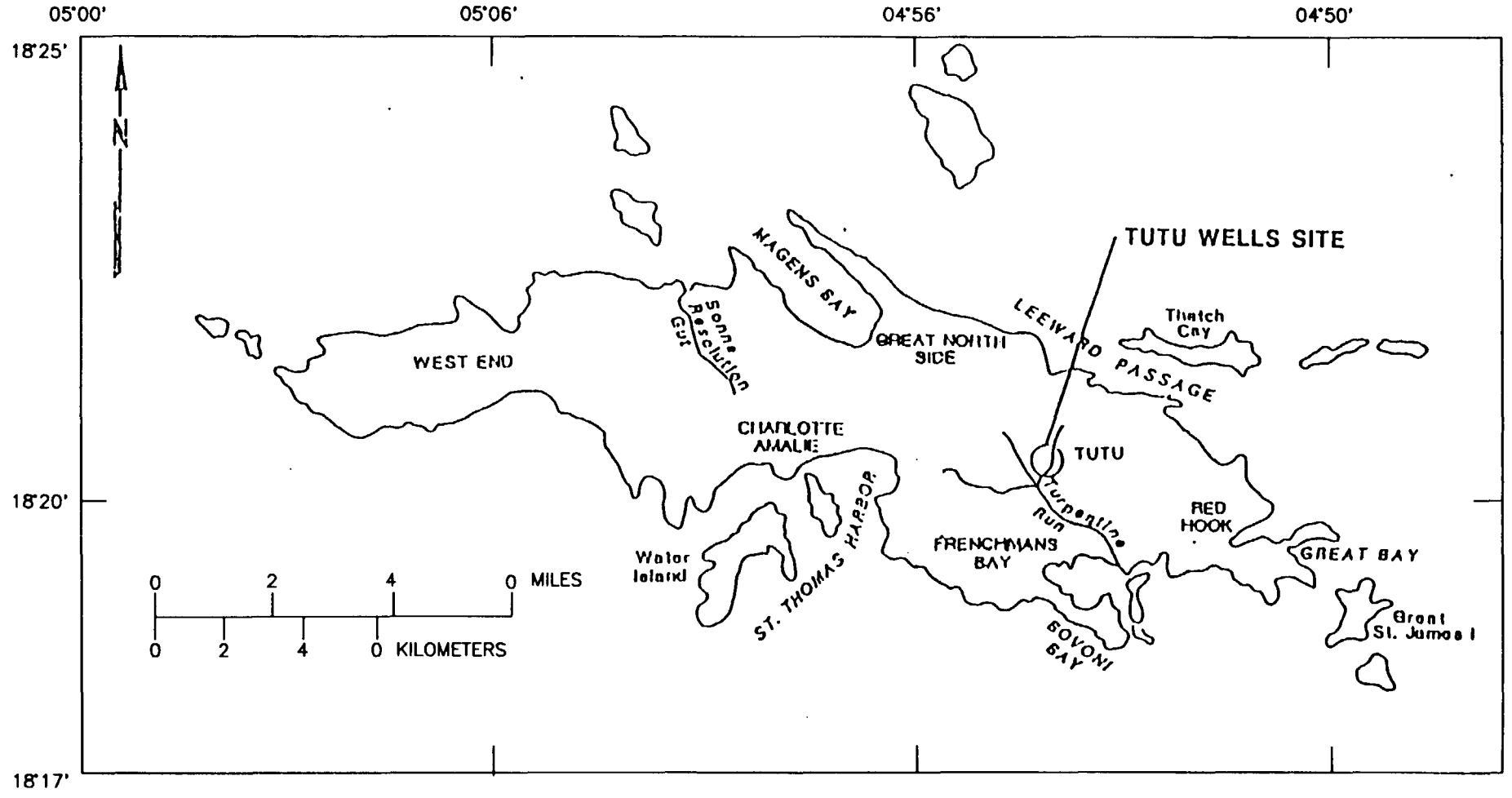
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APPENDIX

A. Soil-Gas Survey Procedures, Tutu Wells Site, St. Thomas, U.S. Virgin Islands.

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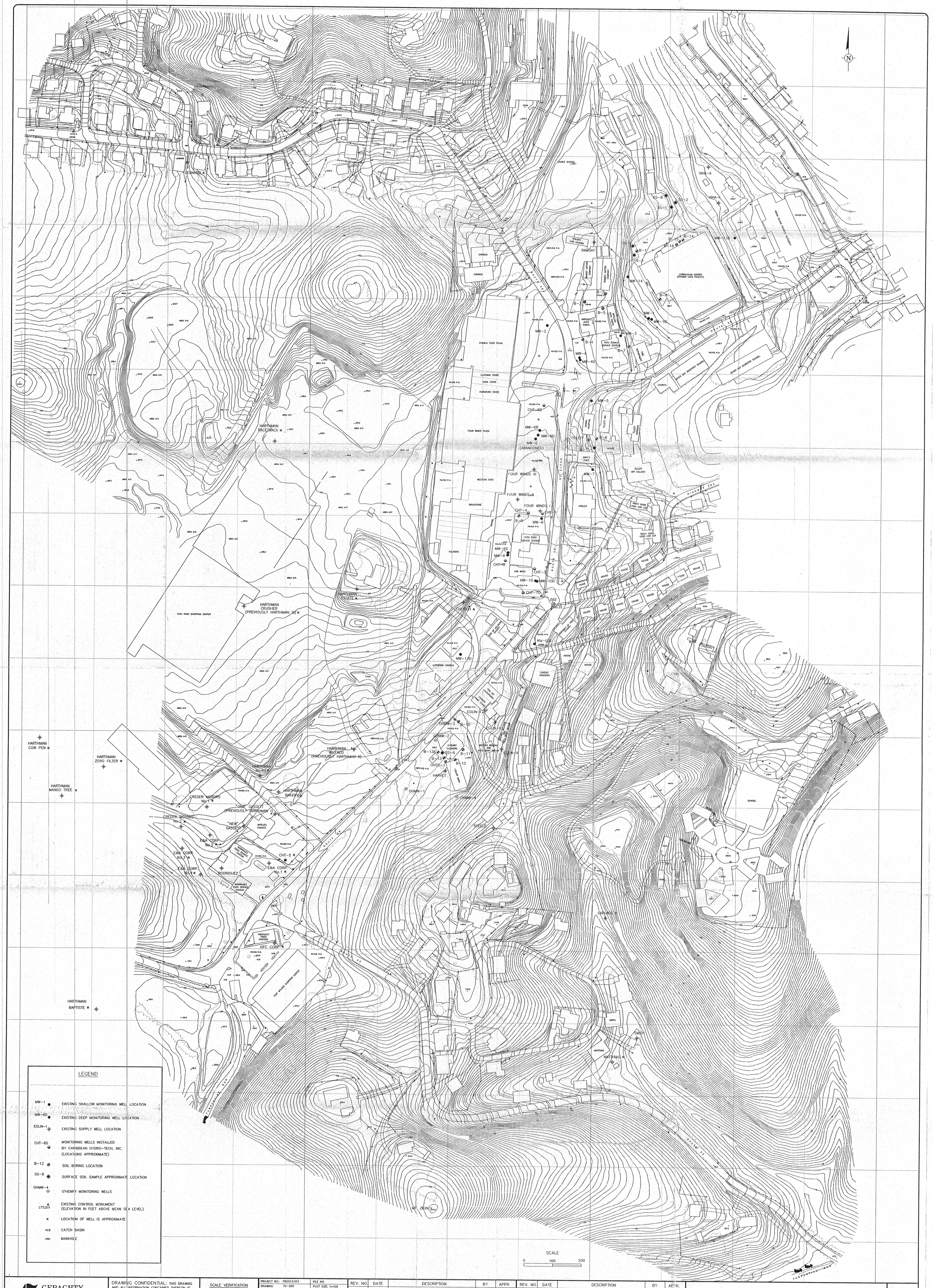
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SITE LOCATION

TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE
2-1

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BASE MAP

TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE
2-2

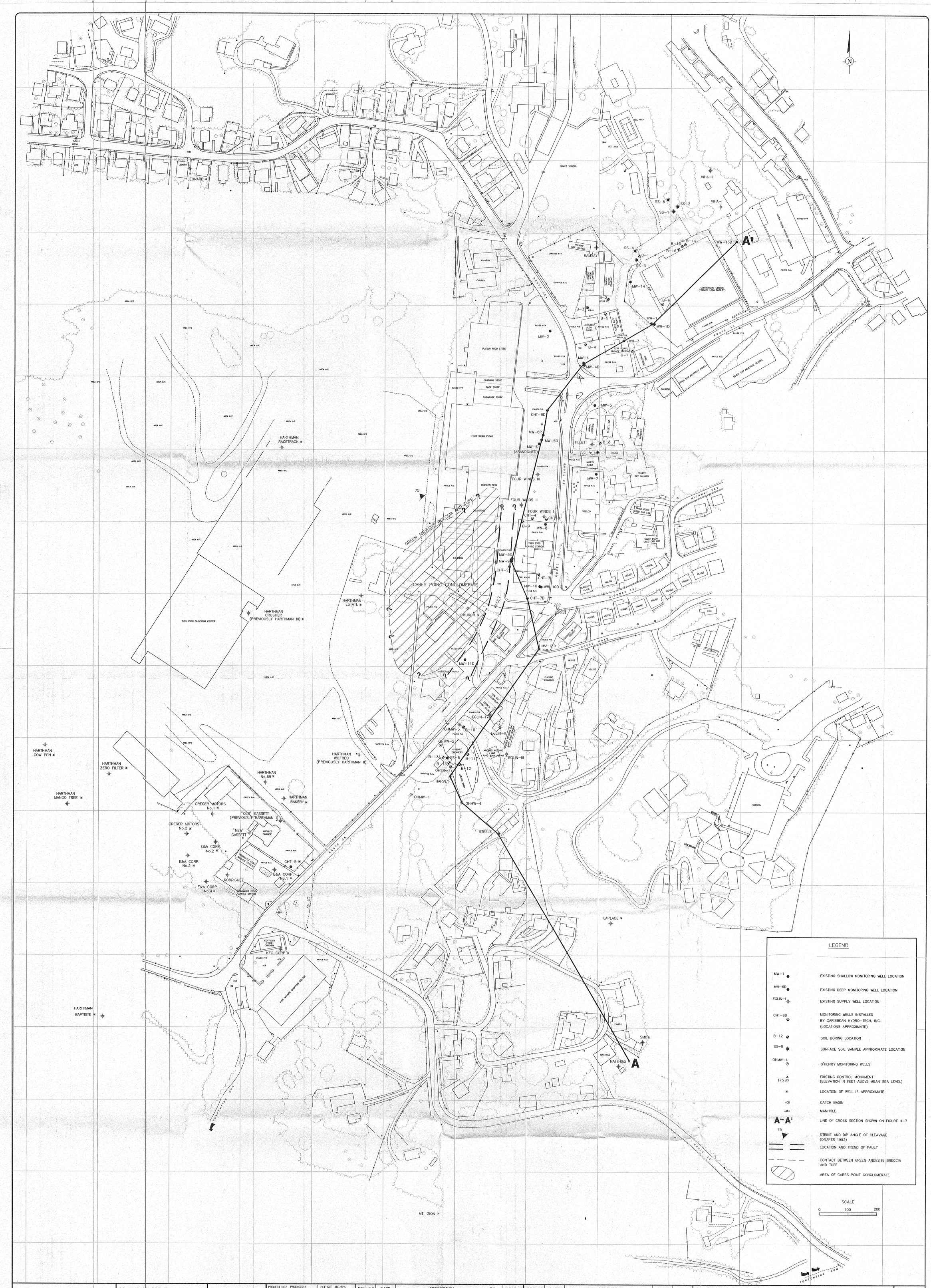
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FIGURE 2-2
BASE MAP

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MW-6D ●	EXISTING DEEP MONITORING WELL LOCATION
EGLIN-I ⊕	EXISTING SUPPLY WELL LOCATION
CHT-6D ◒	MONITORING WELLS INSTALLED BY CARIBBEAN HYDRO-TECH, INC. (LOCATIONS APPROXIMATE)
B-12 ◒	SOIL BORING LOCATION
SS-8 ✸	SURFACE SOIL SAMPLE APPROXIMATE LOCATION
OHMW-4 ⊙	O'HENRY MONITORING WELLS
175.89 △	EXISTING CONTROL MONUMENT (ELEVATION IN FEET ABOVE MEAN SEA LEVEL)
✳	LOCATION OF WELL IS APPROXIMATE
▫CB	CATCH BASIN
▫MH	MANHOLE
A-A'	LINE OF CROSS SECTION SHOWN ON FIGURE 4-7
75 ➤	STRIKE AND DIP ANGLE OF CLEAVAGE (DRAPER 1993)
	LOCATION AND TREND OF FAULT
	CONTACT BETWEEN GREEN ANDESITE BRECCIA AND TUFF
	AREA OF CABES POINT CONGLOMERATE

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BEDROCK SURFICIAL MAP WITH LOCATION OF MONITORING WELLS, SUPPLY WELLS, AND LINE OF CROSS SECTION

TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE **2-3**

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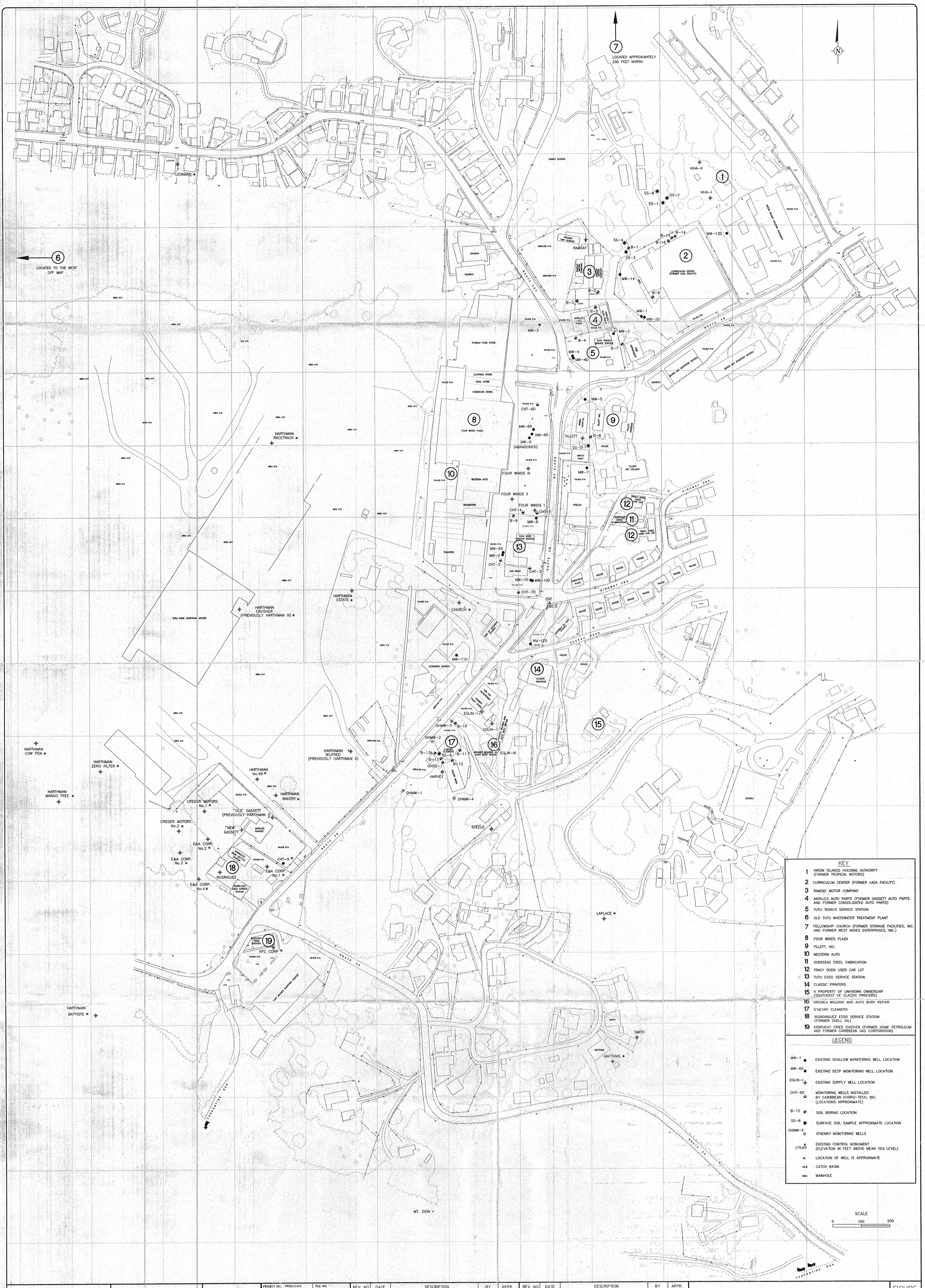
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TUTU WELLS SUPERFUND SITE
FIGURE 2-3
BEDROCK SURFICIAL MAP WITH LOCATION OF MONITORING WELLS, SUPPLY WELLS, AND LINE OF CROSS SECTION

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KEY

1. VIRGIN ISLANDS HOUSING AUTHORITY (FORMER TROPICAL MOTORS)
2. CURRICULUM CENTER (FORMER LAGA FACILITY)
3. RAMSAY MOTOR COMPANY
4. ANTILLES AUTO PARTS (FORMER GASSETT AUTO PARTS AND FORMER CONSOLIDATED AUTO PARTS)
5. TUTU TEXACO SERVICE STATION
6. OLD TUTU WASTEWATER TREATMENT PLANT
7. FELLOWSHIP CHURCH (FORMER STORAGE FACILITIES, INC. AND FORMER WEST INDIES ENTERPRISES, INC.)
8. FOUR WINDS PLAZA
9. TILLETT, INC.
10. WESTERN AUTO
11. OVERSEAS STEEL FABRICATION
12. TRACY DODD USED CAR LOT
13. TUTU ESSO SERVICE STATION
14. CLASSIC PRINTERS
15. A PROPERTY OF UNKNOWN OWNERSHIP (SOUTHEAST OF CLASSIC PRINTERS)
16. ARCHIES WELDING AND AUTO BODY REPAIR
17. O'HENRY CLEANERS
18. RODIGRIGUEZ ESSO SERVICE STATION (FORMER SHELL OIL)
19. KENTUCKY FRIED CHICKEN (FORMER HOME PETROLEUM AND FORMER CARIBBEAN GAS CORPORATION)

LEGEND

- MW-1 ● EXISTING SHALLOW MONITORING WELL LOCATION
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- SS-8 ✱ SURFACE SOIL SAMPLE APPROXIMATE LOCATION
- OHMW-4 ⊙ O'HENRY MONITORING WELLS
- 175.89 △ EXISTING CONTROL MONUMENT (ELEVATION IN FEET ABOVE MEAN SEA LEVEL)
- ✳ LOCATION OF WELL IS APPROXIMATE
- CB CATCH BASIN
- MH MANHOLE

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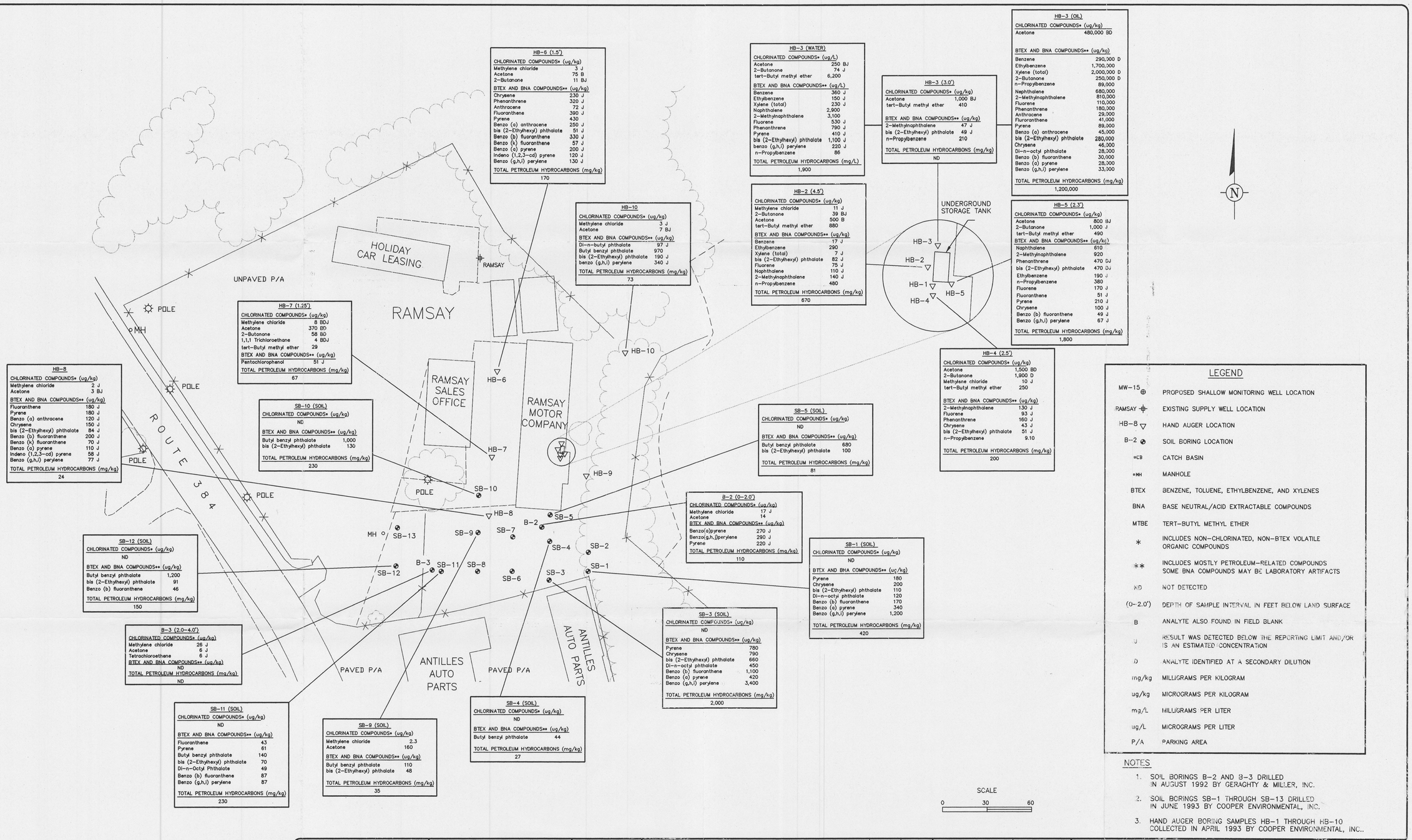
PROJECT NO.: PR0013.013	FILE NO:
DRAWING: TU-280	PLOT SIZE: 1=100
DRAFTED BY: E. EAGLESTON	DATE: 12-16-93
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REV. NO.	DATE	DESCRIPTION	BY	APPR.	REV. NO.	DATE	DESCRIPTION	BY	APPR.

LOCATIONS OF POTENTIAL SOURCE FACILITIES

TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE
4-1



HB-6 (1.5')

CHLORINATED COMPOUNDS* (ug/kg)	
Methylene chloride	3 J
Acetone	75 B
2-Butanone	11 BJ
BTEX AND BNA COMPOUNDS (ug/kg)	
Chrysene	230 J
Phenanthrene	320 J
Anthracene	72 J
Fluoranthene	390 J
Pyrene	430
Benzo (a) anthracene	250 J
bis (2-Ethylhexyl) phthalate	51 J
Benzo (b) fluoranthene	330 J
Benzo (k) fluoranthene	57 J
Benzo (a) pyrene	200 J
Indeno (1,2,3-cd) pyrene	120 J
Benzo (g,h,i) perylene	130 J
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
170	

HB-10

CHLORINATED COMPOUNDS* (ug/kg)	
Methylene chloride	3 J
Acetone	7 BJ
BTEX AND BNA COMPOUNDS (ug/kg)	
Di-n-butyl phthalate	97 J
Butyl benzyl phthalate	970
bis (2-Ethylhexyl) phthalate	190 J
benzo (g,h,i) perylene	340 J
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
73	

HB-7 (1.25')

CHLORINATED COMPOUNDS* (ug/kg)	
Methylene chloride	8 BDJ
Acetone	370 BD
2-Butanone	58 BD
1,1,1 Trichloroethane	4 BDJ
tert-Butyl methyl ether	29
BTEX AND BNA COMPOUNDS (ug/kg)	
Pentachlorophenol	51 J
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
67	

HB-8

CHLORINATED COMPOUNDS* (ug/kg)	
Methylene chloride	2 J
Acetone	3 BJ
BTEX AND BNA COMPOUNDS (ug/kg)	
Fluoranthene	180 J
Pyrene	180 J
Benzo (a) anthracene	120 J
Chrysene	150 J
bis (2-Ethylhexyl) phthalate	84 J
Benzo (b) fluoranthene	200 J
Benzo (k) fluoranthene	70 J
Benzo (a) pyrene	110 J
Indeno (1,2,3-cd) pyrene	58 J
Benzo (g,h,i) perylene	77 J
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
24	

SB-10 (SOIL)

CHLORINATED COMPOUNDS* (ug/kg)	
ND	
BTEX AND BNA COMPOUNDS (ug/kg)	
Butyl benzyl phthalate	1,000
bis (2-Ethylhexyl) phthalate	130
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
230	

SB-12 (SOIL)

CHLORINATED COMPOUNDS* (ug/kg)	
ND	
BTEX AND BNA COMPOUNDS (ug/kg)	
Butyl benzyl phthalate	1,200
bis (2-Ethylhexyl) phthalate	91
Benzo (b) fluoranthene	46
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
150	

B-3 (2.0-4.0')

CHLORINATED COMPOUNDS* (ug/kg)	
Methylene chloride	26 J
Acetone	6 J
Tetrachloroethene	6 J
BTEX AND BNA COMPOUNDS (ug/kg)	
ND	
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
ND	

SB-11 (SOIL)

CHLORINATED COMPOUNDS* (ug/kg)	
ND	
BTEX AND BNA COMPOUNDS (ug/kg)	
Fluoranthene	43
Pyrene	61
Butyl benzyl phthalate	140
bis (2-Ethylhexyl) phthalate	70
Di-n-Octyl Phthalate	49
Benzo (b) fluoranthene	87
Benzo (g,h,i) perylene	87
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
230	

SB-9 (SOIL)

CHLORINATED COMPOUNDS* (ug/kg)	
Methylene chloride	2.3
Acetone	160
BTEX AND BNA COMPOUNDS (ug/kg)	
Butyl benzyl phthalate	110
bis (2-Ethylhexyl) phthalate	48
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
35	

SB-4 (SOIL)

CHLORINATED COMPOUNDS* (ug/kg)	
ND	
BTEX AND BNA COMPOUNDS (ug/kg)	
Butyl benzyl phthalate	44
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
27	

SB-3 (SOIL)

CHLORINATED COMPOUNDS* (ug/kg)	
ND	
BTEX AND BNA COMPOUNDS (ug/kg)	
Pyrene	780
Chrysene	790
bis (2-Ethylhexyl) phthalate	660
Di-n-octyl phthalate	450
Benzo (b) fluoranthene	1,100
Benzo (a) pyrene	420
Benzo (g,h,i) perylene	3,400
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
2,000	

B-2 (0-2.0')

CHLORINATED COMPOUNDS* (ug/kg)	
Methylene chloride	17 J
Acetone	14
BTEX AND BNA COMPOUNDS (ug/kg)	
Benzo(a)pyrene	270 J
Benzo(g,h,i)perylene	290 J
Pyrene	220 J
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
110	

SB-1 (SOIL)

CHLORINATED COMPOUNDS* (ug/kg)	
ND	
BTEX AND BNA COMPOUNDS (ug/kg)	
Pyrene	180
Chrysene	200
bis (2-Ethylhexyl) phthalate	110
Di-n-octyl phthalate	120
Benzo (b) fluoranthene	170
Benzo (a) pyrene	340
Benzo (g,h,i) perylene	1,200
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
420	

SB-5 (SOIL)

CHLORINATED COMPOUNDS* (ug/kg)	
ND	
BTEX AND BNA COMPOUNDS (ug/kg)	
Butyl benzyl phthalate	680
bis (2-Ethylhexyl) phthalate	100
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
81	

HB-3 (WATER)

CHLORINATED COMPOUNDS* (ug/L)	
Acetone	250 BJ
2-Butanone	74 J
tert-Butyl methyl ether	6,200
BTEX AND BNA COMPOUNDS (ug/L)	
Benzene	360 J
Ethylbenzene	150 J
Xylene (total)	230 J
Naphthalene	2,900
2-Methylnaphthalene	3,100
Fluorene	530 J
Phenanthrene	790 J
Pyrene	410 J
bis (2-Ethylhexyl) phthalate	1,100 J
benzo (g,h,i) perylene	220 J
n-Propylbenzene	86
TOTAL PETROLEUM HYDROCARBONS (mg/L)	
1,900	

HB-2 (4.5')

CHLORINATED COMPOUNDS* (ug/kg)	
Methylene chloride	11 J
2-Butanone	39 BJ
Acetone	500 B
tert-Butyl methyl ether	880
BTEX AND BNA COMPOUNDS (ug/kg)	
Benzene	17 J
Ethylbenzene	290
Xylene (total)	7 J
bis (2-Ethylhexyl) phthalate	82 J
Fluorene	75 J
Naphthalene	110 J
2-Methylnaphthalene	140 J
n-Propylbenzene	480
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
670	

HB-3 (3.0')

CHLORINATED COMPOUNDS* (ug/kg)	
Acetone	1,000 BJ
tert-Butyl methyl ether	410
BTEX AND BNA COMPOUNDS (ug/kg)	
2-Methylnaphthalene	47 J
bis (2-Ethylhexyl) phthalate	49 J
n-Propylbenzene	210
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
ND	

HB-4 (2.5')

CHLORINATED COMPOUNDS* (ug/kg)	
Acetone	1,500 BD
2-Butanone	1,900 D
Methylene chloride	10 J
tert-Butyl methyl ether	250
BTEX AND BNA COMPOUNDS (ug/kg)	
2-Methylnaphthalene	130 J
Fluorene	93 J
Phenanthrene	160 J
Chrysene	43 J
bis (2-Ethylhexyl) phthalate	51 J
n-Propylbenzene	9.10
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
200	

HB-3 (OIL)

CHLORINATED COMPOUNDS* (ug/kg)	
Acetone	480,000 BD
BTEX AND BNA COMPOUNDS (ug/kg)	
Benzene	290,000 D
Ethylbenzene	1,700,000
Xylene (total)	2,000,000 D
2-Butanone	250,000 D
n-Propylbenzene	89,000
Naphthalene	680,000
2-Methylnaphthalene	810,000
Fluorene	110,000
Phenanthrene	180,000
Anthracene	29,000
Fluoranthene	41,000
Pyrene	89,000
Benzo (a) anthracene	45,000
bis (2-Ethylhexyl) phthalate	280,000
Chrysene	46,000
Di-n-octyl phthalate	28,000
Benzo (b) fluoranthene	30,000
Benzo (a) pyrene	28,000
Benzo (g,h,i) perylene	33,000
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
1,200,000	

HB-5 (2.3')

CHLORINATED COMPOUNDS* (ug/kg)	
Acetone	800 BJ
2-Butanone	1,000 J
tert-Butyl methyl ether	490
BTEX AND BNA COMPOUNDS (ug/kg)	
Naphthalene	610
2-Methylnaphthalene	920
Phenanthrene	470 DJ
bis (2-Ethylhexyl) phthalate	470 DJ
Ethylbenzene	190 J
n-Propylbenzene	380
Fluorene	170 J
Fluoranthene	51 J
Pyrene	210 J
Chrysene	100 J
Benzo (b) fluoranthene	49 J
Benzo (g,h,i) perylene	67 J
TOTAL PETROLEUM HYDROCARBONS (mg/kg)	
1,800	

LEGEND

MW-15 ⊕	PROPOSED SHALLOW MONITORING WELL LOCATION
RAMSAY ⊕	EXISTING SUPPLY WELL LOCATION
HB-8 ▽	HAND AUGER LOCATION
B-2 ⊘	SOIL BORING LOCATION
▫CB	CATCH BASIN
◦MH	MANHOLE
BTEX	BENZENE, TOLUENE, ETHYLBENZENE, AND XYLENES
BNA	BASE NEUTRAL/ACID EXTRACTABLE COMPOUNDS
MTBE	TERT-BUTYL METHYL ETHER
*	INCLUDES NON-CHLORINATED, NON-BTEX VOLATILE ORGANIC COMPOUNDS
**	INCLUDES MOSTLY PETROLEUM-RELATED COMPOUNDS SOME BNA COMPOUNDS MAY BE LABORATORY ARTIFACTS
ND	NOT DETECTED
(0-2.0')	DEPTH OF SAMPLE INTERVAL IN FEET BELOW LAND SURFACE
B	ANALYTE ALSO FOUND IN FIELD BLANK
J	RESULT WAS DETECTED BELOW THE REPORTING LIMIT AND/OR IS AN ESTIMATED CONCENTRATION
D	ANALYTE IDENTIFIED AT A SECONDARY DILUTION
mg/kg	MILLIGRAMS PER KILOGRAM
ug/kg	MICROGRAMS PER KILOGRAM
mg/L	MILLIGRAMS PER LITER
ug/L	MICROGRAMS PER LITER
P/A	PARKING AREA

NOTES

1. SOIL BORINGS B-2 AND B-3 DRILLED IN AUGUST 1992 BY GERAGHTY & MILLER, INC.
2. SOIL BORINGS SB-1 THROUGH SB-13 DRILLED IN JUNE 1993 BY COOPER ENVIRONMENTAL, INC.
3. HAND AUGER BORING SAMPLES HB-1 THROUGH HB-10 COLLECTED IN APRIL 1993 BY COOPER ENVIRONMENTAL, INC..

SOURCES: COOPER ENVIRONMENTAL, INC. (1993).
GERAGHTY & MILLER, INC. (1993a)

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APPROVED BY: T. DANAHY	DATE: 12-15-93

RAMSAY MOTOR COMPANY
SOIL AND GROUNDWATER ANALYTICAL RESULTS FOR SAMPLES COLLECTED BY COOPER ENVIRONMENTAL, INC. IN APRIL AND JULY 1993

TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE
4-3

EPA REGION II
SCANNING TRACKING SHEET

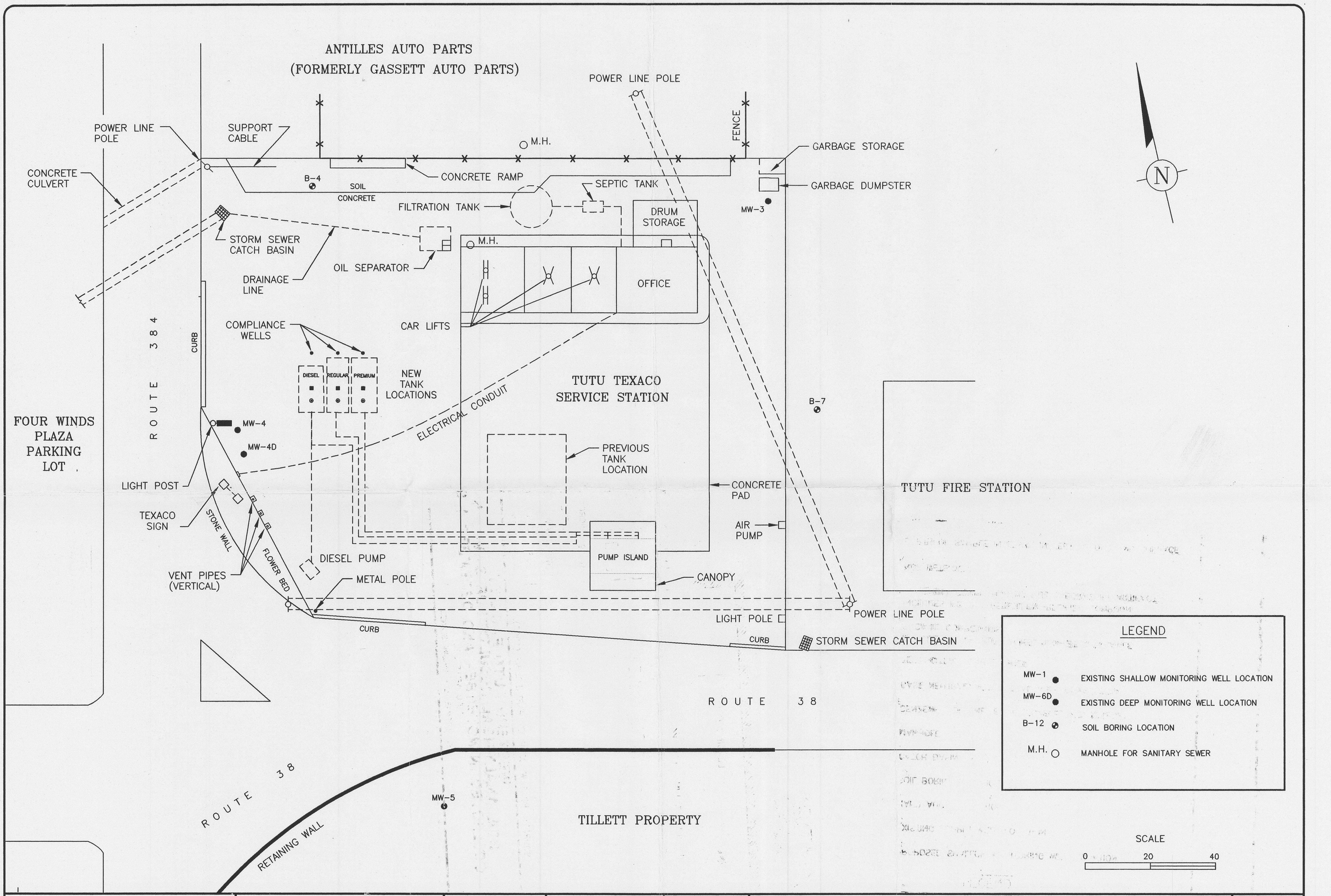
DOC ID # 64546

DOC TITLE/SUBJECT:

TUTU WELLS SUPERFUND SITE
FIGURE 4-3
RAMSAY MOTOR COMPANY SOIL AND GROUNDWATER ANALYTICAL RESULTS FOR SAMPLES COLLECTED BY COOPER ENVIRONMENTAL, INC. IN APRIL AND JULY 1993

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DRAFTED BY: J. DE SOUZA	DATE: 12-15-93
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SITE PLAN OF TUTU TEXACO SERVICE STATION

TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE
4-4

EPA REGION II
SCANNING TRACKING SHEET

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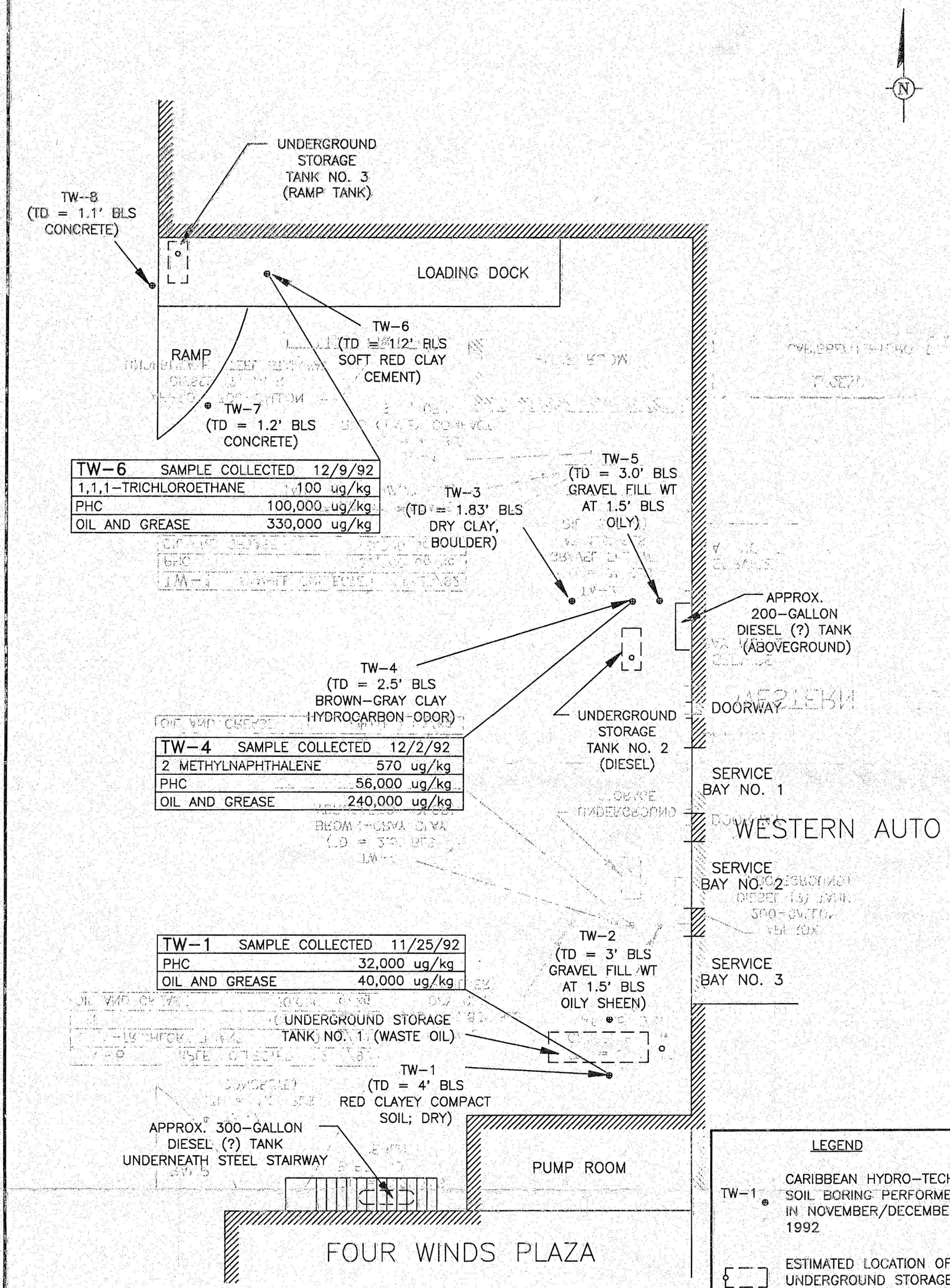
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TUTU WELLS SUPERFUND SITE
FIGURE 4-4
SITE PLAN OF TUTU TEXACO SERVICE STATION

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SOURCE: FOUR WINDS PLAZA PARTNERSHIP (1993).

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WESTERN AUTO FACILITY
SOIL ANALYTICAL RESULTS FOR SAMPLES COLLECTED IN NOVEMBER AND DECEMBER 1992

TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE
4-5

EPA REGION II
SCANNING TRACKING SHEET

DOC ID # 64546

DOC TITLE/SUBJECT:

TUTU WELLS SUPERFUND SITE
FIGURE 4-5
WESTERN AUTO FACILITY SOIL ANALYTICAL RESULTS FOR SAMPLES COLLECTED IN NOVEMBER AND DECEMBER 1992

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B-109	(0.0–2.0')	(4.0'–6.0')	(8.0'–9.5')
CHLORINATED COMPOUNDS (ug/kg)			
Tetrachloroethene	ND	ND	10.46
BTEX AND BNA COMPOUNDS (ug/kg)			
	ND	ND	ND

B-105	(0.0–1.5')
CHLORINATED COMPOUNDS (ug/kg)	
	ND
BTEX AND BNA COMPOUNDS (ug/kg)	
	ND

B-107	(0.0–1.5')	(4.0'–5.5')
CHLORINATED COMPOUNDS (ug/kg)		
	ND	ND
BTEX AND BNA COMPOUNDS (ug/kg)		
	ND	ND

B-104 NOT DRILLED DUE TO A THICK CONCRETE SLAB

B-108	(0.0–1.5')	(4.0'–6.0')	(7.5'–8.5')
CHLORINATED COMPOUNDS (ug/kg)			
	ND	ND	ND
BTEX AND BNA COMPOUNDS (ug/kg)			
	ND	ND	ND

B-101	(0.0–1.5')	(4.0'–4.75')	(8.0'–10.0')	(10.0'–12.0')
CHLORINATED COMPOUNDS (ug/kg)				
	ND	ND	ND	ND
BTEX AND BNA COMPOUNDS (ug/kg)				
Ethylbenzene	ND	ND	ND	303.5
Toluene	ND	ND	27.8	548.3
Methylxylene	ND	ND	59.6	1,008.5
o–p Xylene	ND	ND	108.3	1,286.4

B-103	(0.0–1.0')	(2.0'–2.5')	(5.0'–5.5')	(7.0'–7.5')
CHLORINATED COMPOUNDS (ug/kg)				
Tetrachloroethene	394.3	85.1	ND	ND
BTEX AND BNA COMPOUNDS (ug/kg)				
Benzene	ND	ND	ND	5.5
Ethylbenzene	ND	ND	ND	25.9
o–p Xylene	ND	ND	ND	6.1

B-106	(0.5–1.0')	(2.5'–3.0')	(4.0'–4.25')
CHLORINATED COMPOUNDS (ug/kg)			
	ND	ND	ND
BTEX AND BNA COMPOUNDS (ug/kg)			
	ND	ND	ND

B-102	(0.0–1.5')	(4.0'–6.0')	(8.0'–10.0')	(10.0'–12.0')
CHLORINATED COMPOUNDS (ug/kg)				
	ND	ND	ND	ND
BTEX AND BNA COMPOUNDS (ug/kg)				
Benzene	ND	ND	ND	625.0
Ethylbenzene	ND	58.2	1,116.9	1,037.0
Toluene	ND	ND	ND	ND
Methylxylene	ND	ND	425.6	575.0
o–p Xylene	ND	ND	714.9	NA

DRUGSTORE
VITELCO
FOUR WINDS PLAZA
PAVED P/A
TUTU ESSO SERVICE STATION
HOLDING TANK
UNDERGROUND FUEL TANKS
OIL/WATER SEPARATOR
CAR WASH
ROUTE 38
DOROTHY'S PLACE
FOUR WINDS I
MW-17
MW-9S
MW-9
MW-10
MW-10D
MW-8
B-9
B-101
B-102
B-103
B-104
B-105
B-106
B-107
B-108
B-109
CHT-1
CHT-2
CHT-3
CHT-4
CHT-7D
MH

SCALE
0 50 100

SOURCE: SOIL–TECH CORPORATION (1990b).

LEGEND

MW-18 ⊕	PROPOSED SHALLOW MONITORING WELL LOCATION
MW-1 ●	EXISTING SHALLOW MONITORING WELL LOCATION
MW-6D ●	EXISTING DEEP MONITORING WELL LOCATION
FOUR WINDS I ⊕	EXISTING SUPPLY WELL LOCATION
CHT-6D ◒	MONITORING WELLS INSTALLED BY CARIBBEAN HYDRO–TECH, INC. (LOCATIONS APPROXIMATE)
B-12 ◒	SOIL BORING LOCATION
175.89 ▲	EXISTING CONTROL MONUMENT (ELEVATION IN FEET ABOVE MEAN SEA LEVEL)
*	LOCATION OF WELL IS APPROXIMATE
∘MH	MANHOLE
BTEX	BENZENE, TOLUENE, ETHYLBENZENE, AND XYLENES
BNA	BASE NEUTRAL/ACID EXTRACTABLE COMPOUNDS
ND	NOT DETECTED
NA	NOT ANALYZED
(0–2.0')	DEPTH OF SAMPLE INTERVAL IN FEET BELOW LAND SURFACE
J	RESULT WAS DETECTED BELOW THE REPORTING LIMIT AND/OR IS AN ESTIMATED CONCENTRATION
ug/kg	MICROGRAMS PER KILOGRAM
P/A	PARKING AREA

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TUTU ESSO SERVICE STATION SOIL ANALYTICAL RESULTS FOR SAMPLES COLLECTED BY SOIL TECH CORPORATION IN DECEMBER 1989

TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE
4-6

EPA REGION II
SCANNING TRACKING SHEET

DOC ID # 64546

DOC TITLE/SUBJECT:

TUTU WELLS SUPERFUND SITE
FIGURE 4-6
TUTU ESSO SERVICE STATION SOIL ANALYTICAL RESULTS FOR SAMPLES COLLECTED BY SOIL TECH CORPORATION IN DECEMBER 1989

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SS-6FR
CHLORINATED COMPOUNDS* (ppb)
Methylene chloride 22
BTEX AND BNA COMPOUNDS** (ppb)
Butyl benzyl phthalate 75 J
Di-n-butyl phthalate 62 J
TOTAL PETROLEUM HYDROCARBONS (ppm)
NA

SS-6
CHLORINATED COMPOUNDS* (ppb)
Methylene chloride 22
Tetrachloroethene 1 J
BTEX AND BNA COMPOUNDS** (ppb)
BTEX ND
BNAs R
TOTAL PETROLEUM HYDROCARBONS (ppm)
NA

B-13A (0-2.0')
CHLORINATED COMPOUNDS* (ppb)
Tetrachloroethene 15
BTEX AND BNA COMPOUNDS** (ppb)
ND
TOTAL PETROLEUM HYDROCARBONS (ppm)
NA

OHSS-1 (2') USEPA SAMPLE No. TW2
CHLORINATED COMPOUNDS* (ppb)
Methylene Chloride 12 BJ
Acetone 310
Tetrachloroethene 5,400 D
BTEX AND BNA COMPOUNDS** (ppb)
Xylenes 6 BJ
(BNAs NOT ANALYZED)
TOTAL PETROLEUM HYDROCARBONS (ppm)
NA

OHSS-1FR (5') USEPA SAMPLE No. TW5 DUP
CHLORINATED COMPOUNDS* (ppb)
Methylene Chloride 3,000 BJ
Tetrachloroethene 22,000
BTEX AND BNA COMPOUNDS** (ppb)
Xylenes 4,700 BJ
(BNAs NOT ANALYZED)
TOTAL PETROLEUM HYDROCARBONS (ppm)
NA

OHSS-1 (5') USEPA SAMPLE No. TW5
CHLORINATED COMPOUNDS* (ppb)
Methylene Chloride 450 BJ
Acetone 360
Tetrachloroethene 59,000 D
2-Butanone 440 BJ
BTEX AND BNA COMPOUNDS** (ppb)
Xylenes 670 BJ
(BNAs NOT ANALYZED)
TOTAL PETROLEUM HYDROCARBONS (ppm)
NA

OHSS-1 (8') USEPA SAMPLE No. TW8
CHLORINATED COMPOUNDS* (ppb)
Methylene Chloride 290 BJ
Acetone 1,300
Tetrachloroethene 400 J
2-Butanone 320 BJ
BTEX AND BNA COMPOUNDS** (ppb)
ND (Xylene RESULTS NOT AVAILABLE)
(BNAs NOT ANALYZED)
TOTAL PETROLEUM HYDROCARBONS (ppm)
NA

OHSS-1 (20') USEPA SAMPLE No. TW20
CHLORINATED COMPOUNDS* (ppb)
Methylene Chloride 1,300 B
BTEX AND BNA COMPOUNDS** (ppb)
ND (Xylene RESULTS NOT AVAILABLE)
(BNAs NOT ANALYZED)
TOTAL PETROLEUM HYDROCARBONS (ppm)
NA

B-10 (6.0-8.0')
CHLORINATED COMPOUNDS* (ppb)
ND
BTEX AND BNA COMPOUNDS** (ppb)
Butyl benzyl phthalate 160 J
Di-n-butyl phthalate 220 J
TOTAL PETROLEUM HYDROCARBONS (ppm)
27

B-13 (4.0-6.0')
CHLORINATED COMPOUNDS* (ppb)
Tetrachloroethene 200 D
BTEX AND BNA COMPOUNDS** (ppb)
Fluoranthene 42 J
TOTAL PETROLEUM HYDROCARBONS (ppm)
28

B-11 (0-2.0')
CHLORINATED COMPOUNDS* (ppb)
Methylene chloride 3 J
Tetrachloroethene 29
BTEX AND BNA COMPOUNDS** (ppb)
Toluene 3 J
TOTAL PETROLEUM HYDROCARBONS (ppm)
41

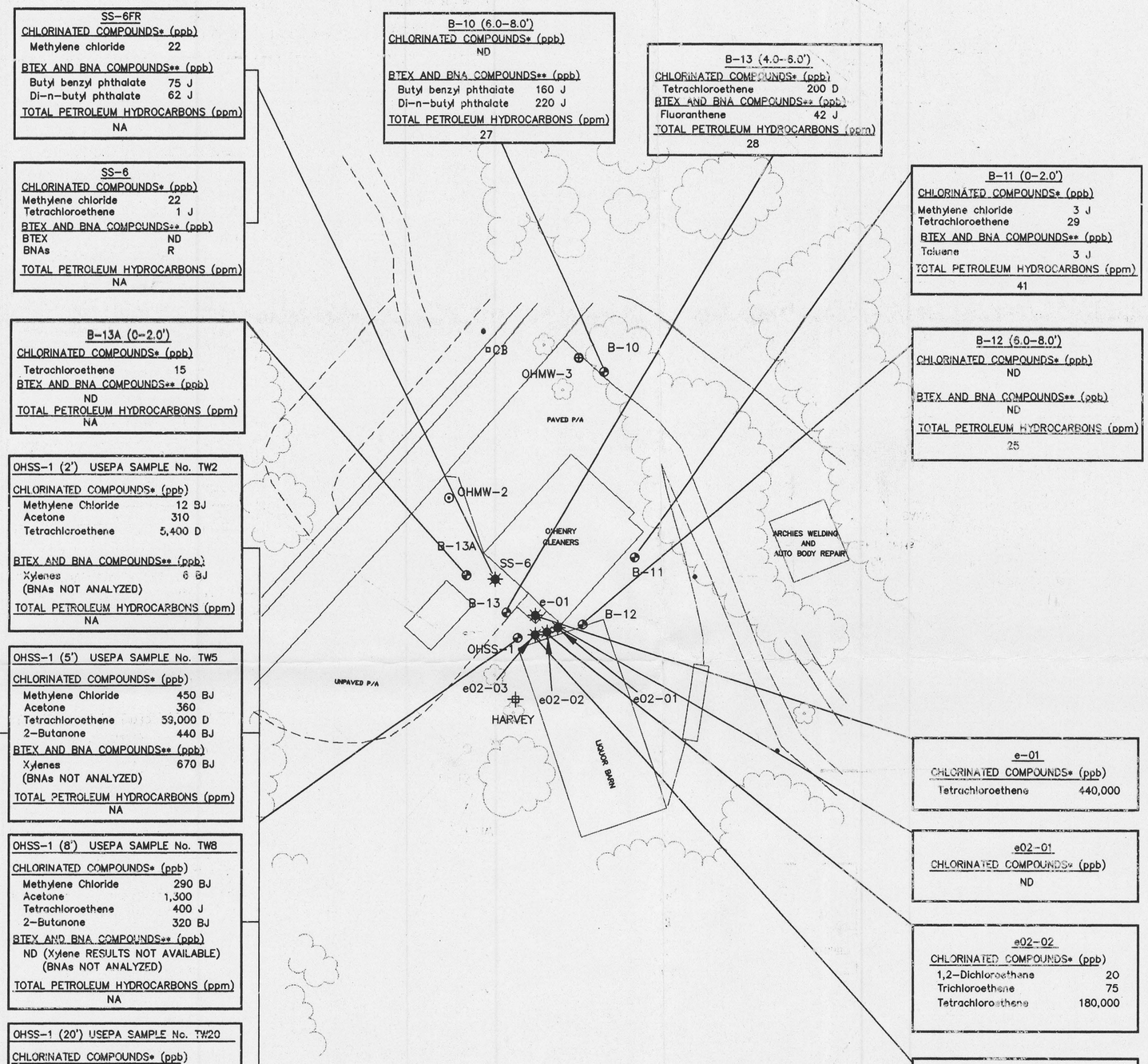
B-12 (6.0-8.0')
CHLORINATED COMPOUNDS* (ppb)
ND
BTEX AND BNA COMPOUNDS** (ppb)
ND
TOTAL PETROLEUM HYDROCARBONS (ppm)
25

e-01
CHLORINATED COMPOUNDS* (ppb)
Tetrachloroethene 440,000

e02-01
CHLORINATED COMPOUNDS* (ppb)
ND

e02-02
CHLORINATED COMPOUNDS* (ppb)
1,2-Dichloroethene 20
Trichloroethene 75
Tetrachloroethene 180,000

e02-03
CHLORINATED COMPOUNDS* (ppb)
ND



NOTES:

1. SOIL SAMPLES B-10, B-11, B-12, B-13, B-13A, SS-6, AND SS-6FR WERE COLLECTED BY GERAGHTY & MILLER, INC. IN AUGUST 1992 (GERAGHTY & MILLER, INC. 1993a); SOIL SAMPLES e-01, e02-01, e02-02, e02-03 WERE COLLECTED BY CAMP, DRESSER & McKEE ON SEPTEMBER 8, 1988 (e-01) AND JUNE 5, 1989 (e02-01, e02-02, e02-03) (CDM 1990b); SOIL SAMPLES FROM OHSS-1 WERE COLLECTED BY GEO-CARIBE ON JUNE 27, 1990 (IT CORPORATION 1990).
2. SOIL SAMPLES e02-01, e02-02, AND e02-03 WERE ALSO ANALYZED FOR BNAs, PESTICIDES, POLYCHLORINATED, BYPHENYLS (PCBs), TOTAL PETROLEUM HYDROCARBONS, AND METALS, BUT NO RESULTS WERE AVAILABLE.

SCALE
0 50 100

LEGEND

HARVEY ⊕	EXISTING SUPPLY WELL LOCATION
B-12 ◕	SOIL BORING LOCATION
SS-8 ✸	SURFACE SOIL SAMPLE APPROXIMATE LOCATION
OHMW-2 ⊙	O'HENRY MONITORING WELL LOCATION
BTEX	BENZENE, TOLUENE, ETHYLBENZENE, AND XYLENES
BNA	BASE NEUTRAL/ACID EXTRACTABLE COMPOUNDS
*	INCLUDES NON-CHLORINATED, NON-BTEX VOLATILE ORGANIC COMPOUNDS
**	INCLUDES MOSTLY PETROLEUM-RELATED COMPOUNDS SOME BNA COMPOUNDS MAY BE LABORATORY ARTIFACTS
ND	NOT DETECTED
NA	NOT ANALYZED
FR	FIELD REPLICATE
(0-2.0')	DEPTH OF SAMPLE INTERVAL IN FEET BELOW LAND SURFACE
B	ANALYTE ALSO FOUND IN FIELD BANK
J	RESULT WAS DETECTED BELOW THE REPORTING LIMIT AND/OR IS AN ESTIMATED CONCENTRATION
D	ANALYTE IDENTIFIED AT A SECONDARY DILUTION
R	REJECTED
ppb	PARTS PER BILLION
ppm	PARTS PER MILLION

GERAGHTY & MILLER, INC.
Environmental Services

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PROJECT NO.: PR0013.018	FILE NO: TU-279
DRAWING:	PLOT SIZE: 1=50
DRAFTED BY: E. EAGLESTON	DATE: 12-3-93
CHECKED BY: N. BENOWITZ	DATE: 12-3-93
APPROVED BY: T. DANAHY	DATE:

O'HENRY CLEANERS FACILITY SOIL ANALYTICAL RESULTS OF SAMPLES COLLECTED SEPTEMBER 1988, JUNE 1989, JUNE 1990, AND AUGUST 1992

TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE
4-7

EPA REGION II
SCANNING TRACKING SHEET

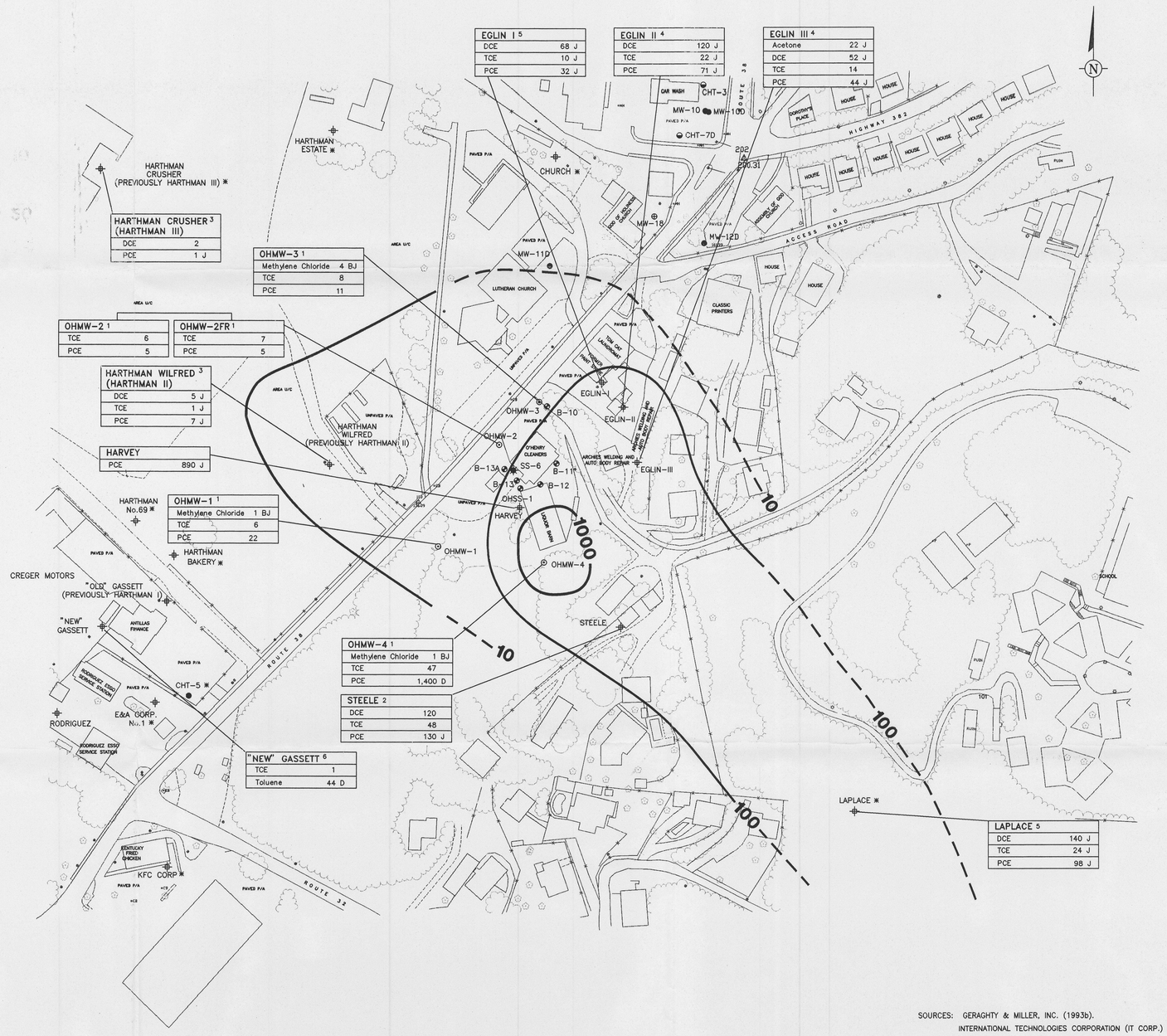
DOC ID # 64546

DOC TITLE/SUBJECT:

TUTU WELLS SUPERFUND SITE
FIGURE 4-7
O'HENRY CLEANERS FACILITY SOIL ANALYTICAL RESULTS OF SAMPLES COLLECTED SEPTEMBER 1988, JUNE 1989, JUNE 1990, AND AUGUST 1992

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NEW YORK, NY 10007



LEGEND

MW-18 ⊕	PROPOSED SHALLOW MONITORING WELL LOCATION
MW-1 ●	EXISTING SHALLOW MONITORING WELL LOCATION
MW-6D ●	EXISTING DEEP MONITORING WELL LOCATION
EGLIN-I ⊕	EXISTING SUPPLY WELL LOCATION
CHT-6D ⊖	MONITORING WELLS INSTALLED BY CARIBBEAN HYDRO-TECH, INC. (LOCATIONS APPROXIMATE)
B-12 ⊘	SOIL BORING LOCATION
SS-8 ✱	SURFACE SOIL SAMPLE APPROXIMATE LOCATION
OHMW-4 ⊙	O'HENRY MONITORING WELL LOCATION
▲ 175.89	EXISTING CONTROL MONUMENT (ELEVATION IN FEET ABOVE MEAN SEA LEVEL)
*	LOCATION OF WELL IS APPROXIMATE
CB	CATCH BASIN
MH	MANHOLE
P/A	PARKING AREA
DCE	1,2-DICHLOROETHENE
TCE	TRICHLOROETHENE
PCE	TETRACHLOROETHENE
D	ANALYTE IDENTIFIED AT SECONDARY DILUTION
FR	FIELD REPLICATE
J	ESTIMATED VALUE
B	ANALYTE ALSO FOUND IN FIELD BLANK

ALL CONCENTRATIONS IN PARTS PER BILLION (ppb) EXCEPT TPHs WHICH ARE IN PARTS PER MILLION (ppm)

1	SAMPLES COLLECTED AUGUST 2, 1990 (IT CORPORATION 1990)
2	SAMPLES COLLECTED SEPTEMBER 25, 1990 (GERAGHTY & MILLER, INC. 1993b)
3	SAMPLES COLLECTED SEPTEMBER 26, 1990 (GERAGHTY & MILLER, INC. 1993b)
4	SAMPLES COLLECTED SEPTEMBER 27, 1990 (GERAGHTY & MILLER, INC. 1993b)
5	SAMPLES COLLECTED OCTOBER 2, 1990 (GERAGHTY & MILLER, INC. 1993b)
6	SAMPLES COLLECTED FEBRUARY 5, 1991 (GERAGHTY & MILLER, INC. 1993b)
100	LINE OF TOTAL CONCENTRATION OF PCE, TCE AND DCE (IN ppb)

SOURCES: GERAGHTY & MILLER, INC. (1993b).
INTERNATIONAL TECHNOLOGIES CORPORATION (IT CORP.) (1990).

SCALE
0 100 200

GERAGHTY & MILLER, INC.
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PROJECT NO.: PR0013.018	FILE NO:
DRAWING: TU-281	PLOT SIZE: 1=100
DRAFTED BY: E. EAGLESTON	DATE: 12-15-93
CHECKED BY: N. BENOWITZ	DATE: 12-15-93
APPROVED BY: T. DANAHY	DATE: 12-15-93

O'HENRY CLEANERS FACILITY GROUNDWATER ANALYTICAL RESULTS FOR SAMPLES COLLECTED IN AUGUST, SEPTEMBER, OCTOBER 1990 AND FEBRUARY 1991

TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE
4-8

EPA REGION II
SCANNING TRACKING SHEET

DOC ID # 64546

DOC TITLE/SUBJECT:

TUTU WELLS SUPERFUND SITE
FIGURE 4-8
O'HENRY CLEANERS FACILITY
GROUNDWATER ANALYTICAL RESULTS FOR SAMPLES COLLECTED IN AUGUST, SEPTEMBER, OCTOBER 1990 AND FEBRUARY 1991

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A

A'

South

North

ELEVATION (FEET ABOVE MEAN SEA LEVEL)

240 230 220 210 200 190 180 170 160 150 140 130 120 110 100 90 80 70 60 50 40 30 20 10

MATTHIAS

STEELE

OHMW-4

HARVEY

EGLIN-I

SEPT 11,1987

SEPT 11,1987

SEPT 11,1987

MW-12D

CHT-7D
FWDWT #1

MW-9

LAND SURFACE

MW-6D

MW-6R

CHT-6D
FWDWT #2

MW-4D

MW-4

MW-3

MW-1D

MW-1

MW-13D

HEAVILY FRACTURED 40-50 GPM (HYDROLOGIC ASSOCIATES U.S.A., INC. 1993a)

HEAVILY FRACTURED (*) (HYDROLOGIC ASSOCIATES U.S.A., INC. 1993a)

SOME FRACTURING <5 GPM (HYDROLOGIC ASSOCIATES U.S.A., INC. 1993a)

NR

GREEN ANDESITE BRECCIA AND TUFF

CABES POINT CONGLOMERATE

HEAVILY FRACTURED (HYDROLOGIC ASSOCIATES U.S.A., INC. 1993a)

MAJOR FAULTS LARGE (1") FRACTURES (HYDROLOGIC ASSOCIATES U.S.A., INC. 1993a)

LESS FRACTURES 30 GPM (HYDROLOGIC ASSOCIATES U.S.A., INC. 1993a)

TD EL.-22 FT

TD EL.-81 ft

VERTICAL EXAGGERATION 10X

NOTE: LINE OF CROSS SECTION SHOWN ON FIGURE 2-3

LEGEND

- FILL AND WEATHERED RESIDUUM (CLAY AND SILT)
- WEATHERED VOLCANIC ROCK
- VOLCANIC ANDESITE TUFF
- VOLCANIC BRECCIA
- VOLCANIC BRECCIA-DEBRIS FLOW
- INTRUSIVE DIORITIC ROCK
- CABES POINT CONGLOMERATE
- LITHOLOGIC LOGS NOT AVAILABLE
- FRACTURED ZONE
- APPARENT DIP OF LITHOLOGIC CONTACTS (DIP MEASUREMENTS WERE TAKEN AT NEARBY OUTCROPS; THE DIP ANGLES WERE PROJECTED ONTO A LINE OF VERTICAL SECTION AND CORRECTED FOR APPARENT DIP AND FINALLY CORRECTED FOR VERTICAL EXAGGERATION.)
- DEEP WATER-LEVEL ELEVATION
- SHALLOW WATER-LEVEL ELEVATION MEASURED ON NOVEMBER 16, 1992
- OPEN BOREHOLE
- SCREENED SECTION/OPEN INTERVAL
- NR NO RECOVERY
- TD EL. TOTAL DEPTH ELEVATION
- GPM GALLONS PER MINUTE

SCALE
0 200 FEET

GERAGHTY & MILLER, INC.
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PROJECT NO.: PR0013.013	FILE NO: TU-270
DRAWING: TU-270	PLOT SIZE: 1"=100'
DRAFTED BY: K. McCANN	DATE: 12-16-93
CHECKED BY: N. BENOWITZ	DATE: 12-16-93
APPROVED BY: T. DANAHY	DATE: 12-16-93

REV. NO.	DATE	DESCRIPTION	BY	APPR.

REV. NO.	DATE	DESCRIPTION	BY	APPR.

HYDROGEOLOGIC CROSS SECTION A-A'

TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE 4-9

EPA REGION II
SCANNING TRACKING SHEET

DOC ID # 64546

DOC TITLE/SUBJECT:
TUTU WELLS SUPERFUND SITE
FIGURE 4-9
HYDROGEOLOGIC CROSS SECTION A-A'

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VIHA-1
AQUIFER TEST
T = NOT OBTAINED
(GERAGHTY & MILLER, INC. 1983a)

CHT-6D
AQUIFER TEST
T = 20,470 TO 25,750 gpd/ft
(HYDROLOGIC ASSOCIATES U.S.A., INC. 1993a)

MW-6R
AQUIFER TEST
T = 90,500 gpd/ft
(GERAGHTY & MILLER, INC. 1993a)

TILLETT
PUMPING TEST
T = 20,000 gpd/ft
(HAMLIN 1985)

MW-6D
AQUIFER TEST
T = 56,100 TO 87,500 gpd/ft
(GERAGHTY & MILLER, INC. 1993a)

FOUR WINDS III
AQUIFER TEST
T = 25,755 gpd/ft
(HYDROLOGIC ASSOCIATES U.S.A., INC. 1993a)

HARTHMAN RACETRACK
AQUIFER TEST
T = 1,189 gpd/ft
(HYDROLOGIC ASSOCIATES U.S.A., INC. 1993a)

HARTHMAN CRUSHER
AQUIFER TEST
T = 6,336 gpd/ft
(HYDROLOGIC ASSOCIATES U.S.A., INC. 1993a)

CHT-7D
AQUIFER TEST
T = 1,571 gpd/ft
(HYDROLOGIC ASSOCIATES U.S.A., INC. 1993a)

HARTHMAN BAPTISTE
AQUIFER TEST
T = 868 TO 1,227 gpd/ft
(HYDROLOGIC ASSOCIATES U.S.A INC. 1993a)

LEGEND

- MW-1 — EXISTING SHALLOW MONITORING WELL LOCATION
- MW-6D — EXISTING DEEP MONITORING WELL LOCATION
- EGLIN-I — EXISTING SUPPLY WELL LOCATION
- CHT-6D — MONITORING WELLS INSTALLED BY CARIBBEAN HYDRO-TECH, INC. (LOCATIONS APPROXIMATE)
- B-12 — SOIL BORING LOCATION
- SS-8 — SURFACE SOIL SAMPLE APPROXIMATE LOCATION
- OHMW-4 — O'HENRY MONITORING WELLS
- 175.89 — EXISTING CONTROL MONUMENT (ELEVATION IN FEET ABOVE MEAN SEA LEVEL)
- * — LOCATION OF WELL IS APPROXIMATE
- CB — CATCH BASIN
- MH — MANHOLE
- GERAGHTY & MILLER FRACTURE LINEAMENTS (GERAGHTY & MILLER, INC. 1992b)
- CAMP, DRESSER & McKEE FEDERAL PROGRAMS CORPORATION FRACTURE LINEAMENTS (CDM 1992)
- gpd/ft — GALLONS PER DAY PER FOOT
- T — TRANSMISSIVITY

SCALE
0 100 200

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APPROVED BY: T. DANAHY	DATE: 12-16-93

REV. NO.	DATE	DESCRIPTION	BY	APPR.

REV. NO.	DATE	DESCRIPTION	BY	APPR.

FRACTURE LINEAMENTS AND DISTRIBUTION OF TRANSMISSIVITY VALUES

TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE 4-10

EPA REGION II
SCANNING TRACKING SHEET

DOC ID # 64546

DOC TITLE/SUBJECT:

TUTU WELLS SUPERFUND SITE
FIGURE 4-10
FRACTURE LINEAMENTS AND DISTRIBUTION OF TRANSMISSIVITY VALUES

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NEW YORK, NY 10007

RAMSAY [3]	
ND	

RAMSEY FR [3]	
ND	

MW-2 [4]	
ND	

MW-4 [4]	
MTBE	1.2 J

MW-4D [4]	
Dimethyl phthalate	8 J

CHT-6D [5]	
B	11
MTBE	120

MW-6R [4]	
Di-n-octylphthalate	1 J
TPH	0.7

MW-6D [4]	
ND	

FOUR WINDS I [3]	
ND	

FOUR WINDS II [3]	
ND	

HARTHMAN RACETRACK [4]	
ND	

CHT-1 [2]	
MTBE	55

CHT-4 [2]	
X	5.4

MW-9S [4]	
B	16
T	2 J
E	5 J
X	2 J
MTBE	2200 D
n-Propylbenzene	12 J
Fluorene	9 J
Phenanthrene	2 J
TPH	21 D

MW-9 [4]	
B	26
E	19
X	2 J
MTBE	2700 D
n-Propylbenzene	8 J
Fluorene	5 J
2-Methylnaphthalene	1 J
Phenol	3 J
TPH	1.7

CH-2 [2]	
E	120
Naphthalene	65

CH-3 [2]	
B	26,000
T	38,000
E	2,400
X	38,000
MTBE	62,000

HARTHMAN CRUSHER [2]	
ND	

CHT-7D [5]	
B	4
E	3.8
X	2.7
n-Propylbenzene	0.81

MW-11D [4]	
ND	

EGLIN-I [3]	
ND	

EGLIN-II [3]	
T	0.081 J

OHMW-3 [6]	
ND	

OHMW-3FR [6]	
ND	

HARTHMAN ZERO [2]	
ND	

HARTHMAN WILFRED [2]	
ND	

HARTHMAN BAKERY [2]	
ND	

HARTHMAN BAPTISTE [2]	
ND	

MW-13D	
T	1 J

MW-14 [4]	
Dibenzoforan	2 J
Phenanthrene	

MW-1 [4]	
ND	

MW-1D	
ND	

MW-3 [4]	
MTBE	24 J
1,2-Dichlorobenzene	2 J

MW-5 [4]	
B	1000
T	180 J
E	930
X	1600
MTBE	6200
2,4-Dimethylphenol	7 J
2-Methylnaphthalene	130 D
4-Methylphenol	3 J
Naphthalene	310 D
TPH	4.2 J
n-Propylbenzene	180 J

MW-5FR [4]	
B	950
T	170 J
E	890
X	1500
MTBE	6200
2,4-Dimethylphenol	7 J
2-Methylnaphthalene	110 D
4-Methylphenol	3 J
Naphthalene	230 D
TPH	2.2 J
n-Propylbenzene	170 J

TILLETT [3]	
B	7
T	0.5 J
E	1.5 J

MW-7 [4]	
MTBE	5.8 J

MW-8 [4]	
MTBE	51

MW-10 [4]	
MTBE	660

MW-10D [4]	
MTBE	780

MW-12D [4]	
T	1 J
MTBE	11

EGLIN III [3]	
ND	

OHMW-2 [6]	
ND	

HARVEY [3]	
ND	

OHMW-4 [6]	
ND	

OHMW-1 [6]	
ND	

STEELE [3]	
ND	

LaPLACE [3]	
B	0.29 J
X	0.85 J

SMITH [3]	
ND	

MATTHIAS [1]	
ND	

LEGEND

- MW-1 ● EXISTING SHALLOW MONITORING WELL LOCATION
- MW-6D ● EXISTING DEEP MONITORING WELL LOCATION
- EGLIN-I ⊕ EXISTING SUPPLY WELL LOCATION
- CHT-6D ◒ MONITORING WELLS INSTALLED BY CARIBBEAN HYDRO-TECH, INC. (LOCATIONS APPROXIMATE)
- B-12 ⊘ SOIL BORING LOCATION
- SS-8 ✱ SURFACE SOIL SAMPLE APPROXIMATE LOCATION
- OHMW-4 ⊙ O'HENRY MONITORING WELLS
- 175.89 △ EXISTING CONTROL MONUMENT (ELEVATION IN FEET ABOVE MEAN SEA LEVEL)
- ✳ LOCATION OF WELL IS APPROXIMATE
- CB CATCH BASIN
- MH MANHOLE

B BENZENE
T TOLUENE
E ETHYLBENZENE
X XYLENE (TOTAL)
MTBE TERT-BUTYL METHYL ETHER
TPH TOTAL PETROLEUM HYDROCARBONS (ppm)
D DILUTION
FR FIELD REPLICATE
J ESTIMATED VALUE
ND NO PETROLEUM-RELATED COMPOUNDS DETECTED

ALL CONCENTRATIONS IN PARTS PER BILLION (ppb)
EXCEPT TPHs, WHICH ARE IN PARTS PER MILLION (ppm)

1 SAMPLES COLLECTED FEBRUARY 5, 1992
2 SAMPLES COLLECTED FEBRUARY 26 TO 29, 1992
3 SAMPLES COLLECTED SEPTEMBER 14 TO 17, 1992
4 SAMPLES COLLECTED SEPTEMBER 29 TO OCTOBER 7, 1992
5 SAMPLES COLLECTED DECEMBER 10 TO 18, 1992
6 SAMPLES COLLECTED MARCH 5, 1993

100 LINE OF TOTAL CONCENTRATION OF B, T, E, AND X (IN ppb)

SCALE
0 100 200

GERAGHTY & MILLER, INC.
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PROJECT NO.: PR0013.018	FILE NO:
DRAWING: TU-267	PLOT SIZE: 1=100
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APPROVED BY: T. DANAHY	DATE: 12-16-93

REV. NO.	DATE	DESCRIPTION	BY	APPR.

REV. NO.	DATE	DESCRIPTION	BY	APPR.

PETROLEUM-RELATED COMPOUNDS IN GROUNDWATER FEBRUARY 1992 TO MARCH 1993

TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE 4-11

EPA REGION II
SCANNING TRACKING SHEET

DOC ID # 64546

DOC TITLE/SUBJECT:

TUTU WELLS SUPERFUND SITE
FIGURE 4-11
PETROLEUM-RELATED COMPOUNDS IN GROUNDWATER FEBRUARY 1992 TO MARCH 1993

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MW-2 [4]	
DCE	26
Chloroform	1 J
TCE	3 J
PCE	15

MW-4 [4]	
DCE	86
TCE	8 J
PCE	25

MW-4D [4]	
DCE	150
Chloroform	1 J
TCE	11
PCE	44

CHT-6D [5]	
DCE	130
Chloroform	4.5
TCE	19
PCE	55
TCA	7.3

MW-6R [4]	
DCE	39
TCE	3 J
PCE	13

MW-6D [4]	
Chloroform	5 J
Bromodichloromethane	21 J
Dibromochloromethane	31 J
Bromoform	18 J

FOUR WINDS I [3]	
DCE	170
Chloroform	1.6 J
TCE	21
PCE	78

FOUR WINDS II [3]	
DCE	99
Chloroform	1 J
TCE	10
PCE	38

CHT-1 [2]	
DCE	170
TCE	14
PCE	69

CHT-4 [2]	
DCE	210
TCE	18
PCE	73

HARTHMAN RACETRACK [2]	
PCE	1.3

MW-9S [4]	
DCE	2 J
2-Butanone	2 J

MW-9 [4]	
Acetone	10 J

CH-2 [2]	
ND	

CH-3 [2]	
ND	

MW-11D [4]	
Chloroform	8 J
Bromodichloromethane	20 J
Dibromochloromethane	36 J
Bromoform	29 J

CHT-7D [5]	
	140
Chloroform	2.5
TCE	14
PCE	83

HARTHMAN CRUSHER [2]	
DCE	5
PCE	9.5

EGLIN-I [3]	
DCE	12
TCE	4.5
PCE	11

EGLIN-II [3]	
DCE	11
TCE	4.7
PCE	11

OHMW-3 [6]	
DCE	11
TCE	3
PCE	9

OHMW-3FR [6]	
DCE	12
TCE	4
PCE	7

HARTHMAN WILFERD [2]	
ND	

HARTHMAN ZERO [2]	
ND	

HARTHMAN BAKERY [2]	
ND	

HARTHMAN BAPTISTE [2]	
ND	

RAMSAY [3]	
DCE	1.4
Chloroform	2.9
Bromodichloromethane	0.98
TCE	0.94
PCE	16
Carbon disulfate	0.15 J

RAMSEY FR [3]	
DCE	1.4
Chloroform	2.8
Bromodichloromethane	0.89
TCE	0.89
PCE	16

MW-13D [4]	
2-Butane	12 J
PCE	7 J
Acetone	56 J

MW-14 [4]	
DCE	44
PCE	1 J
Carbon disulfate	3 J
VC	17

MW-1 [4]	
DCE	1000
Chloroform	6 J
TCE	190
PCE	590

MW-1D [4]	
DCE	600 J
Chloroform	10 J
Bromodichloromethane	4 J
TCE	52 J
Bromoform	8 J
PCE	190 J
Dibromochloromethane	6 J
VC	12 J

MW-3 [4]	
DCE	530 J
TCE	19 J
PCE	58
VC	140

MW-5 [4] *	
ND	

MW-5FR [4] *	
ND	

TILLETT [3]	
Acetone	85 BJ
Methylene Chloride	16 B
DCE	290
Chloroform	3.6 J
TCE	62
PCE	140

MW-7 [4]	
DCE	170
Chloroform	3 J
TCE	29
PCE	110

MW-8 [4]	
DCE	140
Chloroform	18
TCE	14
PCE	38

MW-10 [4]	
DCE	130
TCE	29 J
PCE	25 J
Acetone	45 J

MW-10D [4]	
DCE	180
TCE	18 J
PCE	40 J

MW-12D [4]	
DCE	2 J
Chloroform	18
Bromodichloromethane	30
Dibromochloromethane	55
Bromoform	44 J

EGLIN III [3]	
DCE	32
TCE	13
PCE	34

OHMW-2 [6]	
DCE	29 D
TCE	48 D
PCE	300 D

HARVEY [3]	
Acetone	28 BJ
Methylene Chloride	11 B
DCE	49
TCE	46
PCE	260

OHMW-4 [6]	
DCE	28 D
TCE	22 D
PCE	250 D

OHMW-1 [6]	
DCE	28 J
TCE	7
PCE	18

STEELE [3]	
DCE	140
TCE	33
PCE	65
VC	3.3

LaPLACE [3]	
DCE	130
Chloroform	1.4 J
TCE	22
PCE	67

SMITH [3]	
DCE	60
TCE	21
PCE	170

MATTHIAS [1]	
DCE	17
Chloroform	0.09 J
TCE	7.5
PCE	60 D

LEGEND

- MW-1 ● EXISTING SHALLOW MONITORING WELL LOCATION
- MW-6D ● EXISTING DEEP MONITORING WELL LOCATION
- EGLIN-I ⊕ EXISTING SUPPLY WELL LOCATION
- CHT-6D ⊖ MONITORING WELLS INSTALLED BY CARIBBEAN HYDRO-TECH, INC. (LOCATIONS APPROXIMATE)
- B-12 ⊘ SOIL BORING LOCATION
- SS-8 ✱ SURFACE SOIL SAMPLE APPROXIMATE LOCATION
- OHMW-4 ⊙ O'HENRY MONITORING WELLS
- 175.89 △ EXISTING CONTROL MONUMENT (ELEVATION IN FEET ABOVE MEAN SEA LEVEL)
- ✱ LOCATION OF WELL IS APPROXIMATE
- ▫CB CATCH BASIN
- ▫MH MANHOLE
- DCE 1,2-DICHLOROETHENE
- TCE TRICHLOROETHENE
- PCE TETRACHLOROETHENE
- VC VINYL CHLORIDE
- TCA 1,1,1-TRICHLOROETHANE
- B COMPOUND ALSO DETECTED IN BLANK
- D DILUTION
- FR FIELD REPLICATE
- J ESTIMATED VALUE

ALL CONCENTRATIONS IN PARTS PER BILLION (ppb)

1. SAMPLES COLLECTED FEBRUARY 5, 1992 (GERAGHTY & MILLER, INC. 1993b)
2. SAMPLES COLLECTED FEBRUARY 26 TO 29, 1992 (HYDROLOGIC ASSOCIATES U.S.A., INC. 1993a)
3. SAMPLES COLLECTED SEPTEMBER 14 TO 17, 1992 (GERAGHTY & MILLER, INC. 1993b)
4. SAMPLES COLLECTED SEPTEMBER 29 TO OCTOBER 7, 1992 (GERAGHTY & MILLER, INC. 1993b)
5. SAMPLES COLLECTED DECEMBER 10 TO 18, 1992 (HYDROLOGIC ASSOCIATES U.S.A., INC. 1993a)
6. SAMPLES COLLECTED MARCH 5, 1993 (IT CORPORATION 1993)

* DETECTION LEVELS ELEVATED TO 500 ppb DUE TO HIGH CONCENTRATIONS OF PETROLEUM-RELATED COMPOUNDS

100 — LINE OF TOTAL CONCENTRATION OF PCE, TCE, DCE, AND VC (IN ppb)

SCALE 0 100 200

SOURCES: IT CORPORATION (1993).
GERAGHTY & MILLER, INC. (1993b).
HYDROLOGIC ASSOCIATES U.S.A., INC. (1993a).

GERAGHTY & MILLER, INC.
Environmental Services

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DRAFTED BY: E. EAGLESTON	DATE: 12-16-93
CHECKED BY: N. BENOWITZ	DATE: 12-16-93
APPROVED BY: T. DANAHY	DATE: 12-16-93

REV. NO.	DATE	DESCRIPTION	BY	APPR.

REV. NO.	DATE	DESCRIPTION	BY	APPR.

CHLORINATED ORGANIC COMPOUNDS IN GROUNDWATER FEBRUARY 1992 TO MARCH 1993

TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN ISLANDS

FIGURE 4-12

EPA REGION II
SCANNING TRACKING SHEET

DOC ID # 64546

DOC TITLE/SUBJECT:

TUTU WELLS SUPERFUND SITE
FIGURE 4-12
CHLORINATED ORGANIC COMPOUNDS IN GROUNDWATER FEBRUARY 1992 TO MARCH 1993

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SUPERFUND RECORDS CENTER
290 BROADWAY, 18TH FLOOR
NEW YORK, NY 10007

GERAGHTY & MILLER, INC.
Environmental Services

PROJECT SCHEDULE

PROJECT:
PHASE II REMEDIAL INVESTIGATION IMPLEMENTATION SCHEDULE

LOCATION:
TUTU WELLS SITE

DESCRIPTION:
ST. THOMAS, U.S. VIRGIN ISLANDS

PROJECT NO.
PR0013.001

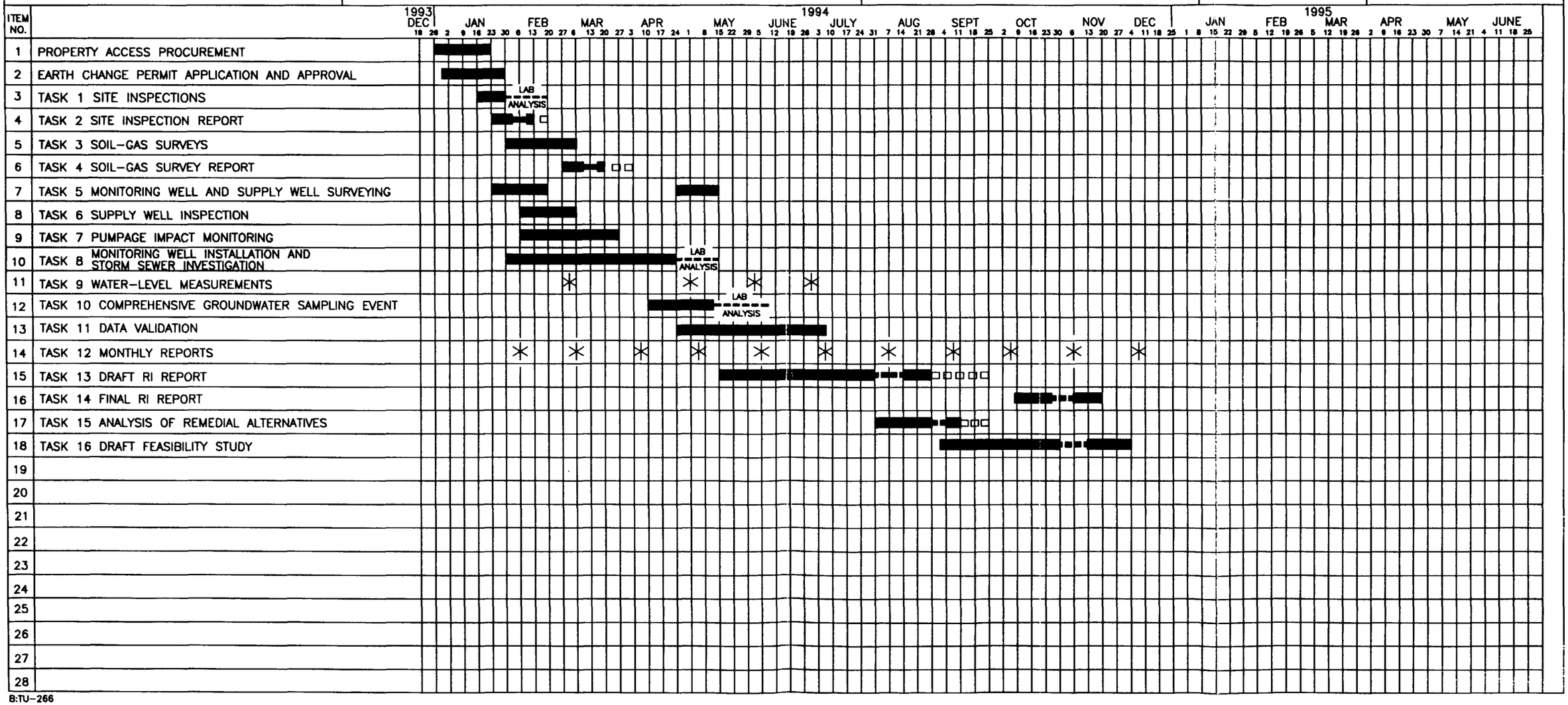
AUTHORIZATION NO.

LEGEND:
- GERAGHTY & MILLER IMPLEMENTATION
- POTENTIALLY RESPONSIBLE PARTY REVIEW
- USEPA REVIEW
- MILESTONES
- LAB ANALYSIS

FIGURE 7-2

SYM	REVISIONS	DATE

SCH'D BY:	D. NACHMAN	DATE:	12-10-93
CHK'D BY:	T. DANAHY	DATE:	12-20-93
APPV'D BY:	D. NACHMAN	DATE:	12-20-93



ITEM NO.	
1	PROPERTY ACCESS PROCUREMENT
2	EARTH CHANGE PERMIT APPLICATION AND APPROVAL
3	TASK 1 SITE INSPECTIONS
4	TASK 2 SITE INSPECTION REPORT
5	TASK 3 SOIL-GAS SURVEYS
6	TASK 4 SOIL-GAS SURVEY REPORT
7	TASK 5 MONITORING WELL AND SUPPLY WELL SURVEYING
8	TASK 6 SUPPLY WELL INSPECTION
9	TASK 7 PUMPAGE IMPACT MONITORING
10	TASK 8 MONITORING WELL INSTALLATION AND STORM SEWER INVESTIGATION
11	TASK 9 WATER-LEVEL MEASUREMENTS
12	TASK 10 COMPREHENSIVE GROUNDWATER SAMPLING EVENT
13	TASK 11 DATA VALIDATION
14	TASK 12 MONTHLY REPORTS
15	TASK 13 DRAFT RI REPORT
16	TASK 14 FINAL RI REPORT
17	TASK 15 ANALYSIS OF REMEDIAL ALTERNATIVES
18	TASK 16 DRAFT FEASIBILITY STUDY
19	
20	
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27	
28	

B:TU-266

APPENDIX A

SOIL GAS SURVEY PROCEDURES
TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN THOMAS

APPENDIX A

SOIL GAS SURVEY PROCEDURES
TUTU WELLS SITE
ST. THOMAS, U.S. VIRGIN THOMAS

INTRODUCTION

A soil-gas survey will be conducted at the Curriculum Center (former LAGA building) and the Virgin Islands Housing Authority (VIHA) maintenance area to identify potential sources of volatile organic compounds (VOCs) in soil. The study will be conducted in accordance with details outlined in Section 7.1.3 (Soil-Gas Surveys) of the Phase II Remedial Investigation (RI) Work Plan. VOCs detected by a soil-gas survey can originate directly from VOCs in the soil or from VOCs diffused upward into the soil atmosphere from ground water. Soil-gas surveys provide a qualitative indication of VOCs in the unsaturated zone, rather than a quantitative indication of VOCs in the soil or the ground water, because site-specific factors (such as paving, geology, distribution properties of VOCs, depth to water, soil moisture, and the geochemistry of the unsaturated sediments) can affect soil-gas concentrations. Although many soil gas surveys have been undertaken by various investigators at several facilities in the Tutu area, previously conducted soil-gas surveys have had mixed results due to these factors. Therefore, interpretation of the soil-gas survey results requires an understanding of the data and their limitations, as well as knowledge of the site geology. Additional sampling and laboratory analyses of the soil and ground water can confirm the presence and quantify the concentration of VOCs identified by the soil-gas survey.

A Photovac 10S50 portable Gas Chromatograph (GC) will be used to determine the presence or absence of VOCs in soil vapor samples collected at the Curriculum Center (former LAGA building) and the VIHA maintenance area. A Photovac 10S50 GC will be used for its ability to separate and quantify selected VOCs. Results can be obtained from the GC within 20 to 30 minutes. Compound identification and approximate concentrations are provided; however, only those compounds for which the instrument is initially calibrated can be identified and quantified. Therefore, prior to the study, the GC will be calibrated with air standards for

benzene, toluene, xylene, trichloroethene, tetrachloroethene, cis-1,2-dichloroethene, and trans-1,2-dichloroethene. Each of these standards will be prepared by introducing a known volume of the compound into a 1-liter (L) Tedlar bag that has previously been filled with organic-free air.

SURVEY GRID

The soil-gas survey will be conducted on an unbiased rectilinear grid pattern established initially on a 40-foot spacing. As "hot spots" are encountered, the grid will be reduced to 20-foot spacing, as needed. The survey will be conducted in the areas to the north and west of the Curriculum Center (former) LAGA building. These areas include the former LAGA loading dock area and the area adjacent to the former LAGA dry cleaning room. The survey will also include the areas to the north and west of the VIHA maintenance garage. Areas to be investigated at the Curriculum Center and VIHA maintenance garage are shown on Figure 7-1 of the Phase II RI Work Plan. The soil-gas survey results will be summarized on a map delineating the approximate areal extent and the concentrations of VOCs detected. This map will be used to evaluate potential sources and to identify optimal locations for monitoring wells at the Curriculum Center and VIHA facilities, as appropriate.

CALIBRATION

Prior to the initiation of the soil-gas survey, the GC will be calibrated with air standards of site-specific compounds. Standards will be made for each compound by introducing known volumes of each compound into a 1-L Tedlar bag that has been previously filled with organic-free air. The amounts of each compound injected into the Tedlar bag are based on the following formula:

$$\text{amount of compound added in microliters (ul)} = (A \times 760 \text{ mm/Hg})/p$$

where A = concentration of the compound, parts per million by volume (ppmv)

p = vapor pressure of the compound, in millimeters of mercury (mm/Hg)

For each initial calibration, the standards will be injected into the GC five times. An average response factor will be obtained by dividing the concentration of the standard by the average area under the peak from the five injections.

SAMPLING PROCEDURE

A rotary hammer drill with a 1 1/2-inch bit will be used to obtain access to the soil beneath asphalt and cement, if present. If the asphalt or cement is believed to be thicker than 1 foot, which is generally the case around the loading docks, then no attempt will be made to core through it. A 1/2-inch diameter borehole in the soil will be created with a slide hammer and solid rod assembly. These boreholes will be approximately 3 feet in depth. The solid rod will be removed and a 1/4-inch diameter hollow, stainless-steel rod will be inserted. A 1/8-inch Teflon tube will be contained inside the stainless-steel tube. The Teflon tube will extend outside of the hollow, stainless-steel tube. Midway down the exposed tubing is a stainless-steel tee through which syringe samples will be taken. A nail inserted into the lower end of the Teflon tubing will prevent clogging of the assembly as it is lowered into the borehole. The nail will then be disengaged, and the top of the borehole will be sealed around the stainless-steel rod with drill cuttings.

A pumping time study will then be conducted to determine the appropriate evacuation time(s) for soils at the Tutu Wells Site. In this study, the Teflon tubing is attached to a diaphragm pump and the borehole is evacuated for 1 minute. A 300-ul sample is collected through the stainless-steel tee with a gas-tight syringe, and then the pump is shut off. The sample is injected into the portable GC for analysis. This procedure is repeated until five samples, at 1 minute intervals, are collected. The pumping time to be used at the Tutu Wells Site will correspond to the time when the highest concentrations of VOCs are detected. If compounds are not detected in the first borehole, the procedure will be repeated. If compounds are not detected by the third borehole, a pumping time of 2 minutes will be used. Care will be taken to ensure that at least two probe volumes will be purged.

COMPOUND IDENTIFICATION AND QUANTITATION

The GC will identify all peak areas greater than 0.1 volt seconds (VS) as unknowns. The GC operator will then match the retention times of the most recent standard with the unknowns. If the retention times match, the VOCs will be identified and quantified by multiplying the area (in VS) of the VOCs by the response factor calculated from the initial calibration. The final concentration will be reported in parts per million (ppm).

BLANKS

Blanks will be run to determine if there is carryover from previous samples and standards. The blanks will be one of the following: GC blanks, syringe blanks, or equipment blanks. A GC blank will be run at the start of each day's sampling to ensure a steady baseline. This is done by starting a GC analysis without injecting a sample. Syringe blanks will be analyzed following the completion of the calibration runs by injecting 500 ul of ambient air into the GC (500 ul is the maximum capacity of the syringe). Syringe blanks will also be analyzed periodically during the day. VOC contamination detected in the syringe will be cleaned from the syringe by using a methanol and organic-free water rinse. Equipment blanks of the sampling apparatus (i.e., tubing and hose) will be analyzed following every sample where a positive result is obtained. Equipment blanks are collected by removing the sampling assembly from a borehole and running the pump for a few minutes to draw ambient air through the system. An air sample is collected from the stainless-steel equipment and analyzed with the GC. If VOCs are detected in the equipment blank sample, the sampling equipment will be decontaminated by purging the equipment with the sampling pump until the VOCs is no longer detected.

QUALITY CONTROL

In addition to the calibration analyses, duplicate analyses will be run once every ten samples. Continuing calibration analyses will be performed as required, or a minimum of once every 2 hours, by injecting 300 ul of the standard into the GC. A syringe blank will be run after every calibration check. The retention time of each compound will then be checked for peak drift by comparing the new retention time with the one from the previous standard analysis.

A fresh standard will be prepared at the beginning of each day to update the average response factors.